



COSPAR

COMMITTEE ON
SPACE RESEARCH



CALL FOR ABSTRACTS 2024



COSPAR 2024
45th Scientific Assembly
July 13-21 2024, BEXCO, Busan, Korea

www.cospar2024.org

COSPAR 2024

45th Scientific Assembly

July 13-21 2024, BEXCO, Busan, Korea

Hosts



Ministry of Science and ICT

Korean National Committee for COSPAR

Organizer



Korea Astronomy and
Space Science Institute



Korea Space Science Society

Sponsors



부산광역시
BUSAN METROPOLITAN CITY



KOREA
TOURISM
ORGANIZATION

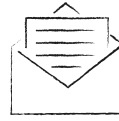


bto BUSAN
TOURISM ORGANIZATION

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Welcome Message

from the COSPAR President

Pascale Ehrenfreund

Dear Esteemed Delegates,

Welcome to the 45th Scientific Assembly of the Committee on Space Research (COSPAR), to be held from July 13 through July 21, 2024, at BEXCO, in the bustling city of Busan, Republic of Korea. It is with great delight and honor that we host this Scientific Assembly together with the Korean Ministry of Science and ICT, the Korean National Committee for COSPAR, the Korea Astronomy and Space Science Institute and the Korean Space Science Society, bringing together the world's finest minds from the diverse realm of space research.

For more than six decades COSPAR has been at the forefront of fostering international scientific research in space, striving to promote peace and cooperation on a global scale. The yearly Scientific Assemblies have been a testament to this commitment, serving as a dynamic platform for researchers, scientists, engineers, and educators from all corners of the world.

This year's Scientific Assembly, too, holds a wealth of promise and possibility. Our theme for the 45th edition - "Team Spirit in Space Research" - reflects our collective ambition to gather scientists and engineers from all countries to peacefully use space science for the benefit of all mankind. Over the course of this nine-day conference, we invite you to engage in thought-provoking scientific sessions, inspiring keynote speeches, interactive workshops, and enlightening panel discussions. These are designed to not only expand our understanding of the universe but also to create new avenues for future exploration and collaboration.

The space sector in Korea has experienced a significant surge recently, emerging as a dynamic and innovative force in the global space arena. With a blend of ambitious government initiatives, robust private sector participation, and cutting-edge technological advancements, Korea is progressively carving out a substantial niche in space exploration and research.

While we dive deep into scientific deliberations and space exploration dialogue, let us not forget the spirit of collaboration that has brought us together. By choosing to become a sponsor or exhibitor, your organization will open a gateway to a wealth of opportunities. You will not only be able to augment your presence and discover fresh audiences, but also successfully reinforce collaboration and offer invaluable support to the space research community.

The choice of Busan as the venue for this Scientific Assembly is symbolic in itself. Known for its spectacular landscapes, vibrant culture, and cutting-edge technology, Busan mirrors the spirit of our mission – a harmonious blend of heritage and progress. This, coupled with the state-of-the-art facilities of BEXCO, ensures a productive and memorable stay for all attendees. Let us also explore and appreciate the rich culture and hospitality of Busan. The warm welcome, exquisite cuisine, and awe-inspiring sights provide a distinct opportunity to connect with and celebrate our shared human heritage, even as we traverse the vast expanse of our cosmic voyage.

On behalf of the COSPAR 2024 Organizing Committees we express our sincerest gratitude to all attendees, presenters, sponsors, and the dynamic city of Busan for making this event possible. We look forward to a week of breakthroughs, learning, networking, and memorable experiences.

Again, welcome to the 45th Scientific Assembly of COSPAR.
Together, let's navigate the future of space research.



Yours sincerely,

Pascale Ehrenfreund
COSPAR President



COSPAR 2024

45th Scientific Assembly

July 13-21, 2024 | BEXCO, Busan, Korea

www.cospar2024.org



Jong Uk Park
Chair
COSPAR 2024
Local Organizing
Committee



Dong-Hun Lee
Chair
COSPAR 2024
Scientific Program
Committee

INVITATION

It is our great pleasure and honor to invite you all to the 45th COSPAR Scientific Assembly to be hosted in Busan, Korea from July 13 to 21, 2024.

Your ideas, expertise, and experience, shared among us, will reshape the future of space science beyond imagination and encourage the development of the next generation of space professionals and students across all regions in this rapidly rising new space age. Korea's talented and passionate space scientists and engineers, with their rapidly elevated profile and the world's leading advanced industries at their disposal, will also share our proven capabilities and versatile approaches in channeling academia and industry, developed and underdeveloped nations.

The COSPAR 2024 LOC and SPC, with the support of the Ministry of Science and ICT, the Korean National Committee for COSPAR, Korea Astronomy and Space Science Institute, and the Korean Space Science Society, are committed to offering the best and most effective platform where all participants can be inspired and enlightened in every way. In addition, Busan is a superlative destination, boasting state-of-the-art conference facilities, the finest accommodations, and world-class city infrastructure. All participants will have a series of superb and pleasant experiences and opportunities to appreciate Busan's rich natural, cultural, and urban legacies in and around the Assembly.

We eagerly await the pleasure of welcoming all of you to Busan.

Host



Ministry of Science and ICT

Korean National Committee for COSPAR

Organizer



Korea Astronomy and
Space Science Institute



The Korean Space Science Society

Sponsor



부산광역시
BUSAN METROPOLITAN CITY



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TOURISM
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BUSAN
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The COSPAR Scientific Assembly serves as a platform for scientists, researchers, engineers, and space professionals from around the world to gather and present their latest research findings, exchange knowledge, and discuss advancements in space science and technology. Continuing the legacy of one of the most successful COSPAR Symposia held in Jeju Island in 2017, COSPAR 2024 guarantees a most fruitful, amusing, and memorable Assembly for all participants.

The key features of COSPAR 2024 will include:

1. Assembly program: The 45th COSPAR Scientific Assembly will convene with new features, including shorter daily schedules and an increased number of rooms compared to the past meetings. These changes will allow attendees to avoid very early-morning and/or late-evening presentations and to reduce the number of events scheduled at the very beginning or end of each day. In addition, to enhance global attention for the motto of Team Spirit in space research, all highlighted cross-sectoral events, such as interdisciplinary lectures, panel discussions, and poster sessions, are strategically scheduled at pivotal times of each day. Various associated events, such as the IAA day, ILWS plenary meeting, Teacher's Training Program, Korean Pathfinder Lunar Orbiter Science workshop, and others, are also planned during the Assembly.
2. Social events & networking: COSPAR 2024 will provide numerous networking opportunities for attendees to interact with fellow researchers, scientists, industry professionals, and representatives from space organizations. The social and special events, such as Icebreaker, welcome reception, young researchers' networking day, IDEA lunch, Farewell lunch, and banquet will elevate networking opportunities as well as accelerate building professional relationships.

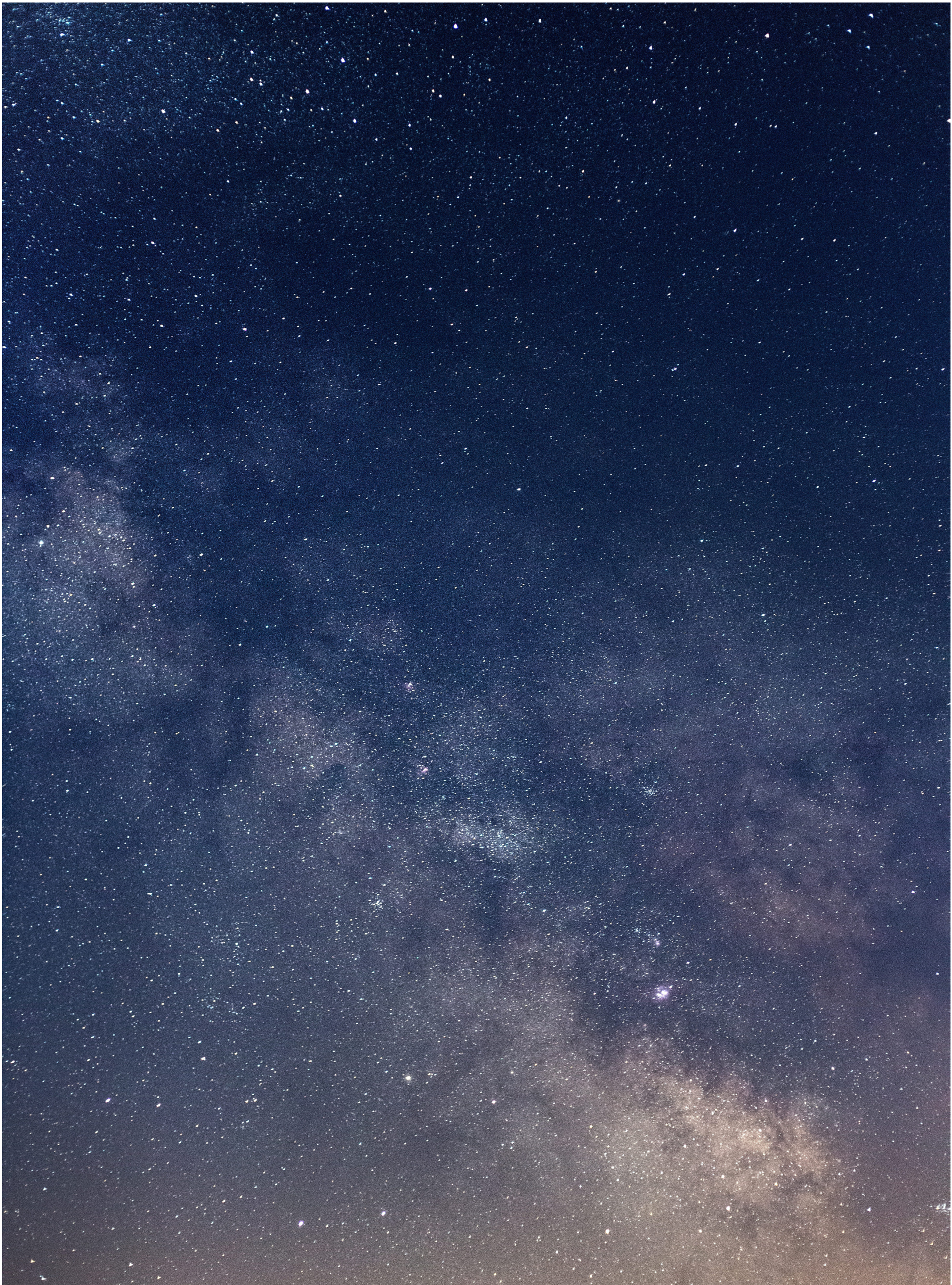


Image credit: Pexels, Free Nature Stock

PROGRAM AT A GLANCE

Time	July 13 (Sat.), 2024	July 14 (Sun.), 2024	July 15 (Mon.), 2024	July 16 (Tue.), 2024
08:30 - 08:45	Registration Desk Opens	Registration Desk Opens	Registration Desk Opens	Registration Desk Opens
08:45 - 09:00				
09:00 - 09:15	IAA Day	Scientific Session #1	Scientific Session #4	Scientific Session #6
09:15 - 09:30				
09:30 - 09:45		Coffee Break	Coffee Break	Coffee Break
09:45 - 10:00				
10:00 - 10:15		Scientific Session #2	Scientific Session #5	Scientific Session #7
10:15 - 10:30				
10:30 - 10:45		Lunch Break	Lunch Break SC/P/TG Business Meetings	Lunch Break SC/P/TG Business Meetings COSPAR Award Lunch
10:45 - 11:00				
11:00 - 11:15		IDL	Opening Ceremony (COSPAR Space Science Award)	Panel Discussion
11:15 - 11:30				
11:30 - 11:45		Scientific Session #3	Industry Session (Sponsor Presentations)	Scientific Session #8
11:45 - 12:00				
12:00 - 12:15		Coffee Break	Coffee Break	Coffee Break
12:15 - 12:30				
12:30 - 12:45		Latest Results	Space Agency Round Table	Poster Session (Sponsor Presentation)
12:45 - 13:00				
13:00 - 13:15		Public Lecture	Opening Reception	
13:15 - 13:30				
13:30 - 13:45		COSPAR Council Meeting #1 (Closed)		
13:45 - 14:00				
14:00 - 14:15	IAA Dinner	Exhibition for Public		
14:15 - 14:30				
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Scientific Session		Special Session	Poster Session	Social Program	Associated Events				
July 17 (Wed.), 2024		July 18 (Thu.), 2024		July 19 (Fri.), 2024		July 20 (Sat.), 2024		July 21 (Sun.), 2024	
Registration Desk Opens		Registration Desk Opens		Registration Desk Opens		Registration Desk Opens		Technical / Social Tours	
Scientific Session #9		Scientific Session #12		Scientific Session #15		Scientific Session #19			
Coffee Break		Coffee Break		Coffee Break		Coffee Break			
Scientific Session #10		Scientific Session #13		Scientific Session #16		Scientific Session #20			
Lunch Break SC/P/TG Business Meetings		Lunch Break SC/P/TG Business Meetings IDEA Lunch		Lunch Break		Closing Ceremony			
IDL		CIR Panel Discussion		IDL					
Scientific Session #11		Scientific Session #14		Scientific Session #17		COSPAR Council Meeting #2 (Closed)			
Coffee Break		Coffee Break		Coffee Break					
Poster Session (Sponsor Presentation)		Poster Session (Sponsor Presentation)		Scientific Session #18					
Young Researchers' Networking Night		COSPAR Council Evening (Closed)		Banquet					

REGISTRATION

CATEGORY	EARLY BIRD	REGULAR	LATE/ONSITE
Full	US\$770	US\$880	US\$990
Early Career/Retiree	US\$360	US\$420	US\$480
Student	US\$240	US\$300	US\$360

IMPORTANT DATES

2023	August 19	Abstract Submission Opens
	October 1	Early Bird Registration Opens
2024	February 9	Abstract Submission Closes
	April 15	Notification of Acceptance
	May 3	Early Bird Registration Closes
	June 3	Regular Registration Closes
	July 5	Late Registration Closes
	July 13-21	45th COSPAR Scientific Assembly

MEET BUSAN

Busan, recently crowned Asia's No.1 destination in 2018 by Lonely Planet and Asia's 4th and the World's 7th convention city, is where contemporary lifestyle meets long-standing history. Busan's thriving culture and exceptional landscapes offer an abundance of experiences to inspire and amaze visitors. With mountainous coasts, serene and time-honored historical premises, the world's celebrated shops and traditional markets, and loads of museums and galleries, Busan is the only perfect destination for bleisure travelers.





BEXCO

BEXCO, Busan’s iconic convention center, has been a host venue for Busan’s most prestigious and exciting conferences and events. The state-of-the-art conference facilities and the world-class city infrastructure nearby will assure the success of the assembly.



ACCOMMODATIONS

COSPAR 2024 participants will be able to enjoy discounted rates offered by first-rate and exceptional accommodation facilities nearby, all easily reachable by public transportation. With over 5,000 rooms available near BEXCO, all just a click away, the COSPAR 2024 Local Organizing Committee has reserved 1,170 rooms exclusively for COSPAR 2024 participants.

NO.	GRADE	HOTEL NAME	RATE	NO. OF BLOCKS	DISTANCE FROM BEXCO
1	★★★★★	Paradise Hotel Busan	USD 203-357 (KRW 254,100-447,700)	150 / 532	13 min.
2		The Westin Josun Busan	USD 222-357 (KRW 278,300-447,700)	100 / 290	9 min.
3	★★★★★	Haeundae Centum Hotel	USD 105 (KRW 132,000)	120 / 518	1 min.
4		Centum Premier Hotel	USD 88 (KRW 110,000-143,000)	200 / 603	1 min.
5	★★★★	Ramada Encore Haeundae	USD 66	100 / 402	10 min.
6		Fairfield by Marriott Busan	USD 150 (KRW 165,000-198,000)	50 / 223	12 min.
7	★★★	Ibis Busan Haeundae	USD 104	150 / 237	10 min.
8		Ibis Budget Ambassador Busan Haeundae	USD 52-66 (KRW 65,000-82,500)	100 / 181	10 min.
9	Business	Haeundae Toyoko Inn 2	USD 56-98 (KRW 70,400-123,200)	200 / 510	10 min.



KOREA: EXPLORE THE UNEXPECTED

Home to K-pop culture, Gangnam Style, Kimchi, Samsung, Hyundai, LG, and many others, Korea, where no two visits are alike, is beyond your imagination.

Accessibility

When it comes to traveling overseas, everyone’s idea of a perfect travel destination differs. Nonetheless, the common standards for overseas travel would include easy accessibility, safety, and relative inexpensiveness. Busan, with connections to multiple hub airports in the country and neighboring countries, is more accessible than most cities in Asia and is one of its safest and most reasonably priced.

Visa-free Entry

Ordinary passport holders visiting Korea temporarily from 113 countries may enter easily by applying for a K-ETA online prior to departure, in accordance with the visa-exemption agreement, principles of reciprocity, or national interests. For participants needing an entry visa, the COSPAR 2024 Secretariat will proactively work with the applicable embassies/consulates or ministries to ensure a smooth and fast process.



SPONSORSHIP & EXHIBITION @ COSPAR 2024

A multitude of activities at COSPAR 2024, including scientific and business sessions, an exhibition, networking opportunities, as well as cultural events, will enable all stakeholders to engage in interesting dialogues on the issues and challenges we face today and to envisage the future of space research together. By becoming a sponsor and/or exhibitor, your organization will maximize its presence at the Scientific Assembly and engage and reposition your brand, while simultaneously supporting the space research community.

We are most convinced that your proactive involvement will be key to the success of the Assembly and very much look forward to having the opportunity to work with your organization in the near future.

To learn more about sponsorship & exhibition, please contact the COSPAR 2024 Secretariat via email at sponex@cospar2024.org or visit the official website at www.cospar2024.org.



COSPAR 2024 Secretariat

3F 183 Bangbae-ro, Seocho-gu, Seoul. 06572 Republic of Korea

REGISTRATION registration@cospar2024.org

SPONSORSHIP & EXHIBITION sponex@cospar2024.org

SCIENTIFIC PROGRAM cospar@cospar-assembly.org

GENERAL INQUIRIES info@cospar2024.org

Financial Support

A very limited amount of money will be available to facilitate participation in the 45th COSPAR Scientific Assembly. Please read the instructions below and, if appropriate, complete the application form available by clicking the 'Financial Support' link at www.cospar-assembly.org.

Participants in COSPAR Scientific Assemblies are reminded that they should rely on their own national sources to finance travel/living expenses. In exceptional cases, partial support, up to a maximum of €1,200, may be available to those who are unable to obtain sufficient funding. In many cases, only some seed money will be provided. In cases where participation is virtual, support will be the equivalent of the appropriate registration fee. Priority will be given to:

1. Scientists under 35 years of age on 1 January 2024 (50% of available funds will be reserved for this category),
2. Scientists from developing countries,
3. Scientists from COSPAR member countries in good standing.

To qualify for financial support, the applicant:

- a. Must be scheduled to make a presentation (poster or oral), of which he/she is the principal author, in one or more of the Assembly events and have submitted, **by the deadline for financial support applications**, the abstract over the web in accordance with the abstract submission instructions;
- b. Must secure most of the required financial support from national sources;
- c. Must submit a completed financial support application form to the Main Scientific Organizer of the relevant event (with a copy to the COSPAR Secretariat, cosparcom@cosparhq.cnes.fr) by 9 February 2024 (by that date, abstracts must be available on the web and should not be attached to the application form; early submission of financial support application forms is strongly encouraged);
- d. Must submit proof of age if applying as a scientist under 35 and provide proof of student status if planning to register at the student rate.

Successful applicants for financial support from COSPAR are strongly encouraged to submit a manuscript resulting from their Assembly presentation to *Advances in Space Research* or *Life Sciences in Space Research*.

Applications will be judged by the Main Scientific Organizer (MSO) with regard to the importance of the applicant's contribution to the relevant event, with special consideration being given to applicants under 35 years of age. The importance of the contribution will be determined in relation to the complete set of abstracts received and the consequent structuring of the event by the MSO.

Final decisions will be made by the COSPAR Bureau according to the funding available and the priorities outlined above.

All applicants will be informed by the COSPAR Secretariat of the outcome of this process in April 2024. Successful applicants will receive their support upon arrival at the Scientific Assembly or at the time of registration if participation is virtual.

No support will be allocated during the Assembly.

Submission of the financial support application form constitutes authorization to COSPAR and its contractors to share any or all information submitted with the local organizing committee (LOC) of the relevant Assembly and/or the professional congress organizer hired by the LOC.

Abstract Submission

The abstract submission website is located at: www.cospar-assembly.org. ZARM (the Centre of Applied Space Technology and Micro-gravity, University of Bremen, Germany) assists in the organization of COSPAR's Scientific Assemblies, particularly with respect to management of the abstract handling arrangements.

Abstract Submission Procedure

Participants who wish to give a presentation (oral or poster) must submit an abstract following the instructions below. Abstracts should be short (one page maximum), clear, concise and written in English with correct spelling and good sentence structure. Mathematical symbols and equations must be typed in, and metric symbols should be used. Figures and tables should not be included. It is important that the abstract should be checked thoroughly, particularly with regard to the list of authors, before it is submitted. By submitting an abstract, the author is undertaking to make a presentation during the Assembly.

Abstracts must be submitted on-line. Authors are encouraged to prepare their abstracts using a text editor of their own choice prior to entering the submission website.

Follow the instructions below to submit your abstract:

1. Use the Call for Abstracts or the Assembly website to identify the event most appropriate for your presentation.

2. Go to the web page of the scientific program: www.cospar-assembly.org.

3. Click on 'Abstract Submission and Log-in' in the left-hand menu column.

4. Log-in.

(a) If not already a user of the system with a username and password, click 'OBTAIN LOGIN for Abstract Submission' in the left-hand menu column and enter the requested information. Choose your personal username and set your own password.

(b) If you registered for a previous Assembly or were a co-author on a presentation at an Assembly from 2008 (Montréal) or later, enter your Username and Password or click "Forgot your password." If you have forgotten your User-name, first click "Forgot your username" to receive this information by e-mail and then reset your password afterward.

Please use the process described under (b) if you have been an author or co-author on any presentation at a COSPAR Scientific Assembly since 2008 rather than creating multiple profiles.

5. Click "Add Abstract" near the centre of the screen and fill in the "Add Abstract" form according to the instructions indicated. Abstracts submitted by e-mail, fax or hard copy will not be processed.

6. Compose and edit your abstract online at www.cospar-assembly.org. You will be asked to provide: (1) Title; (2) Author(s); (3) Affiliation(s) of Author(s); and (4) Text of the abstract (see the full instructions on-line for the proper formatting of this material).

7. Acknowledgement: Authors whose abstracts have been received and successfully processed will receive an acknowledgement regarding the receipt and status of their contribution as well as its ID-No. for future updating/correction or withdrawal.

Please Note: This call for abstracts is the sole printed announcement for the 45th COSPAR Scientific Assembly. Updates will be posted on the web at: www.cospar-assembly.org.

See the Local Organizing Committee website at <https://www.cospar2024.org> for registration, accommodation, local logistics, etc.

Important

Submissions are limited to not more than two solicited abstracts and two contributed abstracts on which the submitter is the presenter.

To cover COSPAR's cost for processing abstracts, an administrative fee of €25 will be charged for each abstract submitted. The abstract submission fee is non-refundable and is not based on approval of your abstract submission or attendance at the Scientific Assembly. Refunds will not be issued for abstracts that are withdrawn.

Any amendments within your abstract can be done free of charge using the online submission system.

The only method of payment accepted for the abstract submission fee is by credit card (Visa, MasterCard, or American Express) through the abstract submission system.

The abstract submission fee does not register you for the Scientific Assembly for which a separate registration fee, paid to the Local Organizing Committee, applies. All presenters must register in order to attend the Scientific Assembly.

Abstract Publication

Abstracts of contributions accepted for presentation by the event organizers and by the Program Committee will be published online as 'Accepted Abstracts' of the respective session/event.

Scientific Assembly at a Glance

The following information on scheduling is subject to modification (please see the Assembly webpage in May, June, and July 2024 for updates). Note that scientific sessions will begin on Sunday morning, 14 July 2024 and run through Saturday morning, 20 July 2024.

Inaugural and Special Events

The Assembly opening ceremony and reception and space agency roundtable will take place Monday afternoon, 15 July 2024. Scheduled for Sunday afternoon, 14 July, are a session on latest results, a host country interdisciplinary lecture, and the public lecture. Mid-day COSPAR panel events and interdisciplinary lectures will alternate throughout the remainder of the week.

Open Scientific Commission and Panel Business Meetings

The majority of business meetings of the COSPAR Scientific Commissions and Panels will be held from Tuesday to Thursday, 16–18 July 2024, during the lunch break.

All Assembly participants are encouraged to attend the business meetings of the Scientific Commissions and Panels which cover topics of interest to them. At these meetings Associates (i.e. Assembly participants) will have the opportunity to influence COSPAR policy by electing scientific officers, joining in the discussions concerning scientific matters, and helping to determine the program for the next Scientific Assembly.

COSPAR Council and Bureau Meetings (Closed except to members as noted below)

The first session of the Council meeting (closed except to official representatives of National Institution and Scientific Union members, Scientific Commission Chairs, and the Finance Committee Chair) will be held on Saturday afternoon, 13 July 2024.

The final Council session (closed as noted above) will be held on Saturday afternoon, 20 July 2024.

The agenda for the Council meeting is expected to cover, among other items:

- Presentation of bids for the 2028 Assembly (first session) and selection of the site for the 2028 Assembly (second session),
- Review of actions taken by the Bureau between the 2022 and 2024 COSPAR Assemblies,
- Business to be dealt with and decisions to be taken during the Assembly.

A meeting of the COSPAR Bureau (closed) will be held on Saturday morning, 20 July.

Members of the Council and Bureau are reminded of the importance of attending these meetings, particularly since decisions on financial and other matters are scheduled. The meetings will also provide an opportunity to exchange information on items of interest to the space research community.

COSPAR Program Committee

The COSPAR Program Committee is chaired by Professor Dong-Hun Lee, Kyung Hee University School of Space Research (dhlee@khu.ac.kr). The Co-Chairs are Dr. Kyung-Suk Cho, Korea Astronomy & Space Science Institute (kscho@kasi.re.kr) and Jason Hyon, Jet Propulsion Laboratory (jason.j.hyon@jpl.nasa.gov). Each COSPAR Scientific Commission (SC), Panel and independent Task Group chair is a member of the Committee. See the inside back cover of *Space Research Today* for the full titles of COSPAR's Scientific Commissions and Panels.

SC A	Dr. Ralph Kahn (USA) ralph.kahn@nasa.gov	PIR	Dr. Ralph McNutt (USA) ralph.mcnutt@jhuapl.edu
SC B	Prof. Hajime Yano (Japan) yano.hajime@jaxa.jp	PolS	Dr. Eric H. Smith (USA) eric.h.smith@lmco.com
SC C	Prof. Andrew Yau (Canada) yau@phys.ucalgary.ca	PPP	Dr. Athena Coustenis (France) athena.coustenis@obspm.fr
SC D	Dr. Nicole Vilmer (France) nicole.vilmer@obspm.fr	PRBEM	Dr. Yoshizumi Miyoshi (Japan) miyoshi@isee.nagoya-u.ac.jp
SC E	Prof. Tomaso Belloni (Italy) tomaso.belloni@inaf.it	PSB	Dr. Mattias Abrahamsson (Sweden) mattias.abrahamsson@sscspace.com
SC F	Prof. Tom Hei (USA) tkh1@cumc.columbia.edu	PSD	Ms. Heike Peter (Germany) heike.peter@positim.com
SC G	Dr. Marc Avila (Germany) director@zarm.uni-bremen.de	PSSH	Dr. Isabelle Sorbès-Verger (France) isabelle.sourbes@cnrs.fr
SC H	Dr. Manuel Rodrigues (France) manuel.rodrigues@onera.fr	PSW	Dr. Maria Kuznetsova (USA) maria.m.kuznetsova@nasa.gov
PCB	Dr. Juan Carlos Gabriel (Spain) juan.carlos.gabriel@gmail.com	TGCSS	Dr. Dan Baker (USA) daniel.baker@asp.colorado.edu
PE	Dr. Rosa Doran (Portugal) rosa.doran@nucio.org	TGIGSP	Dr. Larry Kepko (USA) larry.kepko@nasa.gov
PEX	TBD	TGII	Ms. Mary Snitch (USA) mary.snitch@lmco.com
PEDAS	Dr. Carolin Frueh (USA) cfrueh@purdue.edu		

Matrix of Events of Particular Interdisciplinary Interest

For earlier Assemblies, the Program Committee used joint event numbering (e.g., PSW1-C0.2-D0.1-E2.4-F0.1-PSRB2) to identify events which were of interest to more than one discipline. To avoid the confusion and repetition in the Program of joint numbering, the PC adopted the matrix on the following pages which shows at a glance sessions of particular interdisciplinary interest. Participants are advised to scan all event titles for other sessions of interest.

For reference, topics covered by COSPAR Scientific Commissions and Panels are listed below:

SC A	Earth's Surface, Meteorology and Climate
SC B	Earth-Moon System, Planets, and Small Bodies of the Solar System
SC C	Upper Atmospheres of the Earth and Planets including Reference Atmospheres
SC D	Space Plasmas in the Solar System, including Planetary Magnetospheres
SC E	Research in Astrophysics from Space
SC F	Life Sciences as Related to Space
SC G	Materials Sciences in Space
SC H	Fundamental Physics in Space
IR	Industry Relations
LR	Late Results
PCB	Capacity Building
PE	Education
PEDAS	Potentially Environmentally Detrimental Activities in Space
PEX	Exploration
PIR	Interstellar Research
PoIS	Panel on Innovative Solutions
PPP	Planetary Protection
PRBEM	Radiation Belt Environment Modelling
PSB	Technical Problems Related to Scientific Ballooning
PSD	Satellite Dynamics
PSSH	Panel on Social Sciences and Humanities
PSW	Space Weather
TGCSS	Task Group on the Establishment of a Constellation of Small Satellites
TGIGSP	Task Group on Establishing an International Geospace Systems Program
TGII	Task Group on IDEA (Inclusion, Diversity, Equity, and Accessibility) Initiative

		SCIENTIFIC COMMISSION / PANEL / TASK GROUP / COSPAR COMMITTEE																						
	A	B	C	D	E	F	G	H	IR	PCB	PE	PEDAS	PEX	PIR	PolS	PPP	PRBEM	PSB	PSD	PSSH	PSW	TGCSS	TGIGSP	TGII
EVENT																								
A0.1																								
A0.2																								
A0.3																								
A0.4																				■				
A0.5																				■				
A0.6			■																		■			
A1.1																								
A2.1																								
A3.1																				■				
B0.1																								
B0.2																								
B0.3																								
B1.1													■											

	SCIENTIFIC COMMISSION / PANEL / TASK GROUP / COSPAR COMMITTEE																							
	A	B	C	D	E	F	G	H	IR	PCB	PE	PEDAS	PEX	PIR	PoIS	PPP	PRBEM	PSB	PSD	PSSH	PSW	TGCSS	TGIGSP	TGII
B1.2					■	■																		
B2.1																			■					
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Scientific Program - Overview

Key to event numbering: The first letter (A-H) of the event indicates the COSPAR Scientific Commission. Numbers, except 0, immediately following the letter indicate Sub-commissions. The second number designates events organized within the remit of a specific Commission or Sub-commission. COSPAR Panel, independent Task Group, and Committee events are identified by the organizing body's acronym.

MSO = Main Scientific Organizer

Scientific Commission A: Space Studies of the Earth's Surface, Meteorology and Climate

A0.1 What Are the Remaining Scientific Challenges above Equatorial Regions?

How Small Satellites Could Fill the Knowledge Gap

MSO: Erick Lansard (Nanyang Technological University, Singapore)

A0.2 Land-Ocean-Atmosphere Interactions

MSO: Severine Fournier (NASA Jet Propulsion Lab (JPL) /
California Institute of Technology (Caltech), USA)

A0.3 The Group on Earth Observations (GEO)

MSO: Suresh Vannan (JPL, USA)

A0.4 Earth Observations for Disaster Mitigation

MSO: Suresh Vannan (JPL, USA)

A0.5 Synergy of Multiple Satellites to Achieve Carbon Neutrality across the Globe

MSO: Jason Hyon (JPL, USA)

A0.6 The Connections between Earth's Lower and Upper Atmosphere

MSO: Ralph Kahn (NASA GSFC, USA)

A1.1 Space-based and Sub-orbital Observations of Atmospheric Physics and Chemistry: Critical Information on the Health of our Planet

MSO: Yasuko Kasai (National Institute of Information and Communication Technology NICT, Japan)

A2.1 Science and Applications Enabled by Satellite Missions for Global Ocean, Inland Seas, and Cryosphere

MSO: Stefano Vignudelli (Consiglio Nazionale delle Ricerche, Italy)

A3.1 New Technology in Earth Observation and Applications for Sustainable Land Ecosystem

MSO: Kanako Muramatsu (Nara Women's University, Japan)

Scientific Commission B: Space Studies of the Earth-Moon System, Planets, and Small Bodies of the Solar System

B0.1 Planetary Science Highlights

MSO: Manuel Grande (Aberystwyth University, UK)

B0.2 Instrumentation for Planetary Exploration

MSO: Fabrizio Dirri (IAPS-INAF, Italy)

- B0.3** Technology for Planetary Exploration
MSO: Andrea Longobardo (INAF-IAPS Rome, Italy)
- B1.1** Small Body Science in a New Generation of Surveys, Observatories, Sample Returns, and Planetary Defense
MSO: Stefanie Milam (NASA GSFC, USA)
- B1.2** Unveiling Planet Formation and How it Connects Small Bodies, Planets, Circumstellar Disks and Stars
MSO: Diego Turrini (INAF Osservatorio Astrofisico di Torino, Italy)
- B2.1** Innovative Approaches for Geodesy in Planetary Exploration
MSO: Steven Vance (JPL, USA)
- B3.1** Lunar Science and Exploration
MSO: Megha Bhatt (Physical Research Laboratory (PRL), India)
- B3.2** New Planetary Science Opportunities and Results Enabled by Commercial Infrastructure and Venture Capital
MSO: David Thomas (Arizona State University, USA)
- B3.3** Life Science in Space and on the Moon
MSO: Elena Fomina (State Scientific Center of the Russian Federation Institute of Biomedical Problems of RAS-IBMP RAS, Russia)
- B4.1** Mercury Science and Exploration
MSO: Johannes Benkhoff (ESA/ESTEC, Netherlands)
- B4.2** Venus Science and Exploration
MSO: Yeon Joo Lee (Institute for Basic Science, S. Korea)
- B4.3** Mars Science Results
MSO: Elliot Sefton-Nash (European Space Agency (ESA), Netherlands)
- B4.4** Forward Planning for the Exploration of Mars
MSO: Timothy Haltigin (Canadian Space Agency, Canada)
- B4.5** Science and Technologies of Mars Sample Return
MSO: Brandi Carrier (JPL, Caltech, USA)
- B5.1** Jupiter, the Galilean Satellites, Rings and Magnetospheres: Juno Results
MSO: Scott Bolton (Southwest Research Institute SwRI, USA)
- B5.2** Gas Giants and Icy Giants with their Systems
MSO: Anezina Solomonidou (Hellenic Space Center, Greece)
- B5.3** Ocean Worlds: Past, Present, and Future
MSO: Morgan Cable (JPL, Caltech, USA)
- B6.1_E4.1** Exoplanet Detection and Characterisation: Current Research, Future Opportunities and the Search for Life Outside the Solar System
MSO: Francesca Altieri (INAF-IAPS Rome, Italy)

Scientific Commission C: Space Studies of the Upper Atmospheres of the Earth and Planets including Reference Atmospheres

- C0.1** International Standards for Space Environment
MSO: W Kent Tobiska (Space Environment Technologies, USA)
- C0.2** Advances in Remote Sensing of the Middle and Upper Atmospheres and Ionosphere from the Ground and from Space, including Sounding Rockets, Novel Radar and Multi-instrument Studies
MSO: David Rees (The Paradigm Factor, UK)
- C1.1** Recent Advances in Equatorial, Low- and Mid-Latitude Mesosphere, Thermo-sphere, and Ionosphere Studies
MSO: Paulo Roberto Fagundes (Universidade do Vale do Paraiba, Brazil)
- C1.2** Coupling Processes of the Magneto-sphere-ionosphere- thermosphere System in the Formation of Various Auroras
MSO: Geonhwa Jee (Korea Polar Research Institute, S. Korea)
- C1.3** Atmospheric and Ionospheric Perturbations at Low, Mid, and High Latitudes from Known Sources
MSO: Young-Sil Kwak (Korea Astronomy and Space Science Institute KASI, S. Korea)
- C1.4** Space Weather and Earth's Atmosphere-Ionosphere
MSO: Nicholas Pedatella (High Altitude Observatory, NCAR, USA)
- C2.1** Gravity Waves and Turbulence in the Middle Atmosphere and Lower Ionosphere
MSO: Robin Wing (Leibniz- Institute of Atmospheric Physics, Germany)
- C3.1** Planetary Atmospheres
MSO: Hilary L. Justh (NASA Marshall Space Flight Center-MSFC, USA)
- C3.2** Planetary Upper Atmospheres, Ionospheres and Magneto-spheres
MSO: Syed A. Haider (PRL, India)
- C4.1** International Reference Iono-sphere: Improvements, Valid-ation, and Applications
MSO: Dieter Bilitza (George Mason University, Fairfax, Virginia and NASA, GSFC, USA)
- C4.2** Development of First-principles and Empirical Models Related to the COSPAR International Reference Atmosphere
MSO: Sean Bruinsma (Centre National d'Etudes Spatiales CNES, France)
- C5.1_D4.1** Dust Observations in Space and Laboratory Experiments
MSO: Jiri Pavlu (Charles University, Czech Republic)

Scientific Commission D: Space Plasmas in the Solar System, including Planetary Magnetospheres

- D0.1** Overview Session Commission D
MSO: Nicole Vilmer (Observatoire de Paris, LESIA, France)
- D1.1** Acceleration and Transport of Energetic Particles in the Heliosphere, the Interstellar Medium, and Astrospheres
MSO: Agnieszka Gil (Siedlce University, Poland)
- D1.2** Large Scale Structure of Heliosphere and its Physical Drivers
MSO: Merav Opher (Boston University, USA)

- D1.3** Magneto-plasma Structures, Streams and Flows in the Heliosphere
MSO: Olga Khabarova (IZMIRAN, Tel Aviv University, Israel)
- D1.4** Suprathermal and Pickup Ions Throughout the Heliosphere
MSO: Matthew Hill (Johns Hopkins University Applied Physics Laboratory JHUAPL, USA)
- D1.5** Turbulence in the Heliosphere from the Solar Corona to the Very Local Interstellar Medium
MSO: Federico Fraternali (University of Alabama in Huntsville, USA)
- D1.6** Understanding and Predicting Solar Energetic Particle Events Across the Heliosphere
MSO: Nicolas Wijsen (KU Leuven, Belgium)
- D1.7** Science from Neutron Monitors, Muon Telescopes, and other Detectors of Atmospheric Showers from GeV Cosmic Rays
MSO: David Ruffolo (Mahidol University, Thailand)
- D2.1_E3.1** Off-the-Sun-Earth-Line (OSEL) Missions
MSO: Nat Gopalswamy (NASA GSFC, USA)
- D2.2_E3.2** Heliospheric Variability, its Solar Sources and Impacts on Solar System Objects
MSO: Mateja Dumbovic (University of Zagreb, Croatia)
- D2.3_E3.3** Magnetic Reconnection in the Turbulent Plasmas - From the Sun through the Heliosphere to Stars and Galaxies
MSO: Joerg Buechner (Max Planck Institut für Sonnensystem- forschung, Germany)
- D2.4_E3.4** STEREO's Journey around the Sun: An Era of Single and Multi-spacecraft Observations from 2007 to 2024
MSO: Noé Lugaz (University of New Hampshire, USA)
- D2.5_E3.5** Impact of the Inhomogeneous Solar Corona and Solar wind on CME Evolution
MSO: Soojeong Jang (Kyung Hee University, S. Korea)
- D3.1** Highlights of Magnetospheric Plasma Physics
MSO: Katariina Nykyri (Embry- Riddle Aeronautical University, USA)
- D3.2** Cross-scale Coupling and Multi-point Observations in the Solar Wind and Magnetosphere
MSO: Marina Stepanova (Universidad de Santiago de Chile, Chile)
- D3.3** Origin of Non-thermal Distributions in Space Plasmas and their Role in Wave Generation and Heating / Acceleration of Particles
MSO: Ioannis Kourakis (Khalifa University of Science and Technology, UAE)
- D3.4** Particle Transport Acceleration and Loss in the Earth and Planetary Magnetospheres
MSO: Kyung-Chan Kim (Chungbuk National University, S. Korea)
- D3.5** Role of Mesoscale Coupling as the Driver of System Level Storm and Substorm Dynamics in Geospace
MSO: Elena Grigorenko (Space Research Institute IKI, RAS, Russia)
- D3.6** CubeSat and Small Satellite Technology Addressing Magnetospheric Challenges
MSO: Jaejin Lee (KASI, S. Korea)
- D3.7** Machine Learning and Data Sciences
MSO: Yuri Shprits (German Research Centre for Geosciences, Germany)

D3.8 Dayside Magnetosphere Interactions
MSO: Qiugang Zong (Peking University, CAS, China)

C5.1_D4.1 Dust Observations in Space and Laboratory Experiments

Scientific Commission E: Research in Astrophysics from Space

E0.1 Scientific Commission E Overview Event
MSO: Tomaso Belloni (INAF, Italy)

E1.1 Origin of Cosmic Rays
MSO: Eun-suk Seo (University of Maryland, USA)

E1.2 Advanced Timing-spectral Polarimetric Analysis and Modeling of Accreting Black Holes and Neutron Stars
MSO: Mariano Mendez (University of Groningen, Netherlands)

E1.3 Space-ground Scientific and Exploitation Synergies and Challenges
MSO: Alvaro Giménez (Consejo Superior de Investigaciones Científicas CSIC, Spain)

E1.4 Spectral Mapping Surveys of the Universe
MSO: Woong-Seob Jeong (KASI, S. Korea)

E1.5 Illuminating Gravitational Waves and their Environments
MSO: Eleonora Troja (Università di Tor Vergata, Italy)

E1.6 Explosive Phenomena in Transient and Multimessenger Sources and their Observational Manifestations
MSO: Lorenzo Natalucci (Istituto Nazionale di Astrofisica, Italy)

E1.7 Black Hole Astrophysics: Theory and Simulations Confront Observations
MSO: Sandip Kumar Chakrabarti (Indian Centre for Space Physics, India)

E1.8 Solving the Accretion/Ejection Puzzle in AGN: Synergies and Clashes in the Central kpc
MSO: Gabriele Bruni (INAF- IAPS, Italy)

E1.9 Spectral/Timing Properties of AGN: Theory and Observations
MSO: Iossif Papadakis (University of Crete, Greece)

E1.10 Extreme Accretion Events in Super-massive Black Holes
MSO: Claudio Ricci (Universidad Diego Portales, Chile)

E1.11 Coevolution between High-redshift Quasars and Galaxies in the Era of JWST
MSO: Kohei Inayoshi (Kavli Institute for Astronomy and Astrophysics KIAA, China)

E1.12 Gamma-ray Bursts in the next Decade
MSO: Paolo D'avanzo (INAF - Osservatorio Astronomico di Brera, Italy)

E1.13 Observations and Prospects for X-ray Polarimetry
MSO: Herman Marshall (Massachusetts Institute of Technology MIT, USA)

E1.14 Multi-wavelength Fast Variability across Mass Scales: from Neutron Stars to Supermassive Black Holes
MSO: Federico Vincentelli (IAC, Spain)

- E1.15** To Flow in or to Flow out, That is the Question of Black-hole X-ray Binaries
MSO: Nikolaos Kylafis (University of Crete, Greece)
- E1.16** High Mass X-ray Binaries: a new View on Accretion and Reprocessing
MSO: Biswajit Paul (Raman Research Institute, India)
- E1.17** Constraining the Behaviour of Ultra-dense Matter Using Weakly Magnetised Neutron Stars
MSO: Wenfei Yu (Shanghai Astronomical Observatory of CAS, China)
- E1.18** Plasma at the Inner Dozen of Gravitational Radii: from Dissipation to Radiation in Accreting Black Hole Systems
MSO: Alexandra Veledina (University of Turku, Finland)
- E1.19** Cataclysmic Variables and Related Systems as Probes of Accretion, Binary Evolution and Thermo-nuclear Explosions
MSO: Solen Balman (Istanbul University, Turkey)
- E2.1** Energetic and Dynamics in the Quiet Solar Atmosphere and Beyond
MSO: Zhenghua Huang (Shandong University, CAS, China)
- E2.2** Energy and Mass Transport of Small Scales in the Low Solar Atmosphere
MSO: Eun-Kyung Lim (KASI, Korea)
- E2.3** Plasma and Magnetic Field Coupling in Solar Prominences
MSO: Stanislav Gunár (Astronomical Institute, Academy of Sciences of the Czech Republic, Czech Republic)
- E2.4** Application of Machine Learning Techniques in Solar and Heliospheric Physics
MSO: Iulia Chifu (Georg-August University of Göttingen, Germany)
- E2.5** Waves in the Solar Atmosphere, from the Photosphere to the Corona and Solar Wind
MSO: Tom van Doorselaere (KU Leuven, Belgium)
- E2.6** Developments and Applications of the Solar Magnetic Field Modelling
MSO: Xiaoshuai Zhu (National Space Science Center, CAS, China:)
- E2.7** Waves and Flows in Solar Coronal Active Regions, from Heating to Coronal Seismology
MSO: Leon Ofman (CUA/NASA GSFC, USA)
- D2.1_E3.1** Off-the-Sun-Earth-Line (OSEL) Missions
- D2.2_E3.2** Heliospheric Variability, its Solar Sources and Impacts on Solar System Objects
- D2.3_E3.3** Magnetic Reconnection in the Turbulent Plasmas - From the Sun through the Heliosphere to Stars and Galaxies
- D2.4_E3.4** STEREO's Journey around the Sun: An Era of Single and Multi-spacecraft Observations from 2007 to 2024
- D2.5_E3.5** Impact of the Inhomogeneous Solar Corona and Solar wind on CME Evolution
- B6.1_E4.1** Exoplanet Detection and Characterisation: Current Research, Future Opportunities and the Search for Life Outside the Solar System

Scientific Commission F: Life Sciences as Related to Space

- F0.1** Joint Commission F Symposium
MSO: Tom K. Hei (Columbia University Irving Medical Center, USA)
- F0.2** International Life Support Panel
MSO: Chloe Audas (ESA, Netherlands)
- F1.1** Gravity Perception and Response in Plants and Fungi: Ground and Space Studies
MSO: Chris Wolverton (Ohio Wesleyan University, USA)
- F1.2** Space Microgravity Environment Utilization
MSO: Jaejin Lee (KASI, S. Korea)
- F2.1** Biological Effects of Space Radiation and Co-stressors
MSO: Christine Hellweg (DLR - Inst. of Aerospace Medicine, Germany)
- F2.2** Enabling Human Space Exploration through Research on Risks and Countermeasures to Space Radiation Exposure
MSO: Francis Cucinotta (University of Nevada Las Vegas, USA)
- F2.3** Space Radiations: Dosimetric Measurements and Related Models and Detector Development
MSO: Thomas Berger (DLR, Germany)
- F2.4** Genetic Epigenetic and Metabolic Changes in Spaceflight and Simulated Spaceflight
MSO: Yeqing Sun (Dalian Maritime University, CAS, China)
- F2.5** Impact of Space Flight Stressors on Neural Network Functionality
MSO: Richard Britten (Eastern Virginia Medical School, USA)
- F3.1** Chemical Complexity of Molecular Universe
MSO: Ankan Das (Institute of Astronomy Space and Earth Science, India)
- F3.2** Astrobiology and Exploration
MSO: Petra Rettberg (DLR - Inst. of Aerospace Medicine, Germany)
- F3.3** Natural and Laboratory Analogues for Astrobiology and Planetary Exploration
MSO: Maeva Millan (LATMOS (Laboratory Atmosphere, Space Observations), France)
- F3.4** Interstellar Organic Molecules in the Age of JWST and ALMA
MSO: Robin Garrod (University of Virginia, USA)
- F4.1** Advances in Life Support Technologies and Test Bed Facilities
MSO: Cyprien Verseux (ZARM, University of Bremen, Germany)
- F4.2** Influence of Spaceflight Environments on Biological Systems
MSO: Galina S. Nechitailo (Inst. of Biochemical Physics RAS, Russia)
- F4.3** Space Food and Nutrition
MSO: Naomi Katayama (Nagoya Women's University, Japan)
- F5.1** Molecular, Cellular and Physiological Changes to Spaceflight and Ground Studies
MSO: Elizabeth Blaber (Rensselaer Polytechnic Institute, USA)

F5.2 Exploring the Space Exposome and Approaches for Assessing Spaceflight-Associated Human Health Risks
MSO: Janice Huff (NASA Langley Research Center, USA)

Scientific Commission G: Material and Fluid Sciences in Space Conditions

G0.1 Gravitational Effects on Physico- Chemical Processes
MSO: Jeff Porter (Universidad Politécnica de Madrid, Spain)

G0.2 Drop Tower Days
MSO: Marc Avila (University of Bremen, Germany)

G0.3 Influence of Free Space Environment on the Behavior of Materials
MSO: Alexey Kondyurin (Ewingar Scientific, Australia)

G0.4 Advanced Materials and their Technologies for Space Exploration
MSO: TBD

G0.5 GravityNEXT
MSO: Álvaro Romero-Calvo (Georgia Institute of Technology, USA)

Scientific Commission H: Fundamental Physics in Space

H0.1 Commission H Highlight Talks
MSO: Claus Laemmerzahl (ZARM, University of Bremen, Germany)

H0.2 Gravitation, Dark Energy and Matter
MSO: Orfeu Bertolami (Universidade do Porto, Portugal)

H0.3 Fundamental Physics in Space
MSO: Paul McNamara (ESA- ESTEC, Netherlands)

H0.4 Gravitational Waves
MSO: Michele Vallisneri (JPL, USA)

H0.5 Advanced Methods for Geodesy, Metrology, Navigation and Fundamental Physics
MSO: Roberto Peron (INAF - IAPS Rome, Italy)

H0.6 Cold Atoms
MSO: Sven Herrmann (ZARM, University of Bremen, Germany)

Industry Relations (IR)

IR.1 Engaging Global Space Industry Stakeholders
MSO: Mary Snitch (Lockheed Martin Space, USA)

Latest Results

LR.1 Latest Results
MSO: Jean-Claude Worms (COSPAR)

Panel on Capacity Building (PCB)

PCB.1 Capacity Building
MSO: Carlos Gabriel (COSPAR, Germany)

PCB.2 Small Satellites for Capacity Building
MSO: Carlos Gabriel (COSPAR, Germany)

Panel on Potentially Environmentally Detrimental Activities in Space (PEDAS)

PEDAS.1 A Sustainable Space Exploration: from the Mitigation of Space Debris in Earth's Orbit to the Safeguard of Planetary Environments
MSO: Carolin Frueh (Purdue University, USA)

Panel on Exploration (PEX)

PEX.1 Integrating Environmental Ethics into Planetary Exploration and Use
MSO: Heather Smith (KIPR/ NASA Ames Research Center, USA)

PEX.2 International and Multiple Stakeholders Cooperation in the Sustainable Exploration and Utilisation of the Moon, Near Earth Asteroids, Mars, and Other Celestial Bodies
MSO: André Galli (University of Bern, Switzerland)

Panel on Education (PE)

PE.1 Space Explorers in Schools - Empowering the Next Generation of Researchers
MSO: Rosa Doran (Nuclio Interactivo de Astronomia NUCLIO, Portugal)

PE.2 Current Trends, Initiatives and Research In Education And Outreach For Space Sciences
MSO: Gustavo Rojas (NUCLIO, Portugal)

Panel on Interstellar Research (PIR)

PIR.1 Near-term Exploration of the Interstellar Medium: Progress and Status
MSO: Pontus Brandt (JHUAPL, USA)

Panel on Innovative Solutions (PoIS)

POIS.1 Quantum Computing
MSO: Eric H. Smith (Lockheed Martin Advanced Technology Lab, USA)

POIS.2 Machine Learning for Space Weather and Atmospheric Science
MSO: George A. Danos (Cyprus Space Exploration Organisation (CSEO), Cyprus)

POIS.3 Machine Learning for Analysis of Biological Sample
MSO: Chris Wolverton (Ohio Wesleyan University, USA)

Panel on Planetary Protection (PPP)

PPP.1 Planetary Protection Policy
MSO: Athena Coustenis (Paris Observatory, France)

PPP.2 Planetary Protection Mission Implementation and Status
MSO: Silvio Sinibaldi (ESA-ESTEC, Netherlands)

PPP.3 Planetary Protection Research and Development
MSO: Peter Doran (Louisiana State University, USA)

Panel on Radiation Belt Environment Modelling (PRBEM)

PRBEM.1 Standards and Tools for Radiation Measurements and Supporting Data

MSO: Paul O'Brien (The Aerospace Corporation, USA)

PRBEM.2 Radiation Environment across the Solar System: Observations, Measurements, and Models for Current and Future Space Missions

MSO: Yoshizumi Miyoshi (Nagoya University, Japan)

PRBEM.3 Development and Validation of Numerical and Empirical Radiation Belts Models

MSO: Antoine Brunet (ONERA, France)

Panel on Technical Problems Related to Scientific Ballooning (PSB)

PSB.1 Scientific Ballooning: Recent Developments in Technology and Instrumentation

MSO: Hideyuki Fuke (ISAS/JAXA, Japan)

PSB.2 Low-Cost Balloon Flights as a Learning Tool

MSO: Sandip Kumar Chakrabarti (Indian Centre for Space Physics, India)

Panel on Satellite Dynamics (PSD)

PSD.1 Satellite Dynamics: New Developments and Challenges for Earth and Solar System Sciences

MSO: Heike Peter (PosiTim UG (haftungs-beschränkt), Germany)

PSD.2 Precision Orbit and Attitude Determination of Small Satellites, CubeSats, and Constellation and their Scientific Applications

MSO: Shin-Chan Han (University of Newcastle, Australia)

PSSH.1 The Challenges of Space Activities from the Perspective of Human and Social Sciences

MSO: Isabelle Sourbès-Verger (CNRS, France)

Panel on Space Weather (PSW)

PSW.1 Parameterising Performance Assessment within the Space Weather Domain: Validation and Verification at Different Stages in the R2O2R Process

MSO: Alexi Glover (ESA, Germany)

PSW.2 Space Weather at Planetary Bodies in the Solar System

MSO: Zhonghua Yao (Institute of Geology and Geophysics, CAS, China)

PSW.3 Preparation for a New Ionospheric Space Weather Scale for Trans-ionospheric Radio Wave Propagation

MSO: Norbert Jakowski (DLR, Germany)

PSW.4 Information Architecture and Innovative Solutions in Space Weather. Interfacing and Coordination between Different Efforts on Standardization

MSO: Arnaud Masson (Telespazio UK for ESA, ESAC, Spain)

PSW.5 Community-Driven COSPAR Space Weather Roadmap

MSO: Maria Kuznetsova (NASA GSFC/ Heliophysics Science Division, USA)

PSW.6 Improving Predictive Capabilities of Radiation Environment in Support of Human Exploration and Robotic Missions

MSO: Kathryn Whitman (University of Houston, USA)

PSW.7 International Space Weather Co-operation
MSO: Ki-Chang Yoon (Korean Space Weather Center, S. Korea)

PSW.8 The Geomagnetic Environment Leading to GIC Impacts on Power-infrastructure
MSO: Hermann Opgenoorth (Umeå University, Sweden)

PSW.9 International Space Weather Missions and Coordination: Current and Planned Missions
MSO: Juha-Pekka Luntama (ESA, Germany)

PSW.10 Radio Observations for Space Weather
MSO: Mario M. Bisi (Rutherford Appleton Laboratory, UK)

Task Group on the Establishment of a Constellation of Small Satellites (TGCSS)

TGCSS.1 Small Spacecraft - Big Science
MSO: Daniel N. Baker (LASP/ University of Colorado, USA)

Task Group on establishing an International Geospace Systems Program (TGIGSP)

TGIGSP.1 ISTEPNext: International Coordination in Heliophysics
MSO: Larry Kepko (NASA GSFC, USA)

Task Group on IDEA Initiative (TGII)

TGII.1 Accessing Opportunities for All in STEM Education and Careers - Reversing Historical Global Trends - How will IDEA Influence Systematic Change?
MSO: Mary Snitch (Lockheed Martin Space, USA)



Details of Scientific Program

The complete Scientific Assembly timetable indicating event dates and durations will be posted on the web in April 2024. In the mean- time, please see the abstract submission website (<https://www.cospar-assembly.org>) for updates and additional information, including institutional affiliation and contact details of scientific event organizers, completed lists of scientific event organizing committees, confirmed solicited speakers, etc.

MSO = Main Scientific Organizer ; DO = Deputy Organizer

A0.1 What Are the Remaining Scientific Challenges above Equatorial Regions? How Small Satellites Could Fill the Knowledge Gap

MSO/DO: Erick Lansard (Nanyang Technological University-NTU, Singapore), Jérôme Benveniste (European Space Agency-ESA, Italy)

Organizing Committee: Mioara Manda (Centre National d'Études Spatiales-CNES, France), Charles Elachi (California Institute of Technology-Caltech, USA), Daniel Baker (University of Colorado, USA), Florence Tan (NASA, USA), K. Rajeev (ISRO, India), Shufan Wu (Shanghai Jiao Tong University, China), Dale Barker (CCRS, Singapore), Benoit Taisne (EOS, Singapore), TBD (INASA-BRIN, Indonesia)

Event Information: Many satellites of different costs and performances have been deployed by several countries over the years to better understand the environmental phenomena that are impacting our planet, in a context of increased extreme events due to climate change yet also harmful geo-hazards in more populated areas.

Although significant scientific progress has been made over the years, it appears that many equatorial phenomena are not yet fully understood, and that models and forecast are not accurate enough to mitigate the risks (e.g.: Tropical thunderstorms; Atmospheric propagation of volcanic ashes, aerosols, GHG and other pollutants; Tsunamis, earthquakes, landslides, wildfires; Coastal erosion and flooding etc.). This is mainly due to the lack of data over the equatorial regions, the equatorial belt being poorly covered by polar satellites.

The objectives of this special event are (i) to review the remaining scientific challenges above equatorial regions (e.g.: Atmosphere and Troposphere; Marine and Coastal; Solid Earth and Land; Ionosphere and Space Weather), (ii) to review how small satellites could improve the current approach, at different levels (e.g.: Systems sensors; Data processing modelling; Applications Services), to significantly enhance the scientific value of existing satellites.

For example, exploiting the complementarity between high performance/poor revisit polar satellites and mid-low performance/high revisit small/very small satellites might allow a disruptive design of low-cost, fast and sober solutions with potentially high scientific value, for the mutual benefit of both equatorial and non-equatorial countries.

A0.2 Land-Ocean-Atmosphere Interactions

MSO/DO: Severine Fournier (NASA Jet Propulsion Lab-JPL / Caltech, USA), Jérôme Benveniste (ESA, Italy)

Organizing Committee: Angelica Tarpanelli (IRPI-CNR, Italy), Marco Restano (Serco-ESRIN, Italy), Sonia Ponce de León (University of Lisbon, Portugal), Sarah Gille (Scripps Inst. Oceanography, UCSD, USA), Ad Stoffelen (KNMI, Netherlands), Joana Fernandes (University of Porto, Portugal), Luis Pedro Almeida (Co-lab+ATLANTIC, Portugal), David Cotton (SatOC Ltd, UK), Clara Lázaro (University of Porto, Portugal), Christine Gommenginger (NOC, UK), Fernando Niño (LEGOS-IRD, France), Karina Nielsen (DTU-Space, Denmark), Jesus Gomez-Enri (University of Cadiz, Spain)

Event Information: The Earth system involves interactions between atmosphere, ocean, and land. These interactions affect energy, water, and carbon cycles, and thus the biosphere. Understanding the underlying processes of the interactions and quantifying the fluxes across different elements of the Earth's system are of fundamental importance to human society. Satellite measurements allow us to observe different elements of the integrated Earth system, greatly increasing the capabilities to conduct interdisciplinary research. Sustaining and enhancing space-based integrated observing system for the Earth system is essential for the development of Earth System model, analysis, and prediction systems, which has important implications for the ability to project future climate change.

This session encourages contributions that emphasize the linkages between the atmosphere, ocean, and/or land based on satellite observations or in conjunction with models and in situ data, at multiple and nested spatiotemporal scales. The objectives are to foster interdisciplinary collaborations, to connect diverse communities and to advocate for the need to sustain and enhance remote sensing capabilities to observe the integrated Earth system, as well as eventually stress on the gaps in observing systems. This may require a complete disruption and paradigm shift in the way we think and work together, transcend the traditional silos of expertise and building a common vision and interdisciplinary framework, ultimately facilitating the transition from research to operations.

A0.3 **The Group on Earth Observations (GEO)**

MSO/DO: Suresh Vannan (JPL, USA), Yasuko Kasai (National Institute of Information and Communication Technology-NICT, Japan)

Organizing Committee: Suresh Vannan (JPL, USA), Yasuko Kasai (NICT, Japan)

Event Information: GEO is a partnership of more than 100 national governments and in excess of 100 participating organizations that envisions a future where decisions and actions for the benefit of humankind are informed by coordinated, comprehensive, and sustained Earth observations. In this session we solicit oral presentations that expands on GEO's strategic objectives namely to advocate the importance of Earth observations, to engage stakeholder communities and deliver data, information, and knowledge enabling stakeholders to improve decision-making processes and inform policy requirements. The session welcome talks related with GEO objective, and highlight major GEO program elements. We also welcome talks from GEO science leaders and agencies who can describe current developments and future activities, and promote opportunities for COSPAR Associates to participate in GEO projects.

A0.4 **Earth Observations for Disaster Mitigation**

MSO/DO: Suresh Vannan (JPL, USA), Yasuko Kasai (NICT, Japan)

Organizing Committee: Suresh Vannan (JPL, USA), Yasuko Kasai (NICT, Japan)

Event Information: Extreme weather triggered because of changing climate has created an increase in disaster all across the globe. Mitigation and adaptation strategies are needed to tackle the impact of these extreme events. The global earth observing system provides critical observations needed to effectively handle disasters (from flooding to wildfires). This session aims to bring GEO and COSPAR participants towards highlighting data, knowledge, policy, and actions for the benefit of humankind informed by coordinated, comprehensive, and sustained Earth observations. We welcome talks from science and application leaders and agencies who can describe current. The session also welcomes talks that highlight new observations needed to tackle the ever-growing threat of climate change.

A0.5 **Synergy of Multiple Satellites to Achieve Carbon Neutrality across the Globe**

MSO/DO: Jason Hyon (JPL, USA), Sujong Jeong (Seoul National University, S. Korea)

Organizing Committee: TBD

Event Information: To mitigate the negative impact of climate change, many countries have made commitments to become carbon neutral by 2050. One critical issue in achieving carbon neutrality across the globe is the lack of a comprehensive understanding of the carbon budget with reliable datasets. Satellite remote sensing is a powerful tool to monitor climate and environmental change from local to global scales. Especially, emerging new remote sensing techniques could help us estimate carbon fluxes of the different components of the global/national carbon budget such as fossil fuel emissions, terrestrial carbon uptake, ocean carbon uptake, deforestation, wildfire, and etc. This session will present the studies of recent efforts to understand the global/national carbon budget using synergies of multiple satellites. Interested topics consist of new satellite observing systems by international organizations, industry, and academia; greenhouse gas information systems and modeling efforts are of key interests for collaboration.

A0.6 [The Connections between Earth's Lower and Upper Atmosphere](#)

MSO/DO: Ralph Kahn (NASA Goddard Space Flight Center-GSFC, USA), Andrew W. Yau (University of Calgary, Canada)

Organizing Committee: TBD

Event Information: Space- and ground- based observations have recently highlighted some of the ways energy, momentum, and material can exchange between Earth's troposphere, stratosphere, mesosphere, thermosphere, ionosphere, and magnetosphere. This includes intra-atmosphere communication due to severe events, such as volcanic eruptions, pyro-cumulonimbus clouds, and space storms, as well as more common background activity. This Event invites presentations that discuss examples of space- and ground-based observations contributing to our emerging knowledge and understanding of how activities in different parts of Earth's atmosphere are interconnected. Event sponsored jointly by/for Scientific Commissions A and C.

A1.1 [Space-based and Sub-orbital Observations of Atmospheric Physics and Chemistry: Critical Information on the Health of our Planet](#)

MSO/DO: Yasuko Kasai (NICT, Japan), Kaley Walker (University of Toronto, Canada)

Organizing Committee: TBD

Event Information: Space-based remote sensing observations have become an indispensable tool for monitoring the state of the atmosphere as well as improving our scientific understanding of the physical and chemical processes of the Earth system. Many satellite data products have reached a state of maturity that qualifies them to be used as essential climate variable (ECV) data sets. One of the main aims of this session is to provide a forum for interaction between space-based and sub-orbital remote sensing communities working in the related science areas of atmospheric chemistry and physics. Contributions to the following areas are welcome: New missions and techniques, instrument development, current mission validation comparisons, technical and spacecraft engineering issues, and scientific analyses in the areas of greenhouse gases, tropospheric pollution, tropospheric and stratospheric aerosols, the UT/LS region, and the dynamics and chemistry of the stratosphere and mesosphere. Contributions on small satellites and geostationary satellites are particularly encouraged.

A2.1 [Science and Applications Enabled by Satellite Missions for Global Ocean, In-land Seas, and Cryosphere](#)

MSO/DO: Stefano Vignudelli (Consiglio Nazionale delle Ricerche, Italy), Severine Fournier (NASA JPL / Caltech, USA)

Organizing Committee: C. K. Shum (Ohio State University, USA), Martin Saraceno (Universidad de Buenos Aires, Argentina), Naoto Ebuchi (Institute of Low Temperature - Science Hokkaido University, Japan)

Event Information: The aim of this event is to promote the values of satellite missions for the global ocean, inland seas and cryosphere, as well as to foster the related international collaborations and coordination. The scope includes scientific and operational exploitation of the aforementioned satellite measurements from past, current and future missions, retrieval improvements, including calibrations and validations. Satellite measurements are interpreted in terms of sea surface temperature, sea surface salinity, marine gravity, bathymetry, relative sea-level, tides, ocean surface wind, waves, currents, ocean color, ocean mass, etc. as well as sea-ice related parameters (freeboard, extent, concentration, thickness, age). These data are used in studies of oceanographic processes including mesoscale and sub-mesoscale dynamics as well as eddies and advection of oil pollution. Of particular interest are studies in coastal oceans, estuaries, and polar oceans, where special retrieval algorithms are required to improve accuracy. The contributions of the above holistic satellite measurements to study climate change are also solicited. Also encouraged is the use of satellite measurements in synergy, as well as their use within models and combined with in situ data, including demonstrations how machine learning techniques impacting ocean science and applications. Finally, contributions to advance the science of future mission concepts, sensor technologies, and instrument data processing algorithms, are welcome.

A3.1 New Technology in Earth Observation and Applications for Sustainable Land Ecosystem

MSO/DO: Kanako Muramatsu (Nara Women's University, Japan), Linghua Guo (China Academy of Space Technology, China)

Organizing Committee: TBD

Event Information: Earth Observation plays a central role in developing the global capability to understand planet Earth, predict changes, and mitigate negative effects of global change on its population. The Symposium will highlight the essential importance for monitoring Earth as a whole and understanding the impact of human activity on our planet. We invite contributions to following topics: vegetation and the terrestrial carbon cycle, biosphere studies, land use, land use changes, agriculture, sustainable cities, terrestrial water cycle, water management, water use, water quality, natural disasters and their impacts, advances in solid earth science from satellite and airborne geodesy, data assimilation, synergistic use of remote sensing techniques of land, inland water and ecosystem process, and future mission concepts.

B0.1 Planetary Science Highlights

MSO/DO: Manuel Grande (Aberystwyth University, UK), Morgan Cable (JPL-Caltech, USA)

Organizing Committee: TBD

Event Information: Planetary science is an exciting, multidisciplinary field, with discoveries touching a wide range of areas from geophysics and igneous petrology to organic chemistry and astrobiology. We solicit contributions highlighting recent developments in planetary science, in our own solar system and beyond. Topics can include, but are not limited to, mission results, telescopic or remote sensing observations, field work, laboratory work, modeling efforts, instrument and/or technology development, and mission concepts. Areas of study may include the atmospheres, surfaces and/or interiors of terrestrial planets (including Earth), gas and ice giants, moons, small bodies (comets, asteroids, etc.) and exoplanets. Reports highlighting recent advances (e.g., within the last two years), crosscutting science themes, or enabling technologies are encouraged.

B0.2 Instrumentation for Planetary Exploration

MSO/DO: Fabrizio Dirri (IAPS- National Institute for Astrophysics-INAF, Italy), M. Shanmugam (PRL, India)

Organizing Committee: Birgit Ritter (Royal Observatory of Belgium, Belgium); Stefania Stefani (INAF, Italy); K. Sankarasubramanian (URSC-Indian Space Research Organization-ISRO, India); Andrea Longobardo (INAF, Italy); Tomas Kohout (University of Helsinki, Finland); Tatsuaki Okada (JAXA, Japan); Julia de Leon (Instituto de Astrofísica de Canarias-Centro de Astrofísica en La Palma - CALP, Spain)

Event Information: The advanced and new instrumentation for planetary exploration has allowed scientists to learn more about the Earth-moon System, planets and small bodies of Solar System. Over the years, the development of new and high-performance instrumentations has been fundamental to obtain scientific and technological mission's goals. The instrument-ations helped to investigate the evolution of planetary and small bodies, to identify the characteristics that lead to life, what in-situ resources can be available for future human exploration, etc. The main aim of this session is to provide a wide canvas of instruments used in the previous, ongoing and future missions and is opened to the following topics:

- Reviews of instruments on previous missions: results obtained and lessons learned;
- Remote and in-situ analysis instruments as synthetic aperture radar, camera, spectro-meters, seismic instrumentation, dust sensors, etc.;
- Instruments developed for astrobiology aims and related laboratory activities;
- Instrument for nanosats, CubeSats and descend probes;
- Next generation of instruments for solar system exploration (Sun, Moon, Mars, Venus etc.) Mars Landers (e.g. ExoMars, Mars Sample Return), Planetary Defense Missions (e.g. HERA-ESA), Orbiter (e.g. TGO/ExoMars, ESA/JUICE)
- Studies and concepts for future instru- ment/payload and laboratory activity related to this topic

B0.3 [Technology for Planetary Exploration](#)

MSO/DO: Andrea Longobardo (INAF - IAPS Rome, Italy), Heather Smith (KIPR/ NASA Ames Research Center-ARC, USA)

Organizing Committee: Morgan Cable (NASA JPL), Manuel Grande (Aberystwyth University, UK), Brian Glass (NASA ARC, USA), Ernesto Palomba (INAF-IAPS, Italy), Dave Murrow (Lockheed Martin, USA), Caroline Freissinet (LATMOS-IPSL, France), Hector Andreas Stavrakakis (University of Athens, Greece), Fabrizio Dirri (INAF, Italy), Maria Genzer (Finnish Meteorological Inst. -FMI, Finland)

Event Information: Recently, planetary missions applied new and innovative methods for exploring target bodies, that are not limited to orbiter and lander exploration.

The use of innovative planetary exploration architectures including small satellites, rovers, landers, probes, and a combination thereof to achieve sample return as well as in-situ exploration of planetary bodies expands our exploration arsenal available to planetary science.

Sample Return is the last frontier of planetary exploration, and many technologies to sample planetary bodies and come the samples back to Earth have been developed or are under development.

CubeSats are a powerful and effective way to observe planetary bodies with an essential payload and saving power and mass. Another innovation concerns the ESA Comet Interceptor mission, whose spacecraft will split in three smaller spacecrafts. New technologies are also under development for navigation and propulsion, such as the solar power sails.

This session is open to contributions about current and new technologies developed or under development for planetary exploration, including the examples above and challenges in electronics. Abstracts related to planetary science technologies and instruments and the knowledge gained from these innovative concepts are welcome.

B1.1 [Small Body Science in a New Generation of Surveys, Observatories, Sample Returns, and Planetary Defense](#)

MSO/DO: Stefanie Milam (NASA GSFC, USA), Ernesto Palomba (INAF - IAPS Rome, Italy)

Organizing Committee: Paul Abell (NASA Johnson Space Center-JSC, USA), Dennis Bodewits (Auburn University, USA), Sabina Raducan (University of Bern, Switzerland), Tomoki Nakamura (Tohoku University, Japan)

Event Information: Small body science is at a premium for the next decade with a number of new sky survey facilities coming on-line (e.g. Rubin observatory, Roman Space Telescope, NEO Surveyor) to help identify/characterize objects in the inner/outer solar system. This is complemented by new observing capabilities offered by large telescopes (e.g. JWST, ALMA) that will reveal new details on the properties that have not been still accessible. Results, obtained by Space missions targeting small bodies, DART, Hayabusa 2, OSIRIS REx have changed our comprehension of the Solar System. Additional missions will soon reach their targets (e.g., HERA, MMX, Comet Interceptor). The analysis of samples returned from various asteroid missions has started to provide critical insights on the correlation to meteorites and bulk asteroid population. Finally, there exists an infrequent but significant hazard to life and property due to impacting asteroids and comets, and considering the technical challenges associated with discovering, characterizing, and mitigating these objects on time is recognized as a high priority for Planetary Defense. This scientific event will continue the success of previous assemblies for presentations representing multiple institutions, nationalities, gender, and a mix of senior and early-career scientist covering the broad range of topics for Small Body Science.

B1.2 [Unveiling Planet Formation and How it Connects Small Bodies, Planets, Circumstellar Disks and Stars](#)

MSO/DO: Diego Turrini (INAF Osservatorio Astrofisico di Torino, Italy), Maria Drozdovskaya (University of Bern, Switzerland)

Organizing Committee: TBD

Event Information: The path of planet formation starts from the interstellar medium and leads to the great diversity of planetary bodies that we observe in the Solar System and among exoplanets. Stars and their circumstellar disks inherit their composition from the interstellar medium and set the chemical and physical stage for the birth of planetary bodies. The interactions between the different component of forming planetary systems and their surrounding environment shape the direction of planet formation. Dust grains grow within the disks and their interaction with the disk gas allows planetesimals to form. Planets are born from planetesimals and dust and their interaction with the gas shape their orbital evolution and their growth into giant planets. Interactions between the planets and the planetesimals create the inter-stellar objects like those that in recent years crossed our Solar System. The composition of the bodies populating the planetary systems, including the host stars, preserves a record of all these process and their genetic link to the interstellar gas and dust from which they started. This interdisciplinary COSPAR event is open to experts on the Solar System, its small and large bodies, exoplanets, protoplanetary disks and stars, from their formation to their post-main sequence life, to share and integrate the unique perspectives from their different fields of study. The event is organized in coordination with Commissions B1, E4 and F3, and welcomes the discussion of results from theoretical and experimental studies as well as from observations from ground and space observatories and the space missions exploring our Solar System.

B2.1 **Innovative Approaches for Geodesy in Planetary Exploration**

MSO/DO: Steven Vance (JPL, USA), Giovanna Rinaldi (INAF-IAPS, Italy)

Organizing Committee: Ryan Park (JPL - Caltech, USA), Jun Kimura (Osaka University, Japan), Hauke Hussmann (DLR, Germany)

Event Information: This coming decades hold the potential to revolutionize the geodetic exploration beyond Earth. Dramatic reductions in launch costs, advances in instrumentation, and a renewed interest in human exploration of the Moon offer just a few reasons to look forward to rapid advances in planetary geodesy. This session solicits contributions promoting innovation and collaboration to advance planetary geodesy.

B3.1 **Lunar Science and Exploration**

MSO/DO: Megha Bhatt (PRL, India), Bernard H. Foing (Leiden Observatory, Netherlands)

Organizing Committee: TBD

Event Information: The Moon, a natural laboratory nearest to us is being explored by orbiters/landers/rovers for understanding the origin and evolution of the solar system for several decades. This decade of Moon exploration is specifically interesting considering planned lunar exploration using advanced instrumentation and a renewed interest in human exploration. This session is aimed at looking forward to rapid advances in lunar science and instrumentation. The session will include invited, contributed, and poster papers on new science results from recent missions, lab-based analysis of lunar returned samples and meteorites, and modeling outcomes. The session will emphasize the technology of future lunar mission concepts, instrumentation for future missions, in-situ resource utilization, and the preparations for human lunar exploration.

The session is co-organized with IAF, ILEWG, MVA Moon Village Association, EuroSpace-Hub academy, and EuroMoonMars. It is co-sponsored by space agencies, industry, and academia and serves as a joint session with the ICEUM18 International Conference on Exploration and Utilisation of the Moon.

B3.2 **New Planetary Science Opportunities and Results Enabled by Commercial Infrastructure and Venture Capital**

MSO/DO: David Thomas (Arizona State University, USA), Lewis Pinault (Birkbeck College, University of London, UK)

Organizing Committee: TBD

Event Information: Venture capital and private investors in partnership with space agencies, through programmes like NASA's Commercial Lunar Payload Services (CLPS), are rapidly increasing the number of commercial providers of lunar

transportation and infrastructure services. The growth of commercially provided lunar infrastructure is positively impacting cost, creating new opportunities for the scientific community, including participation by more spacefaring nations, university space programmes, and a new generation of scientists and engineers. Planned lunar infrastructure includes new rovers, robotics, orbital arrays, sensors and telecommunication systems as well as enhanced computing power and machine learning that offer compelling opportunities for lunar science. Autonomous networks of rovers, equipped with Computer Vision/Machine Learning, sample manipulators and on-board processing, will soon work in conjunction with both pilot beneficiation devices and orbital quantum sensing and laser telecommunication systems to guide and manage a relative explosion of data greatly stretching the boundaries of human exploration. New and fast-emerging opportunities include better understanding of e.g. pristine pit crater/ lava tube environments, extraterrestrial micro-materials in the lunar soil, surface dust dynamics, and potential resource accessibility and concentrations. COSPAR-24-B3.2 will include invited, contributed and poster papers, offering both scientific collaborators and entrepreneurs multidisciplinary opportunities to share mission plans and results, and to propose the co-design and development of new exploration and experimental capabilities leveraging the planned lunar infrastructure to maximize scientific return.

B3.3 **Life Science in Space and on the Moon**

MSO/DO: Elena Fomina (IBMP RAS, Russia), Bernard H. Foing (Leiden Observatory, Netherlands)

Organizing Committee: Lev Zelenyi (Space Research Institute-IKI, RAS, Russia), Oleg Orlov (IBMP RAS, Russia), Olga Bannova (University of Houston's College of Engineering, USA), Chrysoula Kourtidou-Papadeli (University of Engineering, Greece)

Event Information: Plans for human exploration and habitation on the moon are becoming a close reality now and humanity expect from scientists offering scientifically-proven methods for development of life support technologies. A comprehensive risk assessment of future lunar exploration missions during extended crew presence on the surface and long-term consequences of such missions – are critical tasks to be investigated during mission planning and design development. The criticality and complexity of such tasks require multi- and inter-disciplinary strategies that allow unfolding the entire range of physical factors affecting people under lunar conditions and propose an adequate protection means against negative effects of lunar environment.

This session aims to discuss the effects on human body of radiation, lunar dust, altered magnetic field and hypogravity conditions. Inter-disciplinary approach will allow to systematically comprehend development of life support systems in the context of the habitat architecture and lunar base infrastructure. Physicists, biologists, engineers, architects and physicians are invited to participate in the session.

B4.1 **Mercury Science and Exploration**

MSO/DO: Johannes Benkhoff (ESA-ESTEC, Netherlands), Go Murakami (JAXA, Japan)

Organizing Committee: TBD

Event Information: In 2018 the joint ESA/JAXA mission BepiColombo was launched to explore Mercury, the innermost planet in the solar system with many unique features. Understanding the origin, formation, evolution, composition, interior structure, and environment of Mercury plays a key role to understand the evolution of the terrestrial planets and the solar system. NASA's MESSENGER spacecraft launched in 2004 explored this unique planet and provided many insights and surprising findings. However, MESSENGER also raised many science questions that still remain unsolved and will be addressed by the two Mercury orbiters, MPO and Mio after orbit arrival in early 2026. Currently the spacecraft are in cruise and have successfully completed two Mercury flybys. Four additional flybys will follow between June 2023 and January 2025.

This session welcomes contributions addressing the planet's origin, formation, geology, surface composition, geodesy, interior structure, exosphere, magnetosphere, gravity, and magnetic fields, based on modeling, laboratory experiments, and observations (ground-based, remote-sensing and in situ). The first analyses of BepiColombo's flyby data from Mercury are welcome.

B4.2 Venus Science and Exploration

MSO/DO: Yeon Joo Lee (Institute for Basic Science, S. Korea), Colin Wilson (ESA-ESTEC, Netherlands)

Organizing Committee: Xiaolong Dong (National Space Science Center-NSSC, China), Lucia Marinangeli (Università G. d'Annunzio, Italy), Anne Grete Straume-Lindner (ESA- ESTEC, Netherlands), Suzanne E. Smrekar (JPL, USA), Takehiko Satoh (JAXA, Japan), David H. Grinspoon (Planetary Science Institute, USA), Maria Antonita (ISRO, India)

Event Information: This session invites presentations on all aspects of Venus, including its interior, surface, and atmosphere, with a focus on recent findings and insights. We welcome diverse approaches, such as model calculations, laboratory experiments, theoretical estimations, revisiting past data, and new ground/space-based measurements, to help better characterize Venus. Our goal is to provide international discussion opportunities to understand ongoing efforts toward solving significant scientific questions about Venus, along with current, confirmed, and planned Venus space missions.

B4.3 Mars Science Results

MSO/DO: Elliot Sefton-Nash (ESA, Netherlands), Michael Meyer (NASA Headquarters, USA)

Organizing Committee: TBD

Event Information: Our collective knowledge of Mars' evolution, and the present state and dynamics, of its atmosphere, surface and interior, is based principally on the wealth of observations made by science instruments aboard orbiters, landers and rovers.

This session will address new science resulting from data returned from completed and current missions, including studies that are reliant on theory, modeling, laboratory analyses, terrestrial analog work, and comparative planetology. This session will include a combination of solicited and contributed presentations, with a focus on international diversity.

B4.4 Forward Planning for the Exploration of Mars

MSO/DO: Timothy Haltigin (Canadian Space Agency, Canada), Steven Matousek (JPL, USA)

Organizing Committee: TBD

Event Information: Mars continues to be a compelling planetary exploration target in spite of, or perhaps even because of, the large number of prior and ongoing missions. The findings of each mission are typically met with an equal or greater number of questions raised to be answered by future missions. This session focuses on forward planning for the exploration of Mars including: (1) future hypothesis-driven or discovery-driven science instruments or missions, and; (2) The precursors that may help us prepare for future human missions. Topics of interest include the primary scientific drivers that require future missions to Mars, recent developments in our engineering and technological capabilities related to missions to Mars, an updated understanding of current mission concepts, and candidate instrumentation for future missions. The session will consist of a mixture of solicited and contributed presentations. The program will be developed with a special regard to achieving international representation.

B4.5 Science and Technologies of Mars Sample Return

MSO/DO: Brandi Carrier (JPL-Caltech, USA), Gerhard Kminek (ESA, Netherlands)

Organizing Committee: TBD

Event Information: NASA and ESA have embarked on a highly collaborative endeavor to return samples from Mars. A fundamental premise of this partnership is that scientists working around the world would share access to the samples such that the scientific benefits and discoveries are maximized. Progress in this international endeavor will be presented, including the progress Perseverance has made collecting samples in Jezero Crater, the planned mission architecture for returning the samples from Mars, and planning for analysis of the samples when they are returned to Earth via the Mars

Sample Receiving Project (SRP). In addition, there will be presentations of recent of Mars Sample Return Campaign Science Group and other working group reports, which have been aimed at formulating mechanisms through which the international scientific community can achieve our shared scientific objectives with the returned samples. The challenges of ensuring the best international science is accomplished, while adhering to planetary protection requirements will be discussed. Contributions to this session are sought to reflect international interest in sample return and its potential scientific benefits.

B5.1 **Jupiter, the Galilean Satellites, Rings and Magnetospheres: Juno Results**

MSO/DO: Scott Bolton (Southwest Research Institute, USA), John E.P. Connerney (GSFC, USA)

Organizing Committee: TBD

Event Information: Jupiter along with its magnetosphere and satellite system has been explored by the Juno mission since 2016, and is the target of ESA's JUICE mission as well as NASA's Europa Clipper mission (both scheduled to arrive in the next decade). Juno results have revealed a new Jupiter that challenges current theories across numerous disciplines of planetary science including the origin and evolution of Jupiter, the interior structure, the evolution of the atmosphere at all depths, and the polar magnetosphere and aurora. The Juno extended mission began in August 2021 and follows up on Juno's multi-discipline investigation of the atmosphere, interior and magnetosphere in addition to including close flybys of Ganymede, Europa and Io as well as the first exploration of Jupiter's enigmatic ring system. We invite abstracts on new scientific results from Juno's investigation of the Jupiter system and their impact on our understanding of the other giant planets within our solar system and beyond, as well as look forward data analysis and models associated with the Europa Clipper and JUICE missions. Abstracts describing results across the full range of disciplines from Juno's prime and extended mission are welcome. Results involving single and multi-disciplinary approaches to the interpretation of spacecraft data analysis, theoretical modeling, laboratory experiments and/or ground-based observations addressing Jupiter or the comparison of giant planets including exo-giants are encouraged.

B5.2 **Gas Giants and Icy Giants with their Systems**

MSO/DO: Anezina Solomonidou (Hellenic Space Center, Greece), Conor Nixon (NASA GSFC, USA)

Organizing Committee: TBD

Event Information: The gas and ice giant planets with their extensive system of rings and moons are of great scientific interest with a long list of open questions. The Scientific Event "Gas Giants and Icy Giants with their Systems" solicits abstracts addressing Jovian, Kronian, Uranian and Neptunian system science. This includes studies of the interiors, composition, dynamics, and processes shaping gas and ice giant atmospheres, magnetospheres, satellites, and rings, as well as the respective interactions between these regions. The event particularly encourages studies addressing the results and anticipated results of past (e.g., Cassini, Galileo), present (Juno, JWST), and future missions, such as JUICE and Europa Clipper. In addition to spacecraft data analysis, results of ground-based observations, theory, laboratory experiments, and numerical modelling work are all welcome.

B5.3 **Ocean Worlds: Past, Present, and Future**

MSO/DO: Morgan Cable (JPL-Caltech, USA), Anezina Solomonidou (Hellenic Space Center, Greece)

Organizing Committee: Rosaly Lopes (JPL, USA), Olivier Witasse (ESTEC, Netherlands), Alfonso Davila (NASA ARC, USA), Britney Schmidt (Cornell University, USA), Giuseppe Mitri (University of Nantes, France), Bethany Thieling (NASA GSFC, USA), Gabriel Tobie (Université de Nantes, France), Kelly Miller (SwRI, USA)

Event Information: The exploration of ocean worlds throughout the solar system has significantly expanded our set of targets in the quest to discover signs of life beyond Earth in the past decade and will continue to be in the ones to come. We invite contributions that cover a wide range of topics focusing on confirmed or potential subsurface (including surficial in the case of Titan's lakes) ocean worlds of our solar system. The topics can include studies on the geomorphology

and geophysics of ocean worlds, ocean (geo)chemistry and possible metabolic networks, plume searches and eruption mechanics, as well as laboratory investigations and field work of analogue environments. Furthermore, studies that examine interactions/exchange between planetary interiors (including core, ocean, and ice shell), surfaces, atmospheres/ exospheres, and astro-biology/ habitability are welcomed.

B6.1_E4.1 Exoplanet Detection and Characterisation: Current Research, Future Opportunities and the Search for Life Outside the Solar System

MSO/DO: Francesca Altieri (INAF - IAPS Rome, Italy), Michael Ireland (Australian National University, Australia)

Organizing Committee: TBD

Event Information: Exoplanet searches using ground- and space-based facilities have revealed a remarkable variety in observed exoplanetary systems. It is clear by now that planetary systems are commonly found in low- and intermediate mass stars. In order to understand the observed diversity in planetary systems we begin to link their architecture to the properties of planet forming disks around young stars, and to trace the present-day properties of exoplanets (mass, radius, chemical composition, atmosphere) to their formation history and evolution to mature planetary systems. Such studies are important to understand which planets in which planetary systems have properties that would support the emergence of life as we know it. The increasing accuracy of mass and radii determinations provides improved constraints on the composition and interior structure of rocky exoplanets. Spectra of increasing quality and resolution, especially from JWST, enable us to investigate exoplanet rotation, atmospheric chemical composition, the presence of clouds and day to night side differences of large samples of exoplanets, and to begin to study important biomarkers. These more detailed observations anticipated in the coming years, especially from space missions, require more sophisticated modelling efforts, including understanding potential abiotic origins of biomarkers and evolutionary models of processes such as atmospheric escape. These developments allow an increasingly more quantitative comparison to the properties and formation history of the solar system planets.

This COSPAR event aims to bring together the planetary and exoplanetary community to discuss exoplanets in context, and address results of ongoing space missions and future opportunities.

CO.1 International Standards for Space Environment

MSO/DO: W Kent Tobiska (Space Environment Technologies, USA), Yukihiro Kitazawa (JAXA, Japan)

Organizing Committee: Vladimir Kalegaev (Moscow State University, Russia), Yugo Kimoto (JAXA, Japan), Jean-Francois Roussel (ONERA, France), Dieter Bilitza (GMU College of Science, USA), Tamara Gulyaeva (IZMIRAN, Russia), David Rees (The Paradigm Factor Ltd., UK),

Event Information: Standardization is based on scientific knowledge and it promotes the social utility of results of scientific research. The ISO (International Standards Organization) develops international standards related to the space environment and these standards describe the context, physical basis, application, and impacts upon space- and ground-support systems. Over 23 ISO space environment standards have been developed since 1992. We invite papers to this session that support the development and/or improvement of current and future ISO space environment standards.

CO.2 Advances in Remote Sensing of the Middle and Upper Atmospheres and Ionosphere from the Ground and from Space, including Sounding Rockets, Novel Radar and Multi-instrument Studies

MSO/DO: David Rees (The Paradigm Factor, UK), Michael Kosch (Lancaster University, UK)

Organizing Committee: TBD

Event Information: The Meeting will provide a forum for the presentation and discussion of novel instruments for exploring the Middle and Upper Atmospheres and Ionospheres of the Earth and Planets by in-situ and remote sensing techniques deployed from space platforms and ground-based facilities and instruments. Reports on recent science

achievements as well as technological development of the instrument capabilities across disciplines are encouraged. Contributions describing the implementation of new measurement techniques and multi-instrumental studies and data interpretation are also encouraged.

C1.1 [Recent Advances in Equatorial, Low- and Mid-Latitude Mesosphere, Thermosphere, and Ionosphere Studies](#)

MSO/DO: Paulo Roberto Fagundes (Universidade do Vale do Paraiba, Brazil), Venkatesh Kavutarapu (PRL, India)

Organizing Committee: TBD

Event Information: Dynamic processes taking place in the mesosphere, lower thermosphere and ionosphere are always intriguing to the scientific community. Ever increasing ground and space based experiments are providing large database on the MLT region, and opening up new avenues to employ advanced Artificial Intelligence (AI) and Machine Learning (ML) techniques to understand and simulate various physical processes taking place in these regions.

Papers are invited for a session on the recent advances in the field of the equatorial, low- and mid-latitude mesosphere, thermosphere, and ionosphere from observational (ground-based and space-borne), theoretical and simulation studies. Contributions related to all aspects of these areas are welcome. Topics include but not limited to: MLT region; the response of the thermosphere- ionosphere system to forcing from above and below; equatorial electrodynamic processes; coupling between mid-, low- and equatorial latitude regions; space weather events; magnetosphere- ionosphere coupling; Ionospheric response to SSW; ionospheric irregularities and scintillations; latitudinal and/or longitudinal variability; ionosphere F-layer stratification; data-assimilation studies; modelling through AI/ML; advanced space and ground-based experiments, tomography. The session will include both solicited and contributed (oral and poster) papers.

C1.2 [Coupling Processes of the Magnetosphere-ionosphere-thermosphere System in the Formation of Various Auroras](#)

MSO/DO: Geonhwa Jee (Korea Polar Research Institute, S. Korea), Wenbin Wang (NCAR, HAO, USA)

Organizing Committee: De-Sheng Han (Tongji University, China), Hyuk-Jin Kwon (KOPRI, S. Korea), Hyosub Kil (JHU APL, USA), Qian Wu (NCAR/HAO, USA), Yukinaga Miyashita (KASI, S. Korea), Yasunobu Ogawa (NIPR, Japan)

Event Information: Aurora is the manifestation of the external energy deposition into the Earth's upper atmosphere in the polar region, and the aurora observed by our naked eyes is the visible form of the currently developing space weather. Aurora was initially understood as the upper atmospheric manifestation of various magneto-spheric processes in the visible frequency range, but later people realized that the formation and evolution of aurora are strongly affected by the state of the upper atmosphere, especially, the ionosphere. Therefore, it is a result of not only the physical processes within the magnetosphere but also the magnetosphere-ionosphere-thermosphere coupling processes. This session invites studies of the development of various forms of aurora in the polar upper atmosphere in association with the state of the ionosphere and thermosphere as well as with magnetospheric processes.

C1.3 [Atmospheric and Ionospheric Perturbations at Low, Mid, and High Latitudes from Known Sources](#)

MSO/DO: Young-Sil Kwak (KASI, S. Korea), Hyosub Kil (JHU APL, USA)

Organizing Committee: Charles Lin (National Cheng Kung University, China: Academy of Sciences Located in Taipei), Huixin Liu (Kyushu University, Japan), Jiuhou Lei (University of Science and Technology of China, China), Tatsuhiro Yokoyama (Kyoto University, Japan), Woo Kyoung Lee (KASI, S. Korea), Rui Wang (Polar Research Institute of China, China)

Event Information: Natural and man-made phenomena such as geomagnetic storms, eclipses, volcanoes, earthquakes, tornadoes, tropospheric storms, and explosions generate various atmospheric waves. Some of these waves generate perturbations of measurable magnitudes in the upper atmosphere and ionosphere. Worldwide observational facilities enable the tracing of the evolution of perturbations, and the development of sophisticated atmosphere-ionosphere

coupling models enables the simulation of the propagation of atmospheric waves. However, we do not yet have sufficient knowledge about the dependence of the characteristics of atmospheric and ionospheric perturbations such as the spatial extent, magnitude, and morphology of perturbations on different sources. This session provides an opportunity to discuss recent progress in the study of the generation of atmospheric waves, their propagation, and the ionospheric response to these waves in low, mid, and high latitudes. We welcome the presentation of observations, numerical simulation results, and theoretical studies for known natural and man-made events.

C1.4 [Space Weather and Earth's Atmosphere-Ionosphere](#)

MSO/DO: Nicholas Pedatella (NCAR HAO, USA), Loren Chang (National Central University, China: Academy of Sciences Located in Taipei)

Organizing Committee: Duggirala Pallamraju (PRL, India)

Event Information: The space weather of the Earth's middle and upper atmospheres is characterized by variability across a range of spatial and temporal scales. The variability encompasses spatial scales from meters to global scale variations, and minute to decadal time scales. Such a range of scales makes predicting the variability of the middle and upper atmosphere challenging. This session solicits presentations focused on the application of numerical models and observations to characterize and understand middle and upper atmosphere variability, with the ultimate goal of improving the predictability of this region. Topics of particular interest include the response of the ionosphere-thermosphere to forcing from above and below, the effect of atmospheric waves and composition changes on the middle-upper atmosphere, improved specifications of solar and magnetospheric forcing of the middle-upper atmosphere, and the chemical and dynamical response of the middle atmosphere to solar and magnetospheric forcing.

C2.1 [Gravity Waves and Turbulence in the Middle Atmosphere and Lower Ionosphere](#)

MSO/DO: Robin Wing (Leibniz- Institute of Atmospheric Physics, Germany), Boris Strelnikov (Leibniz-Institute of Atmospheric Physics (IAP), Germany)

Organizing Committee: TBD

Event Information: Gravity waves and turbulence have long been recognized as integral to our understanding of the neutral middle atmosphere and ionosphere. However, important questions still remain regarding gravity wave generation and propagation; instabilities and wave breaking, secondary wave generation, energy transfer to turbulence, coupling between atmospheric layers, and other topics. This session is intended to bring together experts working on related topics in the middle atmosphere. Presentations of theoretical, modelling, experimental and observational work on gravity waves or turbulence in the middle atmosphere and ionosphere are welcome.

C3.1 [Planetary Atmospheres](#)

MSO/DO: Hilary L. Justh (NASA Marshall Space Flight Center-MSFC, USA), Larry W. Esposito (University of Colorado, USA)

Organizing Committee: TBD

Event Information: This session is focused on the planetary atmospheres of the inner and outer planets and their moons. Presentations of results from recent and ongoing planetary missions, ground-based observations, modeling, and theoretical studies are welcomed. Solicited talks, contributed presentations, and posters will be included in this session which encompasses all solar system bodies except the Earth.

C3.2 [Planetary Upper Atmospheres, Iono-spheres and Magnetospheres](#)

MSO/DO: Syed A. Haider (PRL, India), Takeshi Kuroda (Tohoku University, Japan)

Organizing Committee: Stephen Bougher (University of Michigan, USA), Anil Bhardwaj (PRL, India), Gina A. DiBraccio (NASA GSFC, USA), Randy Gladstone (SwRI, USA)

Event Information: In recent decades, special emphasis is given on the observations, modelling, data analysis and theoretical interpretations of planetary atmospheres. This session covers the studies of the upper atmospheres, ionospheres, magnetospheres and exospheres of inner and outer planets and their satellites except the Earth. Future atmospheric missions like MMX, Shukrayaan, Mangalyaan, ExoMars 2022, JUICE, Europa Clipper are currently planned to explore Mars, Venus, Jupiter and Europa. BepiColombo will arrive soon on Mercury. Papers on these missions are welcome. The results obtained from recent missions viz. ExoMars/TGO, MAVEN, EMM, Cassini, Juno and New Horizon will also be considered. The comparative studies of the upper atmospheres, ionospheres and magnetospheres of these planets are also encouraged. Both solicited talks and contributed presentations are welcome in this event.

C4.1 **International Reference Ionosphere: Improvements, Validation, and Applications**

MSO/DO: Dieter Bilitza (George Mason University, and NASA GSFC, USA), Young-Sil Kwak (KASI, S. Korea)

Organizing Committee: Andrzej Krankowski (University of Warmia and Mazury Poland), Ivan Galkin (University of Massachusetts Lowell-UMass Lowell, USA), Bodo Reinisch (UMass Lowell, USA), Vladimir Truhlik (Inst. of Atmospheric Physics, Czech Academy of Sciences, Czech Republic), YongHa Kim (Chungnam National University, S. Korea)

Event Information: The International Reference Ionosphere is the international standard for the specification of the ionospheric environment and is recognized as such by COSPAR, URSI, and ISO. IRI describes the electron and ion densities and temperatures, the ion drift, total electron content and the occurrence probabilities of spread-F. This session invites presentations that discuss improvements of the current version of IRI, comparisons with data and other models, new inputs for expanding the model, and reports on usage of IRI for science, engineering, education and other applications. We particularly welcome presentations on studies that use data assimilation to bring IRI up to real-time conditions.

C4.2 **Development of First Principles and Empirical Models Related to the COSPAR International Reference Atmosphere**

MSO/DO: Sean Bruinsma (CNES, France), Marcin Pilinski (LASP / University of Colorado, USA)

Organizing Committee: TBD

Event Information: This event will consider the development of atmospheric models, both first-principles and empirical, for the COSPAR International Reference Atmosphere (CIRA). This session solicits presentations on recent advances in thermosphere, coupled upper atmosphere, and Whole Atmosphere Modeling and recommendations for future research and development, especially in the context of addressing satellite drag. Talks related to issues of applying first-principles models to operational problems are welcomed. Descriptions of models with the potential of future operational transition are especially encouraged. Model construction and validation is limited by the availability of data. Descriptions and re-analysis of data sets applicable to atmospheric model construction/ validation will also be discussed. This includes but is not limited to neutral density, composition, and temperature measurements. It also includes assimilation efforts and any associated validation of the estimated thermospheric states.

C5.1_D4.1 **Dust Observations in Space and Laboratory Experiments**

MSO/DO: Jiri Pavlu (Charles University, Czech Republic), Ingrid Mann (The Arctic University of Norway, Norway)

Organizing Committee: Linda Megner (Stockholm University, Sweden), Timothy J. Stubbs (NASA GSFC, USA), Jamey R. Szalay (Princeton University, USA), Hubertus M. Thomas (DLR, Germany), Shengyi Ye (Southern University of Science and Technology, China)

Event Information: Recently, wide attention has been paid to dust observation, detection, and characterization. The session is interdisciplinary by nature and focuses on the latest research and discoveries related to the study of dust in space and planetary environments, including their ionospheres. It covers a wide range of topics, including the composition and properties of interstellar dust, the dynamics of dust, dust interaction with atmospheres, and laboratory experiments on dust charging and collision processes. We welcome contributions to recent advances in observational techniques for studying

dust in space, including new results from space missions (Solar Orbiter, Parker Solar Probe,...) and Earth-based observations. Yet it also focuses on laboratory experiments aimed at understanding the fundamental physics of dust charging and collision processes as well, i.e., experiments in dusty plasmas, dust charging, and the impact ionization, aiming to investigate the charging properties and behaviour of dust particles under different conditions. The session will provide a comprehensive overview of the latest developments in space dust research, highlighting the importance of interdisciplinary approaches and collaborations between laboratory experiments and space observations. Works to link the space measurements to dust in the universe are welcome.

EXPECTED TOPICS:

"Dust in the planetary atmospheres" (NLC, PMSE, PMWE, meteoric trails, wave phenomena, etc.) "Dust in space, rings, comets, asteroids" (latest results of space missions and remote observations)

"Space Instruments and laboratory experiments" (i.e., dust detectors, antenna observations, dust accelerator studies, charging of dust, light scattering on dust, destruction and growth of dust...)

D0.1 Overview Session Commission D

MSO/DO: Nicole Vilmer (Observatoire de Paris, LESIA, France), Agnieszka Gil (Siedlce University, Poland)

Organizing Committee: TBD

Event Information: In this session the recent developments and highlights of solar magnetospheric and heliospheric science are presented and summarized. The session consists of invited talks exclusively, for each of the Sub-commissions (the heliosphere, transition from the Sun to the heliosphere, and magneto-spheres). The session will be scheduled on a single half-day with no other commission D sessions in parallel. Please submit an abstract to this session only when invited by the MSO or the DO.

D1.1 Acceleration and Transport of Energetic Particles in the Heliosphere, the Interstellar Medium, and Astrospheres

MSO/DO: Agnieszka Gil (Siedlce University, Poland), Nicholas Eugene Engelbrecht (North-West University, S. Africa)

Organizing Committee: Anna Wawrzaszek (Space Research Centre, Polish Academy of Sciences-PAS, Poland)

Event Information: Heliosphere and astro-spheres surrounding stars in our galaxy, as well as the surrounding local interstellar medium, are filled with several populations of energetic particles such as Galactic cosmic rays, anomalous cosmic rays, accelerated pickup ions and suprathermal solar/stellar wind particles. They interact with plasma and magnetic fields with embedded turbulence, leading to particle drift, diffusion, and acceleration. These processes are fundamental to energetic particle production and intensity modulation by solar and stellar activities. In some cases, energetic particles can play important dynamic role in the formation of heliospheric structure. Various space-borne or ground-based observations of particle intensity, spectrum and anisotropy contain valuable information about the mechanisms of particle acceleration and transport through the heliosphere. This session brings together observers and theoreticians studying energetic particles acceleration and transport to discuss progress and challenges in understanding the underlying physics of particle acceleration and transport in heliosphere, various astrospherical environments, and interstellar medium.

D1.2 Large Scale Structure of Heliosphere and its Physical Drivers

MSO/DO: Merav Opher (Boston University, USA), Konstantinos Dialynas (Academy of Athens, Greece)

Organizing Committee: Merav Opher (Boston University, USA), Konstantinos Dialynas (Center of Space Research and Technology, Academy of Athens, Greece)

Event Information: The solar wind interacts directly with the Very Local Interstellar Medium (VLISM), forming our local astrosphere that we call Heliosphere. Its properties are modulated by magnetic field influences, particle-based interactions, and hydro-magnetic instabilities of the interface, to name but a few.

The path-breaking observations of the two Voyager spacecraft, providing in-situ particle and fields measurements throughout the upwind direction of the heliosphere, were placed in a global context by the remotely sensed Energetic Neutral Atom (ENA) observations from the Interstellar Boundary Explorer (IBEX) as well as the Ion and Neutral camera (INCA) onboard Cassini, showing a number of surprises concerning the physics of the global heliosphere. The Voyagers continue to provide invaluable information from beyond the heliopause, a region that may become accessible again in a few decades, by a future Interstellar Probe mission. In anticipation of the IMAP mission, the focus of the heliospheric community is turned to employing all available measurements from space missions and current models for the heliosphere to construct a predictive model to understand its structure.

This session will focus on

- analysis of observational data from various sources that may serve to constrain the physical properties of the heliosphere as a whole (or large parts thereof), and
- numerical and analytical modelling efforts aiming at the physical interpretation of such data, or otherwise suitable to render our present concepts of the heliosphere's large-scale structure and dynamics more consistent and complete.

The session will also welcome contributions that discuss the physics of other astrospheres, heliosphere-like structures around nearby stars

D1.3 **Magneto-plasma Structures, Streams and Flows in the Heliosphere**

MSO/DO: Olga Khabarova (IZMIRAN, Tel Aviv University, Israel), Olga Malandraki (IAASARS, National Observatory of Athens, Greece)

Organizing Committee: Lan Jian (NASA GSFC, USA), Jörg Büchner (Berlin Institute of Technology, Germany), Georgios Nicolaou (UCL Department of Space and Climate Physics, UK), Luca Franci (Queen Mary University of London, UK)

Event Information: The heliosphere contains various structures both originated from the Sun and formed directly in the solar wind. A common feature of magneto-plasma objects is their contribution to the nonlinear energy cascade and the ability to produce other structures, leading to the development of dynamical processes that make the solar wind an inhomogeneous medium in which turbulence and intermittency coexist with structuring and regularity. Streams, flows, shocks, current sheets and magnetic islands/flux ropes are important sources of particle acceleration and sites of magnetic reconnection. These structures can also be geoeffective and cause hazardous space weather effects.

We invite space physicists to share their recent results in studying

- interplanetary coronal mass ejections (ICMEs);
- corotating/stream interaction regions (CIRs/SIRs);
- current sheets of various origins, including the heliospheric current sheet (HCS);
- flux rope/plasmoids/blobs/magnetic islands;
- interplanetary and bow shocks, and related processes.

Contributions discussing theoretical aspects, modeling and observations are welcome.

D1.4 **Suprathermal and Pickup Ions Throughout the Heliosphere**

MSO/DO: Matthew Hill (JHU APL, USA), Konstantinos Dialynas (Academy of Athens, Greece)

Organizing Committee: Matthew E. Hill (JHU APL, USA), Kostas Dialynas (Academy of Athens, Greece), TBD

Event Information: We invite presentations on suprathermal (ST) ion and interstellar pickup ion (PUI) theory, simulations, or observations from across the heliosphere with the general goal of deepening the understanding of this key population, which bridges the plasma and energetic particle regimes. Past, ongoing, or future missions including but not limited to Parker Solar Probe, Solar Orbiter, ACE, JUICE, Ulysses, Juno, Cassini, New Horizons, Voyager 1 2, IBEX and IMAP are appropriate

for inclusion, as are results from NASA DRIVE centers, such as SHIELD. Topics could explore, for example, fundamental PUI and ST topics (such as the origin, energization, and transport of the particles themselves); the influence ST ions and PUIs have on global heliospheric structures (such as the termination shock and the heliosheath) or on other particle populations (such as the solar wind, anomalous cosmic rays, and energetic neutral atoms); or phenomena that are probed using STs and PUIs as tracers of other processes (such as the evolution of transient shocks or corotating interaction regions).

We seek broad representation from our community and anticipate a lively and productive meeting discussing the latest investigations into the physics of these fascinating particle populations, so please consider contributing to this session: COSPAR-2024-D1.4: Suprathermal and Pickup Ions Throughout the Heliosphere.

Abbreviations:

- ACE: Advanced Composition Explorer (NASA mission)
- DRIVE: Diversify, Realize, Integrate, Venture, Educate (NASA Science Center program)
- IBEX: Interstellar Boundary Explorer (NASA mission)
- IMAP: Interstellar Mapping and Acceleration Probe (NASA mission)
- JUICE: Jupiter Icy-moons Explorer (ESA Mission)
- SHIELD: Solar wind with Hydrogen Ion charge Exchange and Large-Scale Dynamics (a NASA DRIVE Science Center)

D1.5 **Turbulence in the Heliosphere from the Solar Corona to the Very Local Interstellar Medium**

MSO/DO: Federico Fraternali (University of Alabama in Huntsville, USA), TBD

Organizing Committee: N. Eugene Engelbrecht (Centre for Space Research, North-West University, S. Africa), Lingling Zhao (Center for Space Plasma and Aeronomic Research, University of Alabama in Huntsville, USA)

Event Information: Turbulence is one of the most fundamental processes throughout the heliosphere, playing a crucial role in the acceleration and heating of the solar wind at the solar corona, the transport and diffusion of energetic particles, and even affecting the global properties of the heliosphere. Our understanding of turbulence within 1 AU from the Sun benefits from a wealth of space missions, including recent ones such as PSP and Solar Orbiter, as well as multispacecraft missions like Cluster and MMS. In the distant solar wind, turbulence is closely linked to charge exchange processes, which generate pickup ions measured by New Horizons. Turbulence becomes compressible in the inner heliosheath and in the very local interstellar medium (VLISM) where the Voyagers provide us with unique in situ data. The goal of this session is to connect the inner and outer heliosphere from the perspective of turbulence, discussing topics such as the energy cascade across scales, its dissipation and associated heating of ions and electrons, turbulence transport and evolution throughout the heliosphere, interplay of turbulence and with shocks and large-scale heliospheric structures, effects of turbulence on suprathermal particles and cosmic rays, and the turbulence of the VLISM. We welcome theoretical, observational and modeling studies.

D1.6 **Understanding and Predicting Solar Energetic Particle Events Across the Heliosphere**

MSO/DO: Nicolas Wijsen (KU Leuven, Belgium), TBD

Organizing Committee: Athanasios Papaioannou (National Observatory of Athens, Greece), Du Toit Strauss (North-West University, S. Africa)

Event Information: Solar Energetic Particle (SEP) events pose a significant threat to space weather and human space exploration. Understanding and predicting these events are crucial for minimizing their impact. This session will bring together researchers in the field to discuss the latest advancements in SEP research, including observations, theoretical modeling, and data analysis techniques. We will address several key topics, such as the acceleration mechanisms of SEPs and their transport through the turbulent solar wind. Additionally, we will explore methods for predicting the occurrence, duration, and intensity of SEP events, including advancements in space weather forecasting. Our goal is to foster collaboration among scientists and to develop a comprehensive understanding of SEP events that will enhance our ability to predict and mitigate their effects.

D1.7 [Science from Neutron Monitors, Muon Telescopes, and other Detectors of Atmospheric Showers from GeV Cosmic Rays](#)

MSO/DO: David Ruffolo (Mahidol University, Thailand), Kazuoki Munakata (Shinshu University, Japan)

Organizing Committee: Yu Yi (Chungnam National University, S. Korea), R. Du Toit Strauss (North-West University, S. Africa), Paul Evenson (University of Delaware, USA), Suyeon Oh (Chonnam National University, S. Korea), Agnieszka Gil-Swidarska (Siedlce University, Poland)

Event Information: Detection of atmospheric shower particles from GeV-range cosmic rays includes that by neutron monitors and other neutron detectors, muon telescopes, air shower arrays, and cosmogenic isotope monitors. We welcome contributions regarding the instrumentation and/or data analysis for any such detectors. In particular, these can provide continuous, long-term monitoring of the cosmic ray flux, spectrum, and anisotropy for solar and heliospheric science; automated space weather warnings; measurements of atmospheric ionization; radiation dosimetry; monitoring of soil moisture; and nuclear threat detection. Contributions regarding atmospheric shower particles from cosmic rays of other energy ranges that relate to such phenomena are also welcome.

D2.1_E3.1 [Off-the-Sun-Earth-Line \(OSEL\) Missions](#)

MSO/DO: Nat Gopalswamy (NASA GSFC, USA), Kyungsuk Cho (KASI, S. Korea)

Organizing Committee: TBD

Event Information: Off-the-Sun-Earth-Line (OSEL) observations from vantage points such as Sun-Earth Lagrange points L4 and L5 can provide information in three-dimensions to understand the magnetic coupling of the solar interior to the heliosphere. These in combination with observations from the Sun-Earth line (L1/ground-based) and in solar polar orbits can provide information missing at the solar poles and hence help us achieve a full 3-D view of the Sun. The unusual attribute of L4 covers the entire solar radiation hemisphere that is relevant for Lunar and Mars Exploration. We invite papers related to OSEL mission ideas, multi-view simulations, anticipated benefits to heliophysics investigations, and observational results from past/current missions such as STEREO.

D2.2_E3.2 [Heliospheric Variability, its Solar Sources and Impacts on Solar System Objects](#)

MSO/DO: Mateja Dumbovic (University of Zagreb, Croatia), Miho Janvier (Institut d'Astrophysique Spatiale, France)

Organizing Committee: Jie Zhang (GMU, USA), Erika Palmerio (Pred. Sci, USA), Jingnan Guo (USTC, China), Emilia Kilpua (University of Helsinki, Finland), Camilla Scolini (UNH, USA), Sergio Dasso (CONICET, Argentina), Spiros Patsourakos (University of Ioannina, Greece), Nina Dresing (University of Turku, Finland), Phil Hess (NRL, USA), Konstantin Herbst (University of Kiel, Germany), Rui Pinto (IRAP, France), Stefan Hofmeister (AIP, Germany), Sophie Musset (ESA-ESTEC, Netherlands)

Event Information: Heliospheric variability is driven by different sources at the Sun, such as the continuous outflow of the solar wind and heliospheric magnetic field, intermittent events such as switchbacks, but also more notably by SIRs/CIRs, CMEs and their associated shocks, as well as SEPs. Therefore, to understand the variability of our heliosphere (and astrospheres in general) we need to understand its drivers – from their initiation to their evolution/dynamics and impacts. This session is devoted to provide the overview of the current state of the research on the drivers of the heliosphere (and more generally astrospheres) from both theoretical, modelling and observational aspects (especially taking into account the multi-spacecraft approach). We solicit abstracts covering any step in the Sun-to-planet chain-of-events analysis, from the initiation at the Sun, through the dynamics and evolution in the heliosphere to planetary impacts.

D2.3_E3.3 Magnetic Reconnection in the Turbulent Plasmas - From the Sun through the Heliosphere to Stars and Galaxies

MSO/DO: Jörg Büchner (Max Planck Institute for Solar System Research, Germany), Masahiro Hoshino (University of Tokyo, Japan)

Organizing Committee: TBD

Event Information: Magnetic reconnection is a major phenomenon of energy release in the Universe. It can be observed, more or less directly in the Sun and in the heliosphere, in situ in planetary magnetospheres as well as in the laboratory. A number of ongoing and planned space mission is devoted to its exploration, MMS in the Earth magnetosphere, the Parker Solar Probe, Solar Orbiter, Solar C to name a few. Also, new laboratory experiments are carried out to understand the physics of reconnection better. In particular, the close but not yet well understood relation between reconnection and turbulence is in the focus of the ongoing research. The session aims at the presentation of new data as well as at their illumination by appropriate numerical simulation results, the verification of reconnection models by laboratory experiments and extrapolations of the reconnection concept to the stellar, interstellar, galactic and intergalactic plasmas.

D2.4_E3.4 STEREO's Journey around the Sun: An Era of Single and Multi-spacecraft Observations from 2007 to 2024

MSO/DO: Noé Lugaz (University of New Hampshire, USA), Robert Wimmer-Schweingruber (Christian-Albrechts-Universität zu Kiel, Germany)

Organizing Committee: TBD

Event Information: The Solar TERrestrial RELations Observatory (STEREO) mission began operations in 2007. It allowed to observe the Sun and heliosphere from multiple viewpoints and thus started a new era of heliophysics. Today STEREO and other spacecraft in the inner heliosphere, notably Bepi Colombo, Parker Solar Probe, and Solar Orbiter, as well as assets at Earth and elsewhere in the solar system (e.g., at Mars), allow us to understand the Sun and heliosphere as a system and investigate in detail its 3D properties.

We solicit contributions which investigate the 3D structure of the heliosphere and solar corona, of the solar wind, disturbances, particle transport, based on multi-spacecraft studies.

D2.5_E3.5 Impact of the Inhomogeneous Solar Corona and Solar wind on CME Evolution

MSO/DO: Soojeong Jang (Kyung Hee University, S. Korea), Meng Jin (Lockheed Martin Solar and Astrophysics Laboratory, USA)

Organizing Committee: Ryun Young Kwon (KASI, S. Korea), Angelos Vourlidas (JHU APL, USA), David Lario (NASA GSFC, USA), Mark Cheung (Lockheed Martin Solar Astrophysics Laboratory, USA), Iulia Chifu (University of Goettingen, Germany), Nada Al-Haddad (University of New Hampshire, USA)

Event Information: In the last decade, there has been significant progress in understanding the initiation and evolution of Coronal Mass Ejections (CMEs), as well as their association with waves/shocks resulting in radio bursts and solar energetic particles. Our progress is evident from the rich set of observations and new findings obtained from multiple vantage points and the advanced numerical simulations that have shown promising results reproducing observations.

However, relatively less effort has been devoted to studying how the inhomogeneities of the solar corona and solar wind influence the generation and dissipation of shocks that largely vary from one event to the other. Such variations hinder our better understanding of the propagation and evolution of CMEs and their relevant phenomena, which significantly limits our capability to forecast space weather. We invite papers dealing with the three-dimensional density distribution of the solar corona and solar wind, and the effects of the inhomogeneities on solar winds, wave/shocks, radio bursts, solar energetic particles, CME propagations/ deformations.

D3.1 Highlights of Magnetospheric Plasma Physics

MSO/DO: Katariina Nykyri (Embry- Riddle Aeronautical University, USA), Lev Zelenyi (IKI, RAS, Russia)

Organizing Committee: TBD

Event Information: Our capabilities to study the magnetosphere and various magnetospheric processes in all their complexity are experiencing gigantic growth. Numerous spacecraft and multi satellite missions provide unprecedented volume of high quality data. Advances in the development of numerical codes and available computer resources allow comprehensive simulations of the global evolution of the magnetosphere that involves an enormous number of dynamical processes operating at various spatial and temporal scales. In addition to the traditional triad of theory, observations and simulations, machine learning is now widely applied to the various problems of magnetospheric physics enhancing our ability to extract important information from vast amounts of available data. We are anticipating both novel constellation missions and imaging missions such as SMILE that will enable remote observations of global magnetospheric dynamics by simultaneous observations of the solar wind and the response of Earth's magnetosphere. This symposium is aimed to assess key recent developments in the physics of the magnetosphere, to review unsolved problems that impede the progress and expectations from future missions.

D3.2 Cross-scale Coupling and Multi-point Observations in the Solar Wind and Magnetosphere

MSO/DO: Marina Stepanova (Universidad de Santiago de Chile, Chile), TBD

Organizing Committee: Hyunju Kim Connor (NASA GSFC, USA), Pablo Moya (Universidad de Chile, Chile), Hiroshi Hasegawa (ISAS, JAXA, Japan), Christine Gabrielse (The Aerospace Corporation, USA), Maria Federica Marcucci (Institute for Space Astrophysics and Planetology, Italy)

Event Information: The Earth's magnetosphere is a complex system that interacts constantly with the turbulent solar wind. Despite extensive research, there is still much debate surrounding the primary mechanisms of energy and mass transfer during solar wind- magnetosphere-ionosphere inter-actions. We invite studies that focus on cross-scale coupling processes and incorporate multi-point satellite and ground-based observations to contribute to our understanding of the solar wind- magnetosphere-ionosphere system, by addressing questions including but not limited to:

- What is the role of turbulence in the solar wind-magnetosphere interactions at different scales and locations?
- What is the mechanism of the magnetosphere-ionosphere coupling, what signs of the magnetospheric processes at different scales are we able to see in the ionosphere, and are we able to make a correct interpretation, including the mapping between the ionosphere and different magnetospheric regions?
- What is the role of the coordinated multi- point satellite and ground-based measurements in deciphering these effects?

Additionally, we encourage research exploring the potential role of small satellite swarms in improving temporal and spatial resolution of our measurements, which is critical for understanding cross-scale coupling.

D3.3 Origin of Non-thermal Distributions in Space Plasmas and their Role in Wave Generation and Heating / Acceleration of Particles

MSO/DO: Ioannis Kourakis (Khalifa University of Science and Technology, UAE), Gurbax Singh Lakhina (Indian Institute of Geomagnetism, India)

Organizing Committee: TBD

Event Information: Nonthermal particle distributions occur commonly in space plasmas, for example, in solar and stellar coronas, in the solar wind and in planetary magnetospheres. Various types of nonthermal distributions have been proposed, including the kappa distribution (and variants thereof), the Cairns, Lorentzian and Tsallis q-extensive distribution(s). Such distributions are characterized by an excess of energetic particles, i.e. a significant component of particles in the suprathermal region, exceeding that of the Maxwell-Boltzmann distribution: the resulting extra free energy can thus give rise to various kinds of plasma waves, instabilities and nonlinear coherent structures (electro- static solitary waves), such as bipolar E-field waveforms, double layers and supersolitons. We solicit papers on the role of nonthermal distributions in exciting plasma wave modes and solitary structures and on their impact on plasma heating and acceleration in planetary magnetospheres,

in solar/stellar coronas, in the solar wind and in astrophysical plasma environments. Papers based on observations, modeling, theory and simulations are welcome.

D3.4 **Particle Transport Acceleration and Loss in the Earth and Planetary Magnetospheres**

MSO/DO: Kyung-Chan Kim (Chungbuk National University, S. Korea), Maria Usanova (University of Colorado, USA)

Organizing Committee: Geoff Reeves (Los Alamos National Laboratory, USA), Dae-Young Lee (Chungbuk National University, S. Korea), Kunihiro Keika (The University of Tokyo, Japan), Elena Kronberg (University of Munich, Germany)

Event Information: Since the discovery of the Van Allen radiation belts, understanding of the acceleration and loss processes in the Earth's magnetosphere and magnetospheres of the outer planets has been a central topic of research in the space physics community. Observations from the Van Allen Probes, ARASE, MMS, Cluster, Double Star, THEMIS, NOAA POES and GOES, Lomonosov, and a number of CubeSat missions provided a vast amount of data. New planetary missions such as Juno and JUICE will provide additional information about the radiation environments of the outer planets, which will lay the foundation for quantitative comparative studies. In this session, we invite modeling and observational contributions that focus on the physics of acceleration and loss of particles in the Earth and planetary magnetospheres.

D3.5 **Role of Mesoscale Coupling as the Driver of System Level Storm and Substorm Dynamics in Geospace**

MSO/DO: Elena Grigorenko (IKI, RAS, Russia), Matina Gkioulidou (JHU APL, USA)

Organizing Committee: Ian Mann (University of Alberta, Canada)

Event Information: The onset and dynamics of substorms and storms encompass various plasma processes, evolving at different spatial and temporal scales, and in different magnetospheric regions including energy conversion and transport in the magnetotail plasma sheet and its boundary layer, as well as the processes in the inner magnetosphere. The coupling of these processes is still unclear. During last decades, the multipoint spacecraft observations in the magnetotail and in the inner magnetosphere along with the data from ground based facilities (such as magnetometers, auroral all-sky imagers, radar, etc.) have generated a unique opportunity for coordinated studies of substorm- and storm-related processes at different scales. In combination with advanced modelling and theoretical studies, these observations have improved our understanding of these highly coupled systems and begun to provide a system-wide perspective. However, many fundamental problems are still unresolved. This session seeks contributions on recent advances in the studies of substorm- and storm-related phenomena (e.g. night-side reconnection, tail flows, the dynamics of the near-Earth transition region and inner magnetosphere) and their interplay enabled by modern multi-point spacecraft observations in the magnetotail, the inner magnetosphere, on the ground and/or related modelling. New insights into the energy conversion and transport processes at different scales enabled by coordinated observations by different magnetospheric missions during geomagnetically active periods are also welcome.

D3.6 **CubeSat and Small Satellite Technology Addressing Magnetospheric Challenges**

MSO/DO: Jaejin Lee (KASI, S. Korea), Kyoung-Joo Hwang (SwRI, USA)

Organizing Committee: Alexander Chernyshov (IKI, RAS, Russia) Eftyhia Zests (NASA GSFC, USA)

Event Information: CubeSat technology has recently made huge progress and its application has been increasing in various fields from near-Earth to solar/interplanetary space. In particular, the space weather community has demanded multi-point observations that are systematically incorporated to advance our understanding of the Sun-Earth connection. Thus, the importance of low-cost CubeSats has been highlighted. This session is coordinated to promote communications among CubeSat mission scientists as well as sharing observation data from multiple CubeSat missions. In this session, we discuss a broad range of magnetospheric research using CubeSats including solar activity observation, physical phenomena occurring in interplanetary space, and plasma structuring/evolution in the Earth's magnetosphere. We invite speakers who want to talk about the CubeSat mission that is currently being planned or developed, observation data using CubeSat, and lessons learned from past/present missions.

D3.7 [Machine Learning and Data Sciences](#)

MSO/DO: Yuri Shprits (German Research Centre for Geosciences, Germany), Simon Wing (JHU, USA), Georgios Balasis (National Observatory of Athens, Greece)

Organizing Committee: TBD

Event Information: Machine learning (ML) and Data Sciences (DL) are rapidly developing fields of research that have advanced various domains of industry, such as fraud detection, image and speech recognition, chatbots, web search results, credit scoring, automation, email spam filtering, and most recently, space research.

Machine learning tools are effectively used for problems of regression and classification, including image analysis and development of empirical models as well as intelligent AI that helps understand the underlying processes. AI tools can help develop algorithms to analyze data, combine sparse data into global empirical models, help calibrate instruments, develop empirical versions of numerically expensive models etc. The discussion at this joint session D and C Commissions will be focused on the application of ML tools, data analysis and data assimilation tools to ionospheric and magnetospheric research.

D3.8 [Dayside Magnetosphere Interactions](#)

MSO/DO: Qiugang Zong (Peking University, CAS, China), Dong-Hun Lee (Kyung Hee University, S. Korea)

Organizing Committee: Hui Zhang (University of Alaska Fairbanks, USA), David Sibeck (NASA GSFC, USA), Philippe Escoubet (ESA – ESTEC, Netherlands)

Event Information: The dayside magnetosphere is the region of geospace that directly responds to solar wind forcing. Sudden changes in solar wind/interplanetary magnetic field parameters provide excellent opportunities to investigate the complex physical processes governing the magnetosphere's response to solar wind's forcing. This chapter reviews several aspects of dayside magnetosphere interactions: structure and dynamics of dayside boundaries and physics of dayside magnetospheric response to solar wind discontinuities. The aspects also include the roles of solar wind sources on wave generations and dynamic processes in the inner magnetosphere and cold plasmas of ionospheric origin and their role in coupling different regions in geospace. Although there has been significant progress in our understanding of dayside magnetospheric interactions, some outstanding questions remain: the effect of plasmaspheric plume on magnetic reconnection and the consequences for energetic particle populations in the ring current radiation belt regions.

C5.1_D4.1 [Dust Observations in Space and Laboratory Experiments](#)

E0.1 [Scientific Commission E Overview Event](#)

MSO/DO: Tomaso Belloni (INAF, Italy), TBD

Organizing Committee: Iossif Papadakis (University of Crete, Greece), Cristina Mandrini (Inst. Astronomia y Fisica del Espacio-IAFE, Argentina)

Event Information: This session is intended as a selection of talks on recent developments and highlights in the topics covered by Commission E. Both Galactic and Extragalactic Astrophysics (Sub-commission E1) and the Sun as a Star (Sub-commission E2) will be covered.

The session consists of two quarter days and will be scheduled in a way not to overlap with any of the other SC-E events. All talks will be solicited, which means that no contributions will be accepted other than by invitation.

E1.1 [Origin of Cosmic Rays](#)

MSO/DO: Eun-suk Seo (University of Maryland, USA), Igor Moskalenko (Stanford University, USA)

Organizing Committee: TBD

Event Information: In recent years, the field of astrophysics has witnessed significant discoveries related to cosmic rays (CRs), thanks to the development of new experimental techniques and technology integrated into instruments launched into space and the upper atmosphere. These instruments include PAMELA, Fermi-LAT, AMS-02, CALET, DAMPE, NUCLEON, and ISS-CREAM.

Ground-based gamma-ray telescopes, such as H.E.S.S., MAGIC, and VERITAS, along with the water Cherenkov detector HAWC, have also been able to investigate CR fluxes in distant regions. Additionally, the birth of gravitational wave astronomy (LIGO and Virgo) and the detection of the first astrophysical neutrinos by IceCube have marked significant milestones in the field. Meanwhile, older instruments like Voyager 1 and 2, built using technology from the 1970s, continue to provide unique information from interstellar space.

This event will showcase recent spectacular discoveries in multi-messenger astrophysics and new measurements of the CR species' spectra and isotopic composition. Direct measurements of gamma-ray and neutrino emissions from particle accelerators and interstellar space, as well as new findings on CRs at very high and ultra-high energies, will also be highlighted. The session encourages presentations of innovative experimental approaches and theoretical analyses that address questions related to the "Origin" of cosmic messengers. COSPAR Scientific Assemblies are open to all bona fide scientists.

E1.2 **Advanced Timing-spectral Polarimetric Analysis and Modeling of Accreting Black Holes and Neutron Stars**

MSO/DO: Mariano Mendez (University of Groningen, Netherlands), Andrzej Zdziarski (Copernicus Astronomical Center, PAS, Poland)

Organizing Committee: Barbara De Marco (Copernicus Astronomical Centre, PAS, Poland) Grégoire Marcel (University of Cambridge, UK)

Event Information: In the past five years great progress has been achieved in understanding the workings of the inner accretion flow in black-hole and neutron-star X-ray binaries. Timing-spectral analysis techniques and modelling allow us to unravel the physical and geometric properties of the corona and accretion disc in these systems, and the relation between these physical components and the jets, outflows and (disc) winds observed at radio, infrared and optical wavelengths. Based on the success of our session in Athens, here we propose to discuss these topics, aiming especially at results of the application of new analysis tools and models to fit (as much as possible) simultaneously the timing, spectral and polarimetric properties of accreting in X-ray binaries, and the correlation of these X-ray properties and the jets, outflows and winds in these systems.

E1.3 **Space-ground Scientific and Exploitation Synergies and Challenges**

MSO/DO: Alvaro Giménez (Consejo Superior de Investigaciones Científicas-CSIC, Spain), Pietro Ubertini (INAF - IAPS Rome, Italy)

Organizing Committee: TBD

Event Information: Astronomy develops with data provided by space platforms and ground-based observatories across the electromagnetic spectrum as well as high-energy particles and gravitational waves. The development of large observatories and complex space missions, requires considering the scientific benefits of their complementarity and the joint exploitation of both types of infrastructures.

The purpose of this event is to review the synergies and the need for cooperation, from the perspective of the scientific community, leading to e.g. multi-messenger astronomy. In addition, the identification of challenges to advance further, and how to mitigate potential difficulties, will be discussed. Examples of these challenges include, exchange of information, coordination of mutual support, open data access, response to alerts, time allocation, or the evaluation of proposals. The meeting will put together the view of the scientific community and the agencies developing the different facilities, both ground and space-based.

E1.4 **Spectral Mapping Surveys of the Universe**

MSO/DO: Woong-Seob Jeong (KASI, University of Science and Technology, S. Korea), Myungshin Im (Seoul National University, S. Korea)

Organizing Committee: TBD

Event Information: Recent advances in the ground-based astronomical facilities give highly confident images as well as object catalogs even with huge areal coverage. Adding the spectroscopic information provides crucial keys to understand the physical properties of objects, furthermore, the formation and evolution of galaxies, and chemical and dynamical history of objects in detail. However, since spectroscopic surveys were still performed in the limited area, wide-area spectral mapping are required in upcoming era. In this session, we will focus on the results coming from current spectral surveys, and from newly developed observations with state-of-the-art wide-area spectral mapping. In addition, we will discuss possible synergies with ground-based spectral surveys.

E1.5 **Illuminating Gravitational Waves and their Environments**

MSO/DO: Eleonora Troja (Università di Tor Vergata, Italy), Myungshin Im (Seoul National University, Korea)

Organizing Committee: Stéphane Basa (Laboratoire d'Astrophysique de Marseille, France), Chryssa Kouveliotou (George Washington University, USA), Hyung Mok Lee (Seoul National University, S. Korea), Enrico Ramirez-Ruiz (University of California Santa Cruz, USA), Takanori Sakamoto (Aoyama Gakuin University, Japan), Hendrik van Eerten (University of Bath, UK), Linqing Wen (University of Western Australia, Australia)

Event Information: The combination of gravitational waves (GWs) and electromagnetic (EM) signals enables for multidisciplinary studies encompassing key fields of modern astronomy: from the cosmic production of heavy metals to the rate of expansion of our universe and the behaviour of dense matter in extreme physical conditions. The next few years will likely see a few joint detections of GWs and EM radiation, opening new frontiers across many areas of science. This scientific event will review the promises, challenges and future perspectives of illuminating GWs with ultraviolet, optical and near-infrared observations from space and ground. We will focus on studies of kilonovae, their host galaxies, and their use as probes of cosmology and dense matter. This session will occur a year since the start of the O4 observing run and will thus represent a timely opportunity to bring together different communities and discuss the most significant results.

E1.6 **Explosive Phenomena in Transient and Multimessenger Sources and their Observational Manifestations**

MSO/DO: Lorenzo Natalucci (INAF, Italy), Marica Branchesi (Gran Sasso Science Institute, INFN, Italy)

Organizing Committee: TBD

Event Information: This scientific event aims at reviewing the progress achieved in the field of the multimessenger astrophysics with regard to reviewing the current observational status, the theoretical understanding of phenomena, and the perspectives of the high-energy astronomy in the multi-messenger context. In particular, we will focus on: (a) the most recent results from current observing facilities, including gravitational waves, neutrino and X-/gamma-rays; (b) current modelling of compact object mergers and astrophysical sources of neutrinos and cosmic rays, fast radio bursts and tidal disruption events; (c) perspectives of future space and ground instrumentation.

E1.7 **Black Hole Astrophysics: Theory and Simulations Confront Observations**

MSO/DO: Sandip Kumar Chakrabarti (Indian Centre for Space Physics, India), Philippe Laurent (CEA Saclay, France)

Organizing Committee: TBD

Event Information: We invite talks/posters on the following major topics:

- A. Black Hole Accretion (Supermassive, intermediate mass, stellar): All models of accretion which make an effort to explain observations. Numerical simulations including Monte-Carlo, finite element method, SPH, GRMHD etc. Spectral, Timing, Evolutions of mass and spin, polarizations, Quasi-Periodic Oscillations)
- B. Gravitational Wave detection and multi-messenger Astronomy (Results, statistics, extreme mass or similar mass systems, GW emission in presence of accretion disks; multi-messenger Astronomy which includes GWs)
- C. Imaging by EHT, future prospects (Imaging black holes, time variation, modeling, numerical simulations including MHD)
- D. Velocity field studies around black holes: Studies of matter/cloud/stars etc. in the vicinity of black holes
- E. Disk jet connection and observational evidence (At all wavelengths)
- F. Estimation of black hole mass/spin (All possible methods to measure black hole mass and spin for all types of astrophysical/classical black holes)
- G. Sources of Viscosity – results of numerical simulations (Models of viscosity, instability, through theory and simulations)
- H. Dynamics of Extreme mass black holes prior to merger (Studies of black holes embedded in accretion disks, evolution of stars in AGN disks, observational evidences in all wavelengths)
- I. Earliest evidence of black holes in the Universe (Theoretical and Observational evidences of earliest possible black holes; evolution of black hole masses through mergers, accretions, captures etc.)
- J. Properties of the Companion in LMXB, HMXB, IMXB

Papers on exotic or quantum black holes are not encouraged in this Session

E1.8 **Solving the Accretion/ Ejection Puzzle in AGN: Synergies and Clashes in the Central kpc**

MSO/DO: Gabriele Bruni (INAF-IAPS, Italy), Manuela Molina (INAF-IASF Milano, Italy)

Organizing Committee: TBD

Event Information: A multifaceted phenomenology of jets, winds and accretion states has been observed in Active Galactic Nuclei (AGN), suggesting a strong accretion/ejection coupling at different black-hole masses. Radiation from the accretion disk and outflows are thought to play a crucial role in the feedback invoked by galaxy evolutionary models, but our knowledge of accretion/ejection physics is still limited. A complete characterization of the AGN cores at different power levels, radio-loudness and accretion rates is key to improve our knowledge significantly. However, so far mainly samples of low-luminosity AGN have been surveyed in the radio band, while high-luminosity ones dominate the high-energy surveys in X/ hardX/ gamma-ray bands. Therefore, the discovery space on such field is yet to be filled and our understanding is still at its dawn.

E1.9 **Spectral/Timing Properties of AGN: Theory and Observations**

MSO/DO: Iossif Papadakis (University of Crete, Greece), Gulab Dewangan (IUCAA, India)

Organizing Committee: P. Arevalo (Valparaiso University, Chile), C. Bambi (Fudan University, China), E. Costantini (SRON, Netherlands), K. Ebisawa (JAXA, Japan), J. Garcia (Caltech, USA), L. Ho (KIAA, China), E. Kara (MIT, USA), S. Mathur (OSU, USA), H. Noda (Osaka University, Japan), M. Paolillo (Napoli University, Italy), M. Urry (Yale, USA), J.-H. Woo (Seoul University, S. Korea)

Event Information: AGN are the most luminous, persistent sources in the Universe. They are also among the most variable at all wavebands. Flux and spectral variations are observed on short time scales and hold significant information regarding the physical processes that operate in the immediate vicinity of their central super-massive black holes. Significant progress has been made in the last few years, both with observations from the current X-ray observatories (like XMM-Newton, NuSTAR, NICER, Swift and AstroSat) and in theoretical advancements in the study of the corona properties and the inner accretion flow. The main aim of this event is to bring together both theorists and observers, and to review the latest advances in this field, including: i) X-ray spectral/timing properties of AGN, ii) X-ray corona properties and modelling, iv) the disc/corona interplay, v) X-ray reflection and disc thermal reverberation, vi) the nature of the 'soft excess', vii) X-ray polarimetric observations of AGN, and viii) the nature of the inner accretion flow in AGN.

E1.10 Extreme Accretion Events in Super-massive Black Holes

MSO/DO: Claudio Ricci (Universidad Diego Portales, Chile), Benny Trakhtenbrot (Tel Aviv University, Israel)

Organizing Committee: Iair Arcavi (Tel Aviv University, Israel), Franz Bauer (PUC, Chile); Brad Cenko (NASA, USA), Erin Kara (MIT, USA), Andrea Merloni (MPE, Germany), Giovanni Miniutti (CAB, Spain), Elena Maria Rossi (Leiden University, Netherlands), Paula Sanchez (ESO, Germany); Nick Stone (Hebrew University, Israel), Phil Uttley (Amsterdam University, Netherlands), Dom Walton (Hertfordshire University, UK), Natalie Webb (IRAP, France)

Event Information: This scientific event will focus on transient and persistent extreme accretion episodes in supermassive black holes, with particular emphasis on the former. Several important aspects of extreme accretion will be discussed, including tidal disruption events, changing-state Active Galactic Nuclei, new types of supermassive black hole-related transients, and super-Eddington accretion in AGN. The program will combine new developments in time domain, multi-wavelength observations and in theoretical models.

E1.11 Co-evolution between High-redshift Quasars and Galaxies in the Era of JWST

MSO/DO: Kohei Inayoshi (Kavli Institute for Astronomy and Astrophysics KIAA, CAS, China), John Silverman (Kavli IPMU, University of Tokyo, Japan)

Organizing Committee: TBD

Event Information: The James Webb Space Telescope (JWST) has recently made ground-breaking discoveries that sparked a revolution in our understanding of the distant universe, the early assembly of galaxies, and the genesis of supermassive black holes (SMBHs). The discoveries not only challenge well-established theoretical frameworks on cosmic structure formation, but also offer pivotal insights that could reshape the foundation of these models. The findings by JWST, coupled with ongoing multi-wavelength efforts by such as ALMA, play an essential role in determining the initial conditions of SMBH-galaxy coevolution throughout cosmic history and shed light on how the empirical correlations seen in the nearby universe have been established.

In this session, our primary goal is to convene experts from diverse observational and theoretical backgrounds to interpret the first results from the JWST cycle1 and 2 observations. That will stimulate discussion among astronomers in the related fields, fostering the development of innovative ideas in preparation for the future JWST observations and large projects such as Euclid and Nancy Grace Roman Space telescope.

E1.12 Gamma-ray Bursts in the Next Decade

MSO/DO: Paolo D'Avanzo (INAF - Osservatorio Astronomico di Brera, Italy), Elisabetta Bissaldi (INFN and University of Trieste, Italy)

Organizing Committee: Maria Grazia Bernardini (INAF - Brera Astronomical Observatory, Italy), Francesco Longo (University of Trieste, Italy), Frederic Piron (LUPM, France), Soebur Razzaque (University of Johannesburg, S. Africa)

Event Information: GRBs are among the most fascinating phenomena in the Universe. Their prompt emission has duration measured in seconds and is produced in relativistic jets with luminosities exceeding 10^{53} erg/s. Such gamma-ray prompt phase is followed by a long-lasting afterglow, observable at all wavelengths. Recent highlights, like the association of short GRBs with GWs and the detection of GRBs at VHE, consolidated a multi-disciplinary and multi-messenger approach to GRB studies. By 2024 new GRB missions will be operating (like SVOM) and the first results of the 4th run of GW interferometers will be available. The proposed event, starting from the legacy of 2 decades of GRB observations with Swift, Fermi and the present generation of high-energy satellites, will address the following topics:

- GRB classes and progenitors
- GRB emission from VHE to radio
- GRB central engine
- GRB as multi-messengers sources
- New missions and perspectives for the next decade

E1.13 Observations and Prospects for X-ray Polarimetry

MSO/DO: Herman Marshall (MIT, USA), Wayne Baumgartner (NASA MSFC, USA)

Organizing Committee: Matthew Baring (Rice University, USA), Michal Dovciak (Astron. Inst. Czech Academy of Sciences, Czech Republic), Hua Feng (Tsinghua University, China), V Girish (ISRO, India), Alice Harding (NASA GSFC, USA), Kiyoshi Hayashida (Osaka University, Japan), Svetlana Jorstad (Boston University, USA), Phil Kaaret (University of Iowa, USA), Henric Krawczynski (Washington University, USA), Giorgio Matt (University Roma Tre, Italy), Stephen O'Dell (NASA MSFC, USA), Biswajit Paul (Raman Research Inst., India), Mark Pearce (KTH Royal Inst. of Tech., Sweden), Kasiviswanathan Sankarasubramanian (URSC, India), Paolo Soffitta (INAF-IAPS, Italy), Silvia Zane (University College London, UK), Shuang-Nan Zhang (IHEP, China)

Event Information: X-ray polarimetry can provide insights to various physical phenomena that are not otherwise possible. Observations of a few targets by INTEGRAL, PoGO+, and XL-Calibur at high energies and new results every month from IXPE have started to reshape the field of X-ray astronomy. Furthermore, there are the prospects for instruments in development such as REDSoX, eXTP, and COSI with sensitivity ranging from 0.2 keV to 5 MeV. The main topics of the event would be current and upcoming instrumentation, observational results from existing missions, scientific principles and theoretical considerations relating to X-ray polarization, and models of possible observations. Observations in other bandpasses are often relevant for modeling and are encouraged.

E1.14 Multi-wavelength Fast Variability across Mass Scales: from Neutron Stars to Super-massive Black Holes

MSO/DO: Federico Vincentelli (IAC, Spain), David Russell (New York University Abu Dhabi, UAE)

Organizing Committee: TBD

Event Information: Multi-wavelength studies, using coordinated X-ray, optical-IR and/or radio-mm ground-based and space-based facilities, have provided some of the most useful constraints on the geometry of matter near accreting black holes and neutron stars. Despite being extremely challenging to obtain, in the last 10 years we have seen a rapid increase of multi-wavelength (strictly and quasi-) simultaneous datasets which uncovered new puzzling phenomena. These include optical-infrared quasi-periodic oscillations in XRBs, wavelength-dependent reverberation lags in AGN, state-dependent radio/X-ray and optical-IR/X-ray correlations in XRBs, variable optical-IR polarization in XRBs along with millisecond optical pulsations from neutron stars. However, despite these results leading to the development of several new models to explain the jet and the accretion flow of these objects, there are still many unknowns and ambiguities in the geometry and physical processes involved.

In this session we aim to bring together from both accreting binaries and supermassive black holes to review the most recent advancements obtained with multi-wavelength time resolved campaigns. We aim to have dedicated sessions for at least 2 quarters for AGN, BH LMXBs and NS LMXBs.

E1.15 To Flow in or to Flow out, That is the Question of Black-hole X-ray Binaries

MSO/DO: Nikolaos Kylafis (University of Crete, Greece), Andrzej Zdziarski (Nicolaus Copernicus Astronomical Center, Poland)

Organizing Committee: Tomaso Belloni (INAF-Osservatorio Astronomico di Brera, Italy) Barbara De Marco (Universitat Politecnica de Catalunya, Spain) Alexandra Veledina (University of Turku, Finland)

Event Information: Contrary to common belief, the hot inner flow in black-hole X-ray binaries, which is taken as the hard X-ray producing corona, is not static. Its Bernoulli number is positive, which implies that the matter there cannot fall into the black hole. Therefore, an outflow from the hot inner flow is absolutely necessary and only when the Bernoulli number of the remaining hot inner flow becomes negative, the matter can fall in. Thus, the corona must be outflowing. What fraction of the corona goes into the outflow and what fraction goes into the black hole is the main question of this event. Through

spectral, timing, and polarization observations and modeling it is hoped that we will get insights into this fundamental question. A related question has to do with the radio emission from the outflow and how to distinguish it from that of the jet. Also, it has not been understood why most sources obey the same radio – X-ray correlation. In addition, other significant correlations have been observed among X-ray properties, but theoretical models mostly concentrate on the observed parameters and not on the correlations themselves. Our goal is to contribute to the progress in our understanding of the nature of inflows and outflows and their mutual connections.

E1.16 [High Mass X-ray Binaries: a New View on Accretion and Reprocessing](#)

MSO/DO: Biswajit Paul (Raman Research Institute, India), Sylvain Chaty (University Paris Diderot CEA Saclay, France)

Organizing Committee: Chandreyee Maitra (Max Planck Institute for extraterrestrial Physics, Germany), Tatehiro Mihara (RIKEN, Japan), Atsuo Okzaki (Hokkai-Gakuen University, Japan), John Tomsick (University of California, Berkeley, USA), Jose Miguel Torrejon (University of Alicante, Spain), Sergey Tsygankov (Tuorla Observatory, Finland)

Event Information: High Mass X-ray Binaries (HMXB) are laboratories for a whole range of astrophysical processes like accretion onto highly magnetized neutron stars, reprocessing of X-rays in stellar wind, evolution of binary systems leading to double compact binaries etc. In the recent years, crucial developments have occurred in the field, thanks to major X-ray observatories and many new systems that have been discovered, revealing for example the first Galactic ultra-luminous X-ray pulsar. In this event, recent developments in understanding the processes related to accretion onto highly magnetized neutron stars, diagnostics on the clumpy wind of the companion star using X-ray reprocessing, and also evolution of the HMXB will be discussed. The global user community of IXPE, NuSTAR, AstroSAT, NICER, eROSITA, XRISM, Swift, XMM-Newton, Chandra and INTEGRAL, that are interested in HMXBs will find this event of interest.

E1.17 [Constraining the Behaviour of Ultra-dense Matter Using Weakly Magnetised Neutron Stars](#)

MSO/DO: Wenfei Yu (Shanghai Astronomical Observatory of CAS, China), Rudy Wijnands (University of Amsterdam, Netherlands)

Organizing Committee: TBC

Event Information: The Equation of State (EoS) of neutron star (NS) matter is still not well understood. Accretion onto weakly magnetized NSs in Low-Mass X-ray Binaries can provide independent insights into this topic for the older stellar remnants in our Galaxy, both when these systems are actively accreting during outbursts and when they are in quiescence. In outbursts, constraints on NS matter can be obtained from thermonuclear explosions on the NS surfaces as well as performing a timing study of the accretion- powered pulsations detected in a subclass of systems. In quiescence, we can study how the NSs reacted to the accretion of matter (how it heats up due to accretion and cools down after the accretion has halted), allowing us to put stringent constraints on the behaviour of NS matter as well. By combining these various studies, we aim to obtain a coherent and consistent picture of the properties of NS matter. The workshop will bring together observational and theoretical experts on the different sub-fields. We will also include the information obtained from studies that focus on the outburst of very strongly magnetized NSs (magnetars) whose outbursts decay might share similarities to what is seen in the cooling of accreting NSs after the end of an accretion outburst.

E1.18 [Plasma at the Inner Dozen of Gravitational Radii: from Dissipation to Radiation in Accreting Black Hole Systems](#)

MSO/DO: Alexandra Veledina (University of Turku, Finland), Joonas Nättilä (Flatiron Institute, USA)

Organizing Committee: Benoit Cerutti (Université Grenoble Alpes, France), Barbara De Marco (UPC - Barcelona Tech, Spain), Sara Issaoun (Center for Astrophysics, Harvard Smithsonian, USA), Sasha Tchekhovskoy (Northwestern University, USA)

Event Information: Our understanding of accretion discs in black hole X-ray binaries and supermassive black holes has significantly changed in recent years thanks to the advances in spectral, fast timing and X-ray polarimetric studies, as well as

high-resolution imaging. Simultaneously, modeling of plasma processes is undergoing a computational revolution owing to the 3D magneto-hydrodynamic models and mesoscale kinetic simulations. This enables us to construct an accretion disk model from first principles. Now, when the simulations are becoming mature and have predictive power, they can be directly compared to the observed properties. The event will bring together experts in plasma physics and observations to discuss recent progress and to identify tasks for deeper interaction.

E1.19 **Cataclysmic Variables and Related Systems as Probes of Accretion, Binary Evolution and Thermo-nuclear Explosions**

MSO/DO: Solen Balman (Istanbul University, Türkiye), Jordi Jose (Universitat Politècnica de Catalunya, Spain)

Organizing Committee: Yael Hillman (Ariel University, Israel), Marina Orio (INAF, Italy, UW, USA), Matthias Schreiber (USM, Chile), Joanna Mikolajewska (CAMK, Poland), Boris Gaensicke (University of Warwick, UK), Marcos P. Diaz (IAG/USP, Brazil), Dmitry Bisikalo (RAS, Russia), Anna F. Pala (ESA-ESAC, Spain), Jeremy J. Drake (CFA/Harvard, USA), Steven N. Shore (Pisa University, Italy), Diogo Belloni (USM, Chile) Domitilla de Martino (INAF-Napoli, IT), Patrick Woudt (UCT, SA), Simone Scaringi (University Durham, UK)

Event Information: Accreting white dwarf binaries (AWBs) comprise Cataclysmic Variables (CVs), Symbiotics, AM CVns and other related systems that host a primary white dwarf (WD) accreting from a main sequence or evolved companion star. AWBs are the most common product of close binary evolution, thus important for understanding binary evolution as well as the study of X-ray binary populations in the Milky Way and the local group of galaxies. AWBs have been essential systems to study astrophysical plasmas under different conditions along with accretion physics and processes, transient events, matter ejection and outflows, compact binary evolution, mergers, angular momentum loss mechanisms, and nuclear processes leading to explosions. Thermonuclear nova outbursts are one of the most violent stellar explosions, contributing to Galactic chemical evolution and display a wide observational diversity from radio to VHE gamma-rays. AWBs are critical ingredients of single degenerate pathway to SNe Ia together with the double degenerate merger channel making them crucial for cosmological studies. AWB sciences closely relate to objects of late stages of stellar evolution, to other compact object binaries, even to young stellar objects, active galactic nuclei, quasars and supernova remnants. Exploring such connections are a matter of key research for a comprehensive understanding of common astrophysical phenomena.

Our meeting will lay out a panorama of theoretical developments and observational results on AWB sciences. Ongoing ground-based and space-borne observations and surveys, and future space and ground facilities like XRISM, EINSTEIN Probe, eXTP, Athena, THESEUS, CTA, LISA, VERA RUBIN LSST, E-ELT, SKA and others will provide a key insight for the accomplishments we made and the challenges now and ahead. We plan to have time for discussion during the sessions. Our event will focus on the following topics:

- Prospects for AWBs utilizing the new and future facilities from radio to VHE wave-lengths.
- Accretion physics; accretion disks and flow structure; wind and jet formation
- Transient events, state changes in AWBs from low states to active phases and disk outbursts
- Magnetic accretion; flaring and variability; complex absorption; reprocessing and reflection.
- AWB formation, evolution, chemical enrichment, and mergers; evolutionary connections.
- Population studies of AWBs versus WDs in the Galaxy and Local Group.
- Thermonuclear explosions on WDs; out-flows and ejection processes; chemical evolution
- Type Ia SNe progenitors; evolution of AWBs towards nova eruptions

E2.1 **Energetic and Dynamics in the Quiet Solar Atmosphere and Beyond**

MSO/DO: Zhenghua Huang (Shandong University, CAS, China:), Maria Madjarska-Theissen (Max Planck Institute for Solar System Research, Germany)

Organizing Committee: David Brooks (George Mason University, USA), Kyungsuk Cho (KASI, S. Korea), Jiansen He (Peking University, China), Elena Khomenko (Inst. de Astrofísica de Canarias, Universidad de La Laguna, Spain), Cristina Mandrini (IAFE, UBA-CONICET, Argentina), Matthias Rempel (High Altitude Observatory-HAO, USA), Hui Tian (Peking University, China), Shin Toriumi (JAXA, Japan), Marco Velli (University of California, Los Angeles-UCLA, USA)

Event Information: The processes involved in the release and transfer of energy and mass throughout the solar atmosphere sustain and drive its energetics, as well as that of its outer extension: the solar wind. The connectivity between various atmospheric heights plays a key role in low and high-energy deposition events at all scales including micro-flares and, possibly, nano- and pico-flares. Waves are also relevant to the transfer of energy throughout the quiet Sun and into the solar wind. Our perspectives on these fundamental processes have been significantly improved thanks to the unprecedented fleet of instruments that have been launched onboard space missions (e.g. Hinode, STEREO, SDO, IRIS, Parker Solar Probe, Solar Orbiter, CHASE) and installed in ground-based observatories (e.g. SST, DST, GST, NVST, DKIST) that observe both remotely and in situ our Sun and the wind it blows out. Our knowledge of these fundamental processes will surely be expanded in the coming years when new space missions (e.g. ASO-S, PUNCH, EUVST, MUSE, Aditya-L1) will be in operation and many more new instruments will be put in place in the most advanced ground-based observatories. Numerical simulations that now include all the significant physics recreate the solar atmosphere and its dynamics as realistically as never before. Our understanding of the Sun and the space it governs has also applications to processes occurring in the outer layers of stars. The focal point of this event is to review our past and new views on the processes that sustain the mass and energy transfer in the “quiet” solar atmosphere and into its extension: the solar wind. We invite theoretical and observational contributions that cover all of these aspects in the “quiet” Sun, coronal holes, and the solar wind. Furthermore, we strongly encourage contributions from stellar wind studies which will benefit both the solar and stellar communities.

E2.2 Energy and Mass Transport of Small Scales in the Low Solar Atmosphere

MSO/DO: Eun-Kyung Lim (KASI, S. Korea), Bart De Pontieu (Lockheed Martin Solar and Astrophysics Laboratory, USA)

Organizing Committee: Jongchul Chae (Seoul National University, S. Korea), Daniel Nobrega Siverio (Instituto de Astrofísica de Canarias, Spain), Brigitte Schmieder (Observatoire de Paris - Meudon, France), Takenori Joten Okamoto (National Astronomical Observatory of Japan, Japan)

Event Information: The low solar atmosphere is physically important as the interface between the convection zone where magnetic energy is generated, and the corona and solar wind where magnetic energy is released. This relatively cool layer contains partially ionized plasma and is dominated by phenomena that are associated with magnetic reconnection and the propagation and dissipation of magneto-hydrodynamic waves. The exact role of these and other mechanisms in understanding long-standing questions regarding the heating of the chromosphere and corona and the source of the solar wind remains poorly understood. Small-scale events such as jets, Ellerman bombs, UV bursts, spicules, waves in sunspots, Alfvén(ic) waves in fibrils or spicules, etc., are only a subset of the complex dynamics of the low solar atmosphere. Thanks to the superb observational facilities, such as GST, IRIS, SDO, Hinode, SST, etc., in combination with the state-of-the-art numerical simulations, our understanding of energy and mass transport in the low solar atmosphere has significantly expanded. Now we are awaiting an even more exciting new view that will be brought by DKIST and missions such as Solar Orbiter, MUSE, Solar-C/ EUVST. This COSPAR 2024 scientific event invites observational and theoretical studies related to the above mentioned small scale dynamical events in the low solar atmosphere.

E2.3 Plasma and Magnetic Field Coupling in Solar Prominences

MSO/DO: Stanislav Gunár (Astronomical Institute, Czech Academy of Sciences, Czech Republic), Brigitte Schmieder (Observatoire de Paris, LESIA, France)

Organizing Committee: Sarah E. Gibson (HAO, NCAR, USA), Judith T. Karpen (NASA GSFC, USA), Kanya Kusano (Nagoya University, Japan), Nicolas Labrosse (University of Glasgow, UK), Duncan H. Mackay (University of St Andrews, UK)

Event Information: Prominences, or filaments when observed against the solar disk, are a fascinating solar phenomenon that is intensely studied using both observations and simulations. They range from long-lived quiescent prominences to highly dynamic eruptive structures. The quiescent prominences allow us to study the intriguing interaction of the partially ionised plasmas with the magnetic field and explore the underlying magnetic structure associated with filament channels/ prominence cavities. Eruptive prominences form the bulk of the solar plasma ejected into the heliosphere by coronal mass ejections (CMEs) and are thus important contributors to space weather. We are currently at the dawn of an era of unprecedented observational capabilities provided by Solar Orbiter, DKIST, ALMA, ASPIICS/Proba-3, Aditya-L1 and many

other state-of-the-art instruments. However, to unravel the secrets of prominences, we need to bring together the experts studying all aspects of prominences.

We will focus on these topics:

- High-resolution imaging, spectroscopic and spectro-polarimetric observations.
- Diagnostics of prominence plasma conditions and radiative transfer modelling.
- MHD simulations of the magnetic field supporting, surrounding and shaping the prominence plasma.
- Relationship of prominences to coronal rain, spicules and CMEs, and the connections between solar prominences and their stellar counterparts.

E2.4 [Application of Machine Learning Techniques in Solar and Heliospheric Physics](#)

MSO/DO: Iulia Chifu (Georg-August-University of Göttingen, Germany), Ricardo Gafeira (Inst. de Astrofísica e Ciências do Espaço, Portugal)

Organizing Committee: Andres Ascensio Ramos (Instituto de Astrofísica de Canarias, Spain), Maria S. Madjarska (Max Planck Institute for Solar System Research, Germany), Anna Malanushenko (HAO, USA), Azaymi Siu Tapia (Instituto Astrofísica Andalucía-IAA, Spain), Ryun-Young Kwon (KASI, S. Korea), Damian Prezbyski (Max Planck Institute for Solar System Research, Germany)

Event Information: Machine learning (ML) techniques have started to be intensively used in different areas of solar and heliospheric physics. This event will provide an overview of the application of ML techniques to different layers and processes in the solar atmosphere and interplanetary space up to 1 AU. ML has been recently employed in the inversion of the magnetic field in the photosphere and chromosphere, magnetic field modeling, dynamic event forecasting in the solar atmosphere and at 1 AU, feature identification, and solar wind studies. We welcome contributions in ML applications to solar and heliospheric physics with a focus on the following topics:

- solar magnetism, from below the photo-sphere to 1 AU
- solar cycle prediction,
- (interplanetary) coronal mass ejection,
- solar feature identification and tracking,
- solar wind
- synergies between physics and ML models

E2.5 [Waves in the Solar Atmosphere, from the Photosphere to the Corona and Solar Wind](#)

MSO/DO: Tom van Doorselaere (KU Leuven, Belgium), Bo Li (Shandong University at Weihai, CAS, China)

Organizing Committee: Takaaki Yokoyama (Kyoto University, Japan)

Event Information: In the last couple of decades, it has become obvious that the solar atmosphere is filled by waves. They are observed in the photosphere, the corona, and travel up to reach the solar wind. They are extremely useful in determining local plasma parameters through seismology, and possibly play a role in heating the atmosphere and driving the solar wind.

This session will bring together scientists observing waves in the photosphere and corona, modellers of these phenomena, and in-situ data analysis from the solar wind. It incorporates the detection of dynamic, periodic events in Solar Orbiter and Parker Solar Probe.

E2.6 [Developments and Applications of the Solar Magnetic Field Modelling](#)

MSO/DO: Xiaoshuai Zhu (NSSC, CAS, China), Jie Zhao (Purple Mountain Observatory, CAS, China)

Organizing Committee: Iulia Chifu (University of Goettingen, Germany), Chaowei Jiang (Harbin Institute of Technology, China), Argiris Koumtzis (Max Planck Institute for Solar System Research, Germany), Thomas Neukirch (University of St Andrews, UK), Brigitte Schmieder (Observatoire de Paris, France), Yingna Su (Purple Mountain Observatory, China), P. Vemareddy (Indian Institute of Astrophysics, India), Michael Weathland (University of Sydney, Australia)

Event Information: The main approach to modelling 3D magnetic fields on the Sun is to use extrapolations from photospheric magnetograms. This, in principle, allows recovery of important magnetic structures like magnetic flux ropes, null points, quasi-separatrix layers, etc. These features are crucial in understanding phenomena observed in the solar atmosphere. The extrapolated magnetic field also serve as initial conditions with high degree of reality for data driven simulations. In recent years, the extrapolation methods have been improved dramatically (in either advanced physical models, e.g., magneto-hydrostatic extrapolation, or extra-polation with new measurements such as chromospheric magnetogram and EUV image, etc.) and their wider applications have helped us to gain more insight into the physical processes (mechanisms of eruption, coronal heating, etc.). We, therefore, propose this event with the aim to discuss: (1) new developments and improvements of the magnetic field extrapolation techniques; (2) applications of the magnetic field extrapolation to various solar activities.

E2.7 Waves and Flows in Solar Coronal Active Regions, from Heating to Coronal Seismology

MSO/DO: Leon Ofman (CUA/NASA GSFC, USA), Dong-Hun Lee (Kyung Hee University, S. Korea)

Organizing Committee: TBD

Event Information: Coronal active regions (ARs) are well known sources of solar activity, such as flares and Coronal Mass Ejections (CMEs). Recent high-resolution observations in EUV by SDO/AIA, Solar Orbiter (SolO) EUI, and other spacecraft show that the dense and hot ARs exhibit fine structure, persistent waves, and flows dynamics. Magnetohydrodynamic (MHD) waves can play an important role in the transfer of energy between the various solar atmospheric regions, such as from the chromosphere and transition region into the corona, and dissipate, producing coronal heating and evaporation flows. In addition, the observed waves provide the basis for the application of coronal seismology, where the magnetic field magnitude can be determined in AR loops. The session will focus on recent EUV observation and MHD models of the role of waves and flows in heating solar coronal ARs. Studies using satellite EUV imaging, spectroscopic data and ground-based observation, such as DKIST, are welcome. Related results of advanced numerical MHD studies of waves and flows in coronal AR, and recent developments in coronal seismology are also solicited in this session.

D2.1_E3.1 Off-the-Sun-Earth-Line (OSEL) Missions

D2.2_E3.2 Heliospheric Variability, its Solar Sources and Impacts on Solar System Objects

D2.3_E3.3 Magnetic Reconnection in the Turbulent Plasmas - From the Sun through the Heliosphere to Stars and Galaxies

D2.4_E3.4 STEREO's Journey around the Sun: An Era of Single and Multi-spacecraft Observations from 2007 to 2024

D2.5_E3.5 Impact of the Inhomogeneous Solar Corona and Solar wind on CME Evolution

B6.1_E4.1 Exoplanet Detection and Characterisation: Current Research, Future Opportunities and the Search for Life Outside the Solar System

F0.1 Joint Commission F Symposium

MSO/DO: Tom K. Hei (Columbia University Irving Medical Center, USA), TBD

Organizing Committee: Giorgio Baiocco (University of Pavia, Italy), John Kiss (University of North Carolina, USA), Petra Rettberg (DLR, Germany), Yeqing Sun (Dalian University, China)

Event Information: Life sciences in space research requires a multi-disciplinary approach to better prepare mankind for extended space exploratory missions. In this Joint Commission F symposium, representative experts from each sub-commissions ranging from F1 to F5 will be invited to share their latest findings in order to synergize and to promote collaborative studies among commission F members. Speakers in the F0.1 symposium will be by invitation only from the MSO.

F0.2 International Life Support Panel

MSO/DO: Chloe Audas (ESA, Netherlands), TBD

Organizing Committee: TBD

Event Information: Human space exploration faces a new paradigm as established government space agencies, emerging countries and private investors are preparing to push the boundaries of human presence beyond Low Earth Orbit, onwards to the Moon and with Mars as the long-term goal. But progress on advanced life support systems for transit habitations is still required to safely embark on a long-duration mission. The F0.2 event will provide a forum for an international round table discussion on the key life support challenges, worldwide initiatives, and preliminary recommendations. Panel participation of key players from the space industry, space agencies and academia is expected.

F1.1 Gravity Perception and Response in Plants and Fungi: Ground and Space Studies

MSO/DO: Chris Wolverton (Ohio Wesleyan University, USA), John Z. Kiss (University of North Carolina-Greensboro, USA)

Organizing Committee: TBD

Event Information: Understanding gravity perception, transduction, and response in plants and fungi is a fundamental, cross-cutting topic for biologists. The distinctions and interactions between statolith sedimentation and movement, mechanosensory processes, and subsequent growth responses remain unclear. Experiments under weightlessness and clinorotation and related techniques as well as studies with numerous mutants have improved the understanding of gravitropism and are likely to increase in pace and importance with the advent of more robust genome sequencing and editing technologies. The session will present the current state of the field with a focus on the function of acceleration-sensitive structures and their role in the perception and transduction of the gravity signal and ensuing responses. The role of statoliths, the cytoskeleton, ion fluxes, and related molecular events such as light perception, gene transcription and expression, and physiological responses will be considered as well as the interaction among tropisms. In addition, ground-based and spaceflight experimentation results in unicellular systems and flowering plants will be presented in this session.

F1.2 Space Microgravity Environment Utilization

MSO/DO: Jaejin Lee (KASI, S. Korea), Gi Hyuk Choi (KASI, S. Korea)

Organizing Committee: Joo-Hee Lee (KARI, S. Korea), Geun-Woo Lee (Korea Research Institute of Standards and Science, S. Korea)

Event Information: This “Space Micro-gravity Environment Utilization Session” is going to receive research papers from all areas of microgravity research results except the Space Medicines. For example, the scopes will be the research in the microgravity environment such as;

- 1) Combustion and Chemical Physics
- 2) Heat and Fluid Physics
- 3) Levitation (Electrostatic, Electromagnetic, Acoustic, Aerodynamic)
- 4) Fundamental Physics
- 5) Thermophysical Properties (Measurements Properties)
- 6) Material Science (Metals and Alloys, Ceramics, Semiconductors, Soft Matters)
- 7) Crystal Growth and Soft Matters (Protein Colloid)
- 8) Life Science and Biotechnology (Microbiology, Plants, Foods, Radiational and Gravitational Effect, Stemcell Growth, 3D Bio Printing)
- 9) Ground-based Microgravity Research and Facilities/Techniques of Microgravity Experiments, Parabolic Flights
- 10) Space Microgravity Industries
- 11) Manned Space Mission, Manned Space Policy and Strategy etc.

F2.1 Biological Effects of Space Radiation and Co-stressors

MSO/DO: Christine Hellweg (DLR - Inst. of Aerospace Medicine, Germany), Insa Sigrid Schroeder (GSI Helmholtz Centre for Heavy Ion Research, Germany)

Organizing Committee: Alexandros Georgakilas (NTUA, Greece), Sarah Baatout (SCK-CEN, Belgium), Jerry Shay (UTSW, USA), Marco Durante (GSI, Germany), Anna Fogtman (ESA EAC, Germany), Laure Sabatier (CEA, France), Sylvain Costes (NASA ARC, USA)

Event Information: Biological effects of space radiation and co-stressors: mechanisms, innovative biological models, systems biology and countermeasures.

Space radiation remains a major health risk for long-term space missions beyond Low Earth Orbit (LEO). Depending on dose, dose rate, radiation quality, affected tissue, genetic background and other factors, early, late and chronic effects might be induced after space radiation exposure. The extents of these risks and the underlying mechanisms have to be further elucidated using innovative biological models and systems biology approaches. The objective of this session is to present and discuss the current status of the multidisciplinary approach based on data from physical interaction to biological response on molecular, cellular, tissue, organ and organismal level.

The interdisciplinary session addresses researchers from the fields of biology, biotechnology, biochemistry, bioinformatics, neuroscience, chemistry, physics and medicine dealing with the effects of space relevant radiation qualities alone or in combination with other spaceflight environmental factors on cells, tissues, organs and organisms. Experiments performed in space and ground-based studies are discussed in this session.

F2.2 Enabling Human Space Exploration through Research on Risks and Countermeasures to Space Radiation Exposure

MSO/DOs: Francis Cucinotta (University of Nevada Las Vegas, USA), Livio Narici (University of Rome Tor Vergata, INFN, ASI, Italy), Giorgio Baiocco (Università di Pavia, Italy)

Organizing Committee: Sungmin Pak (University of Nevada-Las Vegas, USA)

Event Information: The general objective of this session is to discuss the results of research activities that can improve space radiation risk assessment including reducing uncertainties in risk projections. This includes the design of biological and passive and active physical countermeasures in order to reduce cancer risk and understand if non-cancer risks will occur for specific space missions. Particular attention will be given to the mechanisms underlining the dependence of biological effects on the quality of radiation. The session will discuss physical and biophysical multi-scale modeling and simulations with the aim of:

- integrating activities carried on by scientists of different disciplines (physicists, biologists, etc.),
- developing predictive models of the behavior of complex biological systems exposed to radiation,
- allowing a better understanding of the risks to health from exposure to space radiation.
- determine the need for countermeasures, and if needed develop the appropriate counter-measures and the knowledge to establish their efficacy in humans.
- Specific topics are:
- Physical interaction models and transport and track structure codes, code verification and validation with experimental data.
- Systems radiation biology involving multi- scale mechanisms, modeling and simulations (at sub-cellular, cellular, tissue and organism levels) of the biological response to radiation.
- Cognitive effects of protons and heavy ions during a space mission, and possible late neurological diseases of space radiation.
- “Omics” investigation of biological systems after radiation exposure.
- Chronic inflammation and impediments to the resolution of inflammation due to space radiation or combined space stressors.
- Development and implementation of counter-measures, in different mission scenarios.
- Advanced shielding materials and development of active shielding
- Risk assessment for cancer and circulatory disease morbidity and mortality, with emphasis on chronic exposures and non-targeted effects.

F2.3 **Space Radiations: Dosimetric Measure-ments and Related Models and Detector Development**

MSO/DO: Thomas Berger (DLR, Germany), Yukio Uchihori (National Institutes for Quantum Science and Technology, Japan)

Organizing Committee: Daniel Matthiae (DLR, Germany), Sönke Burmeister (CAU, Germany), Ramona Gaza (NASA, USA)

Event Information: The space radiation environment and the relevant radiation exposure from the various sources is one of the limiting factors for long duration human space missions. The event will present the newest radiation measurement results gathered on- board various manned space crafts as for example the International Space Station ISS. Further on it will provide information about the radiation field parameters measured in interplanetary missions as to the Moon and to Mars, being the precursor missions for future human exploration. These results shall be compared and benchmarked applying various radiation transport codes and newest results for model developments shall be discussed. Emphasize shall be further given to the development of new radiation detectors to be applied for long duration humans space missions (as to the Moon and Mars) and their ground based characterization applying various accelerator facilities and sources.

F2.4 **Genetic Epigenetic and Metabolic Changes in Spaceflight and Simulated Spaceflight**

MSO/DO: Yeqing Sun (Dalian Maritime University, CAS, China), Honglu Wu (NASA JSC, USA)

Organizing Committee: TBD

Event Information: It addresses changes at the molecular level in living organisms in response to spaceflight and simulated space- flight environment with technologies for large scale DNA, mRNA, miRNA, methylation and protein-expression measurement. Results collected from spaceflight experiments and experiments using ground-based facilities that simulate the spaceflight environment (bioreactions, charged particle radiation, hindlimb suspension model, etc.), the development of space technologies for on orbit monitoring of biological processes and analysis of biological samples, and the synergistic effect of radiation and microgravity are included and welcome.

F2.5 **Impact of Space Flight Stressors on Neural Network Functionality**

MSO/DO: Richard Britten (Eastern Virginia Medical School, USA), TBD

Organizing Committee: TBD

Event Information: This session will focus on the effects that space flight stressors (SFS) e.g., radiation, hypercapnia, microgravity and social isolation have on the functionality of the brain. The specific emphasis of this session is on how SFS impact neural networks.

The purpose of this session is to provide an overview of EEG/fMRI data from astronauts to establish the status of neural networks in response to microgravity, and then to present data from ground-based studies on how other SFS (radiation, hypercapnia and social isolation) may lead to other perturbation in neural network functionality. Studies using EEG/ fMRI/ LTP/ neurotransmitter release in humans and rodents are invited.

Participants in this session would include investigators from multiple fields, including aerospace medicine, non-invasive neuroimaging, neuroscientists and radiobiologists.

F3.1 **Chemical Complexity of Molecular Universe**

MSO/DO: Ankan Das (Institute of Astronomy Space and Earth Science, India), Cristina Puzzarini (University of Bologna, Italy)

Organizing Committee: Paola Caselli (CAS@MPE, Germany), Nigel Mason (University of Kent, UK), Victor Manuel Rivilla (Centro de Astrobiología, Spain), Bhalamurugan Sivaraman (PRL, India), Takashi Shimonishi (Niigata University, Japan)

Event Information: Our Universe is filled with a wide variety of chemical species. Somewhere it is vibrant and varied in organic inventory. Recent advancement in space-based and ground-based observational facility has resolved the understanding of the Universe at an accelerating stride. Parallely with the modern experimental facility, the theoretical investigation can now comply with the observational yields. This conference will provide a platform to revisit some new developments. In the present meeting we would like to discuss the following issues more elaborately:

- (a) Numerical simulations to study the collapse and fragmentation of star-forming regions.
- (b) Chemical evolution during the process of star formation.
- (c) Fate of molecules in some exotic environments (super-hot, super-cold, superdense, etc.).
- (d) Chemical diversity in a protoplanetary disk
- (e) Advancement in Laboratory and observational aspects to address the most relevant astrochemical issue.

F3.2 **Astrobiology and Exploration**

MSO/DO: Petra Rettberg (DLR - Inst. of Aerospace Medicine, Germany), André Antunes (Macau University of Science and Technology, China)

Organizing Committee: TBD

Event Information: Astrobiology is an interdisciplinary research area aiming at the understanding of the origin and evolution of life on Earth to enable the search for life on other planets and moons in our solar system and beyond. Different complementary approaches are necessary to identify the physical and chemical limits of life as we know it and to obtain a better understanding of habitability in general. Laboratory studies allow the in depth investigation of biological phenomena in a standardized and reproducible environment. Field studies are necessary for the analysis of natural communities adapted to their environment and the interactions and dependencies between the community members. Space experiments allow the investigations of the response of organisms and communities to the space environment and to the combined simulated planetary conditions, e.g. Mars or the icy moons. Modelling approaches can predict the habitability of extraterrestrial environments.

For this session, we invite contributions covering astrobiological research in laboratories, in planetary and space simulation facilities, by modelling, in field studies, and in space.

F3.3 **Natural and Laboratory Analogues for Astrobiology and Planetary Exploration**

MSO/DO: Maeva Millan (LATMOS, France), Keyron Hickman-Lewis (Natural History Museum, UK)

Organizing Committee: TBD

Event Information: The current and future exploration of the planetary bodies in our solar system requires prior preparation using terrestrial analogue samples and field sites, which have numerous similarities to the extraterrestrial environments that they represent such as composition, formational processes, mineralogies, etc. The study of analogues, both synthesized in the laboratory and of natural provenance, is of major importance to understand processes relevant to prebiotic chemistry, and the origin, evolution and distribution of life in the solar system. Results from analogue investigations are also crucial for the interpretation of data from current flight missions and the preparation of future missions. We welcome submissions addressing the use of laboratory and natural analogues for understanding astrobiology events throughout the history of the solar system, the preservation and detection of organic molecules and biosignatures using mission-relevant analytical approaches, as well as high-resolution and high-sensitivity techniques that will form the basis of returned sample analyses.

F3.4 **Interstellar Organic Molecules in the Age of JWST and ALMA**

MSO/DO: Robin Garrod (University of Virginia, USA), Eric Herbst (University of Virginia, USA)

Organizing Committee: Ryan Fortenberry (University of Mississippi, USA), Miwha Jin (NASA GSFC, USA), Jeong-Eun Lee (Kyung Hee University, Korea), Alexey Potapov (Friedrich Schiller University Jena Max Planck Institute for Astronomy, Germany), Victor Rivilla (CSIC, INTA, Spain), Yao-Lun Yang (RIKEN, Japan)

Event Information: Following its launch in December 2021, the James Webb Space Telescope has already shown itself to be a transformative instrument for astrochemistry, providing unparalleled interstellar infrared spectra, and being used to identify several new solid-phase interstellar molecules. Over the coming years, JWST is expected to provide a wealth of new information about the spatial distribution of ices and gas-phase molecular species, with unprecedented infrared spectral resolution and sensitivity. In combination with data from the now well-established ALMA telescope, our picture of interstellar organic chemistry - and the link between gas-phase and dust grain-surface chemistry - will be richer and clearer than ever.

In this scientific event, we will bring together observers, experimentalists, computational modelers and theorists to present the latest results in molecular astrochemical research pertinent to new JWST and ALMA results, interstellar molecular complexity, and the origins of life. We will provide a platform for young researchers, especially those from developing countries, to present their work to an international audience.

F4.1 **Advances in Life Support Technologies and Test Bed Facilities**

MSO/DO: Cyprien Verseux (ZARM, University of Bremen, Germany), Lucie Poulet (Université Clermont Auvergne, France)

Organizing Committee: Chloé Audas (ESA, Netherlands)

Event Information: Crewed endeavors as long and remote as a permanent station on the Moon, or a journey to Mars, will require environmental control and life support systems which are beyond the state of the art: the amount of supplies to be lifted off Earth, and perhaps the accumulation of waste, would otherwise be prohibitive. Physico-chemical technologies currently in use must become more robust and more efficient; biological ones must be matured; and new technologies must be developed. Systems must be tested at a scale that matches the targeted applications, for which ground facilities will be needed. To extend mission autonomy on the Moon and Mars, the integration of local resources – notably the local regolith and, in the case of Mars, atmosphere – should be investigated thoroughly. The F4.1 event will provide a forum for those who aim at addressing these needs to present and discuss their ideas and findings.

F4.2 **Influence of Spaceflight Environments on Biological Systems**

MSO/DO: Galina S. Nechitailo (Inst. of Biochemical Physics RAS, Russia), Alexey Kondyurin (Ewingar Scientific, Australia)

Organizing Committee: Tomita Yokotami Kaori (University of Tsukuba, Japan), Tatyana Borisova (National Academy of Science, Ukraine), Raúl Herranz (Centro de Investigaciones Biológicas, Spain)

Event Information: Orbiting spacecraft is a unique physical, chemical and biological environment, which affects living organisms in many different ways. Lack of gravity, temperature and chemical gradients, magnetic and electrical fields, spectral composition and intensity of light and high-energy cosmic radiation influence many important metabolic and physiological processes in animals, plants and microorganisms, as well as transfer phenomena in and around them. Success of future manned space missions depends on understanding the effects of these factors on biological organisms and developing appropriate countermeasures, aimed on improving growth, development and reproduction in microgravity. The program of the symposium will include presentations on the influence of the entire complex of physical factors associated with spaceflight on biological systems, including detailed analysis of the impact of the microgravity on the organism, as well as the effects of electric and magnetic fields. Both spacecraft and ground-based studies will be covered. The goal of this symposium is to bring together scientists interested in the above problems for a productive exchange of ideas.

F4.3 **Space Food and Nutrition**

MSO/DO: Naomi Katayama (Nagoya Women's University, Japan), Yoshiaki Kitaya (Osaka Prefecture University, Japan)

Organizing Committee: TBD

Event Information: In the near future, humankind will create a moonbase and aim for Mars. For human enabled long-term stays in space it is increasingly commonplace to consider emigration to Mars. Ensuring a food supply will be necessary.

The cultivation of farm products in space is therefore a requisite for a successful mission, and of course it will be necessary to farm products and prepare meals without abundant water. Securing meals is not enough, however; nutrition balance is also important. Humans will become able to embark on long-term stays in space only if we can prevent disease to a large degree by eating meals adapted to the circumstances. Hence, food adapted to the particular circumstances we will find and astroponics are indispensable in preparing humans for future long-duration stays in space. In addition, food processing technology needs to be further developed. For that purpose, a small, lightweight and highly accurate device is required.

F5.1 **Molecular, Cellular and Physiological Changes to Spaceflight and Ground Studies**

MSO/DO: Elizabeth Blaber (Rensselaer Polytechnic Institute, USA), TBD

Organizing Committee: TBD

Event Information: This session aims to discuss the cellular, molecular and physiological changes that occur in response to spaceflight. We will focus primarily on flight experiments that have been conducted using cell culture, animal studies, and 3D micro physiological systems/tissue chips in space, however we also invite research conducted using ground-based analogues. Included will be space and ground based physiological experiments that deal with spaceflight induced deconditioning, as well as those that show how different interventions could be used to alleviate spaceflight induced deconditioning. This session will also include studies focusing on synthetic biology and developmental biology in space and using ground-based analogues.

F5.2 **Exploring the Space Exposome and Approaches for Assessing Spaceflight- Associated Human Health Risks**

MSO/DOs: Janice Huff (NASA Langley Research Center-LRC, USA), Charles Werneth (NASA LRC, USA), Evagelia Laiakis (Georgetown University, USA)

Organizing Committee: TBD

Event Information: F5.2 Exploring the Space Expo-some and Approaches for Assessing Spaceflight-Associated Human Health Risks The space exposome is a unifying paradigm for conceptualizing spaceflight hazards in concert with lifetime environmental exposures and other individual factors. The main hazards of spaceflight are radiation, micro-gravity, isolation/confinement, sleep deprivation, closed/ hostile environments, and distance from Earth with limited access to health- care. Each is associated with physiological and performance risks that need to be characterized. These spaceflight hazards are not experienced independently; therefore, their combined impact on human health is needed to develop a comprehensive approach for risk assessment and to evaluate the requirements for risk mitigation.

This session addresses the concept of the space exposome along with innovative experimental and computational approaches for evaluating multi-stressor spaceflight risks to human health and performance. Topics include the following:

- The space exposome encompassing the main spaceflight hazards
- High-priority in-mission and late health risks
- Strategies to maximize use of ground and flight analogs to acquire data on the spaceflight hazards
- The role of multi-omics in spaceflight risk monitoring and mitigation
- Assessing individual sensitivity and personalized medicine for individualized risk assessments and mitigation
- The use of the adverse outcome pathway approach for spaceflight applications
- Computational strategies for quantifying combined risks
- Prevention and mitigation strategies
- Incorporating biologically-based risk models for spaceflight hazard assessment

G0.1 **Gravitational Effects on Physico-Chemical Processes**

MSO/DO: Jeff Porter (Universidad Politécnica de Madrid, Spain), Taishi Yano (Kanagawa University, Japan)

Organizing Committee: TBD

Event Information: This session is dedicated to research into the effects of gravity in fluid and material sciences. A wide range of basic processes and systems are of interest including: transport, mixing, multiphase flows, solidification, miscible or immiscible layers, interfacial instabilities, bubbles, drops, evaporation, boiling, combustion, particle motion and accumulation, convection, thermocapillary flows, jets, electro-capillarity, Kelvin-Helmholtz, Rayleigh-Taylor, Rayleigh-Bénard, Marangoni-Bénard, etc. A complementary concern of this session is in practical and industrial applications such as material processing, separation methods, oil recovery and cleanup, life-support and propulsion systems, and biomedical engineering. The general aim is to provide a productive and stimulating forum where scientists from universities, industry, and other research institutions can discuss exciting new results and share their experience. Results from experiments carried out on microgravity platforms such as the International Space Station, sounding rockets, drop towers, parabolic flights, etc., are welcome, as are results from numerical studies examining the effects of gravity.

G0.2 **Drop Tower Days**

MSO/DO: Marc Avila (University of Bremen, Germany), Thorben Könemann (ZARM Fab mbH, Germany)

Organizing Committee: TBD

Event Information: The Drop Tower Days session is mainly concerned with latest results of short-term microgravity experiments and displays an excellent platform to share experimental know-how. Ideas and proposals for microgravity experiments in drop towers or any further (ground-based) research platforms are also discussed. All scientific or technological subjects are treated to facilitate an interdisciplinary discourse among the participants. The Drop Tower Days session is addressed to all scientists who conduct research under conditions of weightlessness (including partial gravity) and those who operate and manage gravity-related facilities.

G0.3 **Influence of Free Space Environment on the Behavior of Materials**

MSO/DO: Alexey Kondyurin (Ewingar Scientific, Australia), Joseph Minow (NASA MSFC, USA)

Organizing Committee: Kim de Groh (NASA Glenn Research Center-GRC, USA), David Edwards (NASA, USA), Lev Novikov (Moscow State University, Russia), Yugo Kimoto (JAXA, Japan)

Event Information: The free space environment is destructive for all materials used in the construction of space systems such as satellites, space stations, spaceships, and future space bases. The destructive factors of the space environment include high vacuum, large temperature variations and gradients, high energy ionising radiation, ultraviolet radiation, meteoroids and orbital debris and atomic oxygen. These factors are significantly different from our experience on the surface of the Earth. The ability to replicate the effects of the space environment on material performance using ground based laboratory facilities is difficult. Space flight experiments that characterise the temporal response of material parameters during space exposure help to validate ground-based testing methodology. The understanding of physical-chemical processes in the construction of space materials is a key factor for our success in space exploration in the future.

The scientific event, Influence of Free Space Environment on the Behaviour of Materials, will include presentations on: The composition of the free space environment; Modelling the free space environment; the influence of the free space environment on material behaviour including physical chemical processes associated with the construction of space materials; Results of space flight materials experiments and ground-based testing capability to emulate the free space environments' influence on material behavior; New material development demonstrating a high tolerance to space environmental effects.

G0.4 **Advanced Materials and their Technologies for Space Exploration**

MSO/DO: TBD, Spiros Anastasiadis (Foundation for Research and Technology-Hellas, Greece)

Organizing Committee: TBD

Event Information: Research presentations on materials and their technologies, which may be used for solving challenges relating to extreme heat or cold, radiation, weight saving, impact and strength. Part of the symposium will be devoted to high performance polymers, like, e.g., Polyether ether ketone (PEEK), Polyimide (PI, Kapton), Ultra High

Molecular Weight Polyethylene (UHMWPE), as well as composites involving advanced polymers, reinforcements and additives, as, e.g., carbon fibers, carbon nanotubes or graphene, focusing on investigations of physical, mechanical, thermal properties and their behavior in harsh environments. Another part will be devoted to additive manufacturing technologies for space applications (e.g., fused filament fabrication and selective laser sintering). Investigations may involve advanced polymers and nanocomposites or lunar regolith simulants for building structures on the moon or other planetary bodies. Non-destructive testing innovations and self-healing materials will also be included.

G0.5 [GravityNEXT](#)

MSO/DOs: Álvaro Romero-Calvo (Georgia Institute of Technology, USA), Katharina Brinkert (Warwick University, UK), Tara Ruttley (Blue Origin, USA)

Organizing Committee: Tara Ruttley (Blue Origin, USA) Anjaly Gupta (Formerly AXIOM Space, USA)

Event Information: The space community is undergoing an accelerated transformation boosted by the commercialization of the sub-orbital environment and the ambition to make humans a multi-planetary species. Research of phenomena in reduced gravity conditions plays a central role in this process as a catalyst for space science and technology development. Therefore, access to microgravity and partial gravity platforms is essential to advance the technological maturity of the next generation of space systems.

In a move that represents a paradigm shift with respect to previous decades, private corporations are taking the lead in offering new testing platforms to a global community of space scientists and engineers. The ultimate goal is to democratize access to low-gravity and space environments and accelerate payload turnaround on a fly-test-fly basis. In order to speed up this process and make these new platforms available to the global microgravity research community, a central node is required.

The Scientific Commission G, Material and Fluid Sciences in Space Conditions, and the Committee on Industry Relations present this new COSPAR G0.5 session named GravityNEXT to promote, coordinate, and expand the industry-enabled gravity-related research community. This session will welcome papers on:

1. New suborbital, orbital, lunar, and Mars research facilities.
2. Research carried out on these new platforms.
3. Human-tended low-gravity research.

H0.1 [Commission H Highlight Talks](#)

MSO/DO: Claus Laemmerzahl (ZARM, University of Bremen, Germany), TBD

Organizing Committee: TBD

Event Information: The main purpose of this session is to give space for highlight talks which are of general interest for all commission H. This covers gravitational physics, condensed matter, space missions and space technologies, new quantum technologies, geodesy, practical applications of space, and all further interdisciplinary aspects of space research. With this event we also plan to create mutual interest.

The selection of the talks will be done in collaboration with the organizers of the events H.02 - H.06.

H0.2 [Gravitation, Dark Energy and Matter](#)

MSO/DO: Orfeu Bertolami (Universidade do Porto, Portugal)

Organizing Committee: André Guerra (Universidade do Porto, Portugal)

Event Information: This event aims to discuss some of the most challenging problems of contemporary cosmology, such as the existence and the nature of dark energy and dark matter. In fact, discovering the main properties of dark energy and dark matter is the goal of various observational programmes and of forthcoming space missions such as, for instance, Euclid mission. Another aspect of this event concerns the possibility of accounting for the observations in the framework of alternative theories of gravity somewhat more complex than General Relativity.

H0.3 Fundamental Physics in Space

MSO/DO: Paul McNamara (ESA- ESTEC, Netherlands), Ernst Maria Rasel (Leibniz Universität Hannover, Germany)

Organizing Committee: TBD

Event Information: Fundamental Physics in Space is about the exploration of the basic laws governing our universe, ranging from the microscopic domain to the largest dimensions. It covers the generally valid laws of quantum mechanics, statistics, and gravity and explores the basic interactions described today through the standard model. One main issue is to explore with better precision the fundamental laws underlying Quantum Theory and General Relativity and finally to resolve the inconsistency between these two universal theories. Furthermore, the properties of many particle systems and the laws of structure formation need to be better understood. Finally, the structure of the universe including galaxy clusters, galaxies, stars and solar systems, Neutron Stars and Black Holes, has to be investigated. Fundamental Physics in Space is about how space can help to answer these important scientific questions and whether the required technology is ready. As the development of enabling technologies improves, in both performance and mass/power, the prospect for performing fundamental physics experiments in a space environment has become a reality. The space environment offers many advantages when it comes to precision measurements, such as low gravity, long baselines, and low seismic noise, as well as interesting regions of space such as the Sun-Earth saddle point which cannot be replicated in an earth-bound laboratory. Drag-free technologies are now well established and precision measurements can be done using a variety of techniques (laser interferometry, SQUIDs, capacitive sensors, matter wave interferometers). These techniques open up a wealth of physics tests which up until now could not be probed in conventional experiments, such as tests of quantum decoherence, dedicated tests of General Relativity, or tests of alternative theories of gravitation in the weak field environment that space offers.

This symposium aims to bring together a global community working in this field, providing an overview of the activities aimed at the advancement of key technologies, as well as the ambitious space missions designed to answer these fundamental questions.

H0.4 Gravitational Waves

MSO/DO: Michele Vallisneri (JPL, USA), Michele Armano (ESA-ESTEC, Netherlands)

Organizing Committee: TBD

Event Information: Gravitational waves provide a new window to astrophysical and cosmological phenomena. The development and operation of improved and new gravitational wave observatories on ground (e.g. LIGO, Virgo, ...) and in space (e.g. LISA), currently based on laser interferometry, is crucial to the growth of our observational capacity. The new frontier of detectors sees atom interferometry, pulsar timing arrays and more technologies at play.

Gravitational Waves encode information from Black Holes and enable high precision tests of their horizons and beyond (e.g. the no-hair theorem), bring relic information from the early Universe and are conducive to the physics of Neutron Star Mergers and to the underlying Standard Model for elementary particles and interactions, all the way to the study of new gravitational theories.

This session will discuss the scientific payoff, technological implementation, and international context of space-based gravitational-wave observatories, and it will stress the unity and complementarity of the detection efforts across all frequencies with all types of instruments. The ground-based, space-based, pulsar-timing, and cosmic-microwave-background programs have a strong history of cross-fertilization in theory, data analysis and experiments, and their future success will depend crucially on continued productive collaborations.

H0.5 Advanced Methods for Geodesy, Metrology, Navigation and Fundamental Physics

MSO/DO: Roberto Peron (INAF - IAPS Rome, Italy), Jürgen Müller (Leibniz University of Hannover, Germany)

Organizing Committee: TBD

Event Information: In this Scientific Event, we discuss advanced methods applied to the precise measurement of the gravitational field on ground and in space. These include applications in gravimetry, gradiometry, reference systems realization, time standards, high-precision frequency comparisons, precise orbit determination, possible variation of fundamental 'constants', testing equivalence principle and theories of gravitation. We invite presentations to illustrate the principles and state of the art of these novel techniques, like atom interferometry, optical clocks, relativistic geodesy with clocks or chronometric levelling, quantum optics, intersatellite links, interplanetary laser ranging, planetary gravimetry. We also welcome presentations on further applications and invite contributions covering the theoretical description of these new methods, introducing novel theoretical concepts as well as new modelling schemes.

H0.6 **Cold Atoms**

MSO/DO: Sven Herrmann (ZARM, University of Bremen, Germany), TBD

Organizing Committee: TBD

This session aims to bring together the world-wide community to present and discuss the status and recent progress as well as proposals for future work in this field. Among other things, potential topics include ongoing and planned quantum gas research on space-based platforms as well as ongoing ground-based work to advance the technology readiness of cold atom instruments such as cold atom interferometers and cold atom clocks.

IR.1 **Engaging Global Space Industry Stakeholders**

MSO/DO: Mary Snitch (Lockheed Martin Space, USA), John Reed (United Launch Alliance, USA)

Organizing Committee: John Reed (United Launch Alliance, USA)

Event Information: This event will be comprised of several sessions as indicated below:

- Implications of Launch Service Market Evolution for Future Science Missions

Session will provide interactive panel engagement with focus on how science community can leverage shift in launch market to PLEO and eventually on to Moon. The session will provide overviews of Space Access Evolution and Predicted Futures. The scope is targeted to provide a nod to various possible roadmaps forward. The goal is to engage community around both the common themes in various perspectives as well as uncertainty in path ahead to set stage for a community conversation.

Topics include: Fighting the natural splitting of the science community space access (maintaining a community voice); Pushing for more combined missions (maximizing the science benefit from every launch); Collaborating to develop advanced mission designs (leverage the cislunar market advancements); Creating Whitepapers around the benefit for augmenting capabilities; Evolving the selection process to consider the benefits of augmentation options.

- Industry Perspectives on Space Weather – Exploring how Aerospace companies are impacted by, and are contributing to, space weather preparedness.

Space weather events can disrupt or disable satellites, complicate space traffic management and satellite operations, threaten the health of astronauts, impact commercial aviation routes, and interrupt activities in the Polar Regions. With critical infrastructure so vulnerable to space weather, some observers speculate that the first trillion-dollar natural disaster will be caused by a space weather event. Aerospace companies are key space weather stakeholders as both users and providers of space weather data and services. This panel will explore how aerospace companies are impacted by space weather and the emerging technologies they're developing to observe, model and predict its effects.

Proposed Panelists: This is a preliminary list of TBD panellists. The concept is to have an all-industry panel. This list will likely be updated with additional international companies.

Moderator: Nicole Duncan

Panelists from:

- Ball Aerospace: Mike Gazarik – Perspectives on industry needs, building NOAA's first operational space weather satellite
- Lockheed Martin – Perspectives on industry needs, impacts on missile defense systems and national security for arctic operations
- Northrop Grumman Space Systems – Perspectives on industry needs, impacts on missile defense systems and national security for arctic operations
- ASCWA Kent Tobiska – Models and model development for commercial air- lines and small business perspective
- Redwire – Sentinel early warning for space weather inside L1
- Planet Labs – Constellation space traffic management perspective
- Blue Origin – Space weather needs for Human Exploration
- Thales Alenia Space – TBD
- Korean Aerospace Industries (KAI) – Space weather critical needs for satellites
- Rocket Lab – Space weather perspectives from the launch industry
- Ethereal Shawn Cochran – Commercial SWx data and services and small business perspective

- Cosmic Clean-Up: Global Solutions for Orbital Debris

Orbital debris represents not only an existential threat to current and future space operations, but to the global economy and the fundamental underpinnings of modern society. This panel will explore the nature and extent of orbital debris with a focus on what needs to be done by both public and private sector actors to mitigate and ultimately reverse this looming international crisis.

- Achieving Escape Velocity from Red Tape: Space Law and Policy in the Final Frontier

Space capabilities, programs, and technologies are evolving at an increasingly rapid rate. Space law and policy has struggled to match the changes that are occurring in the space domain. This panel will explore the global challenges that space law and policy need to address and potential solutions that will ensure all of humanity can enjoy a peaceful and prosperous future in space.

- Two additional, yet to be identified topics.

LR.1 **Latest Results**

MSO: Jean-Claude Worms (COSPAR)

Event information: The Latest Results event is intended to highlight some recent, outstanding results, through a series of selected presentations by outstanding scientists, able to convey to a large audience the content and importance of these results covering various space research domains and COSPAR Scientific Commissions. The paper selection is made by the COSPAR Executive Director, the COSPAR President and the Chair of the Assembly Scientific Program committee. The event will close the first day of scientific sessions. There being no conflict with any other event, except the public lecture, the Latest Results event may be attended by all Assembly participants and by the media.

PCB.1 **Capacity Building**

MSO/DO: Carlos Gabriel (COSPAR, Germany), Mariano Mendez (University of Groningen, Netherlands)

Organizing Committee: TBD

Event Information: Capacity building is one of the most important and constant activities carried out by COSPAR over the past two decades. After the hiatus of activities during COVID-19, we started in the second half of 2022 to resume our main activities with renewed energy. This has been reflected in several courses and collaborations in different areas of space science.

In this session we will discuss the experiences and innovations introduced in recent events, as well as our vision for the future of the initiative. We invite participants of COSPAR CB courses to contribute with their particular experiences, as well as organisers or participants of other training events to present their ideas/experiences.

PCB.2 Small Satellites for Capacity Building

MSO/DO: Carlos Gabriel (COSPAR, Germany), Amal Chandran (Laboratory for Atmospheric and Space Physics-LASP / University of Colorado, USA)

Organizing Committee: Amal Chandran (LASP, USA) Marie Chantale Damas (Queensborough Community College-QCC, USA)

Event Information: The advent of the New Space or Space 2.0 era, based largely on the development and exploitation of small satellites, is opening up new possibilities for developing countries and access to previously elusive science and technology. This is a key reason, but only one of several, why small satellites are of paramount importance for capacity building in developing countries. The COSPAR Panel on Capacity Building is working on the development of a new programme specifically for this area, with different characteristics from its traditional programme on CB that has been so successful over the last two decades. Presentations about this new programme will be part of this session, but we also invite participants to share experiences and lessons learned in the design and execution of small spacecraft development projects, considering both the challenges of meeting scientific and engineering requirements, and the role of such projects in education and capacity building in diverse environments.

PE.1 Space Explorers in Schools - Empowering the Next Generation of Researchers

MSO/DO: Rosa Doran (NUCLIO - Núcleo Interactivo de Astronomia, Portugal), Gustavo Rojas (NUCLIO, Portugal)

Organizing Committee: Sandra Benitez Herrera (ESA, Spain), Marie Chantale Damas (QCC, USA) Mary Snitch (Lockheed Martin, USA)

Event Information: The Panel on Education is devoted to empowering educators to become beacons for future space explorers and entrepreneurs. The future is being designed in classrooms across the globe. Space Exploration should invade students' lives and be the trigger for new talents and the boost for students and their communities' science capital. The post-pandemic world requires educators and learners to embrace the digital transition. Artificial Intelligence, conversational agents, machine learning, augmented and virtual reality, etc. are jargons that are all around us. However, the reality of most schools on the planet is very far from this. The aim of this session is to bring together these two aspects, the role that space exploration can have in schools as an inter-multidisciplinary discipline and the improvement of the digital competence profile of educators and learners. We invite COSPAR members to bring to the stage cutting-edge research that can transform the way we deliver curriculum content while also shortcutting the road from schools to the professional space exploration world.

The aim of this event is to offer a unique experience to participants provided by re- searchers in the field of space exploration and education.

If you are a researcher or an educator with experience in the field, bring your ideas closer to educators. If you are interested in learning more, join us during this event. Our goal is to transform school education into a stage that brings space directly to the student-centred exploration experience.

Another important aspect of this session will be the introduction of key aspects of an innovative methodology to facilitate learning. Students should be at the centre of their learning and educators have to facilitate their journey in an inclusive, equitable and accessible manner. Tips and tricks on how to transform classrooms that are diverse and avoid stereotyping will be central to the training.

In a nutshell, this week can be summarised as: An inclusive, interdisciplinary and innovative way to deliver curriculum content while enjoying adventures in space.

PE.2 Current Trends, Initiatives and Research In Education And Outreach For Space Sciences

MSO/DO: Gustavo Rojas (NUCLIO, Portugal), Rosa Doran (NUCLIO, Portugal)

Organizing Committee: Sandra Benitez Herrera (ESA, Spain), Marie Chantale Damas (QCC, USA), Mary Snitch (Lockheed Martin, USA)

Event Information: This session intends to be an open forum for discussions and exchange of best practices in the area of Space Education in Schools and Universities. It is also a session devoted to discussing Space Exploration Outreach Activities and how COSPAR can gain more visibility among the public in general. Participants are invited to share their ideas, suggest new trends to introduce space exploration at an early stage in schools or integrate it as part of graduate studies and how to bring awareness to the public in general about the importance of Space Exploration in our lives.

Scientists, educators and outreach experts are invited to present ideas in the following areas:

- Current trends for education and outreach in space science
- Citizen space sciences
- Space literacy
- Use of small and nanosatellites
- Use of Big Data in the classroom and for outreach
- Effective open access for schools
- User-friendly software for education Space Sciences in the Curricula Space in our modern life

We call for research studies and experiences from educators and researchers in the above- mentioned fields.

PEDAS.1 **A Sustainable Space Exploration: from the Mitigation of Space Debris in Earth's Orbit to the Safeguard of Planetary Environments**

MSO/DO: Carolin Frueh (Purdue University, USA), Carmen Pardini (ISTI-CNR, Italy)

Organizing Committee: TBD

Event Information: The ongoing intensification of space activities, both around the Earth and beyond, should not disregard the potential detrimental impacts that space missions could have on the environment. It is indeed our responsibility to ensure the sustainability and usability of space for future generations. With this in mind, the revisited COSPAR Panel on "Potentially Environmentally Detrimental Activities in Space" will aim to address several aspects sharing the common goal of assessing and mitigating the potential adverse impacts of human activities on space and planetary environments.

The main issues that will be addressed and discussed include:

- Orbital debris: Observations and measurements; Environmental models and databases; Modelling and risk analysis; Mitigation and remediation; Sustainable space activities; National and international standards and guidelines; Mega-constellation impact on astronomy.
- Environmental impact of space activities: Pollution of the Earth's atmosphere by rocket launches and re-entries; Cis-lunar space; Lunar and Martian environment.

Selected papers will be automatically recommended for publication in *Advances in Space Research*.

PEX.1 **Integrating Environmental Ethics into Planetary Exploration and Use**

MSO/DO: Heather Smith (KIPR/ NASA ARC, USA), Chris McKay (NASA ARC, USA)

Organizing Committee: TBD

Event Information: The intersection between environmental ethics and planetary exploration has come to be known as "Planetary Protection". Planetary protection originated as a policy centered on protecting the scientific search for life beyond Earth, and the possibility of harm to Earth's biosphere. The legal basis for this program is two-fold. Spacefaring nations (e.g., US, ESA, JAXA) may have their own laws that cover the need for planetary protection practices – and for most nations that are signatories, Article IX of the Outer Space Treaty includes the statement that "States Parties to the Treaty shall pursue studies of outer space... and conduct exploration of them so as to avoid their harmful contamination..." With increased interest in planetary exploration and resource use, plans for human exploration of Mars and The Moon, and the growing private sector involvement, it is time to reopen the question of what constitutes harmful contamination.

This session focuses on how environmental ethics as developed on Earth can be applied to planetary exploration and use. Topics include, but are not limited to: sustainability, precautionary principles, reversibility, landscape preservation, and multi-use principles. We welcome papers from the international science community and those planning commercial activities and resource utilization on other worlds.

PEX.2 **International and Multiple Stakeholders Cooperation in the Sustainable Exploration and Utilisation of the Moon, Near Earth Asteroids, Mars, and Other Celestial Bodies**

MSO/DO: André Galli (University of Bern, Switzerland), Bernard H. Foing (Leiden Observatory, Netherlands)

Organizing Committee: TBD

Event Information: In the present climate of exploration and potential scientific and commercial exploitation of space and celestial bodies ranging from the Moon and Mars through asteroids and comets, all space actors have to consider environmental stewardship and international cooperation as essential for 'planetary sustainability'. Accepting that future exploitation of celestial bodies can provide an essential ingredient in the survival of the human species, and that outer space is not limitless with respect to the investments required, now is the time to address the conditions under which those investments will best be made, as well as the mechanisms required to avoid negative, and potentially irreversible, changes resulting from human activities. This future calls for international and multiple stakeholders discussion of the benefits of space exploration. These discussions will also form the basis to evaluate future investments and their collateral economic aspects, coupled to legal considerations of what measures can and should be undertaken to assure sustainable use of space resources and stewardship of celestial bodies.

We welcome contributions addressing any aspect of these topics, including viewpoints from space scientists, commercially-oriented contributors, legal experts, policy makers, and from all Research branches covered by COSPAR Committees and Panels incl. social sciences and the humanities.

PIR.1 **Near-term Exploration of the Interstellar Medium: Progress and Status**

MSO/DO: Pontus Brandt (JHU APL, USA), Ralph McNutt (JHU APL, USA)

Organizing Committee: Michel Blanc (Institut de Recherche en Astrophysique et Planétologie, France), Kostas Dialynas (Academy of Athens, Greece), Dimitra Koutroumpa (LATMOS, France), Vlad Izmodenov (IKI, RAS, Russia), Ralph McNutt (JHU APL, USA) Justyna Sokol (SwRI, USA), Linda Spilker (Caltech, USA), Chi Wang (NSSC, China) Robert Wimmer-Schweingruber (University of Kiel, Germany)

Event Information: During its 4.6-billion- year journey our Sun and its protective magnetic bubble – The Heliosphere – have encountered dramatically different interstellar environments ranging from dense hydrogen clouds to tenuous plasma regions ultimately shaping the environment within our Solar System. The Sun is now entering the un-charted territory of the neighboring G-Cloud that will continue to shape the evolution of our habitable astrosphere. The global heliosphere and its interaction with the Very Local Interstellar Medium (VLISM) therefore represent one of the least explored and most rewarding frontiers in space physics today.

The remarkable discoveries made by Voyager 1 and 2 in interstellar space have unveiled an entirely new regime of space physics with fundamental properties such as ionization levels, plasma and neutral gas characteristics, magnetic fields, composition, dust, cosmic rays, and inhomogeneities still eluding our knowledge. With the Voyager power supplies dwindling, the rapid pace of exoplanet discoveries, and the evolution in our own understanding brought about results from the Voyager, Cassini, New Horizons, the Interstellar Boundary Explorer (IBEX) and soon the Interstellar Mapping and Acceleration Probe (IMAP), the time is right for planning the next phase of robotic space exploration to understand our place in the galaxy.

This Scientific Event brings together recent discoveries in this emerging field with a view to the next actionable steps in our exploration of our galactic neighborhood. The Event is therefore divided into (1) science of the heliosphere, the VLISM, and its connection to the galactic environment, (2) measurements and instrumentation for making both remote and in situ observations to support that science, (3) corresponding mission and space-craft concepts using near-term technology to reach at least several hundred astronomical units (au) from the Sun, and potentially to 1000 au in appropriate mission extensions, and (4) implications for and consequences of longed-lived missions to support these scientific goals.

POIS.1 **Quantum Computing**

MSO/DO: Eric H. Smith (Lockheed Martin Advanced Technology Lab, USA), TBD

Organizing Committee: TBD

Event Information: This event will explore the state-of-the-art in quantum computing (QC) as it exists today, with detailed treatment of modern QC architectures that hold promise for massive scaling of logical q-bits in the future. We will discuss specific applications of modern QC to problems of interest to space research, and will close the event with a vision of QC in 2035; what is the anticipated growth in logical q-bits in that 10-year timeframe, and what are the research problems that will be within reach of QC at that time.

POIS.2 Machine Learning for Space Weather and Atmospheric Science

MSO/DO: George A. Danos (Cyprus Space Exploration Organisation (CSEO), Cyprus), TBD

Organizing Committee: TBD

Event Information: We will be providing an update on the progress made by the Panel on Innovative Solutions (PoIS) in the application of modern Machine Learning (ML) techniques to predictive modeling and computational analysis of currently available Space Weather (SWx) datasets. We will explore the current state of SWx data and discuss the potential advancements that can be achieved by incorporating new space-borne and ground measurements. Additionally, we will address our plans to extend ML techniques from Earth to the Martian upper atmosphere, with the ultimate objective of gaining insights into the influence of SWx on Martian evolution and understand its implications for our own planet. During the session, we encourage an open discussion with experts from the fields of SWx and ML. Our objective is to gather valuable scientific input to shape our future endeavors. Together, we will explore innovative approaches and ideas that can guide us forward in this exciting and crucial area of research.

POIS.3 Machine Learning for Analysis of Biological Sample

MSO/DO: Chris Wolverton (Ohio Wesleyan University, USA), TBD

Organizing Committee: TBD

Event Information: All known life evolved on Earth under the constant influence of 1 g, protected from most harmful radiation. As humanity endeavors to move off Earth for sustained periods of time, it is essential that the potential risks are mitigated as much as feasible, but many open questions remain in fundamental space life science research about how organisms respond in the space environment. The need to extract as much as possible from previous spaceflight experiments and datasets, as well as the need to perform new and carefully designed and controlled experiments, represent potential areas for the application of machine learning (ML), artificial intelligence (AI), and modeling to solve complex problems and make predictions. This session will focus on the application of these and other cutting-edge technologies for the advancement of fundamental space life sciences knowledge and ultimately enable human exploration of space.

PPP.1 Planetary Protection Policy

MSO/DO: Athena Coustenis (Paris Observatory, France), Niklas Hedman (United Nations Office for Outer Space Affairs-UNOOSA, Austria)

Organizing Committee: TBD

Event Information: This session will include reports on recent COSPAR Panel on Planetary Protection (PPP) activities, planetary protection studies by scientists and agencies, and colloquia/workshops with relevance to planetary protection and in general and the COSPAR Policy and implementation guidelines. We will present and discuss the overall Policy perspective, as well as recent adaptations and updates of the Policy proposed by the PPP and validated by the COSPAR Bureau, as based on documented research and recent findings.

PPP.2 Planetary Protection Mission Implementation and Status

MSO/DO: Silvio Sinibaldi (ESA-ESTEC, Netherlands), Frank Groen (NASA Headquarters, USA)

Organizing Committee: TBD

Event Information: This session covers reports on the planetary protection implementation and status of launched, ongoing and planned missions. Focus will be placed on techniques, measures and procedures applied to spacecrafts, payloads and ground facilities to implement forward and backward planetary protection. The session will also include discussions on lessons learnt from implementing planetary protection throughout mission and industrial organisations.

PPP.3 Planetary Protection Research and Development

MSO/DO: Peter Doran (Louisiana State University, USA), Karen Olsson-Francis (The Open University, UK)

Organizing Committee: Peter Doran (Louisiana State University, USA) Karen Olsson-Francis (Open University, UK)

Event Information: This session will report on planetary protection research and development activities of all kinds, particularly those involving challenging scientific endeavors, such as life detection and contamination testing. We encourage presentation of research on new approaches in planetary protection as they apply to both robotic and human missions.

PRBEM.1 Standards and Tools for Radiation Measurements and Supporting Data

MSO/DO: Paul O'Brien (The Aerospace Corporation, USA), Daniel Heynderickx (DH Consultancy, Belgium)

Organizing Committee: TBD

Event Information: PRBEM has long maintained a standard for flux data files developed to facilitate development of auto-mated tools for analysis and processing of data files. This session will address changes and expansions to the PRBEM standards as well as tools that support analysis and processing. The session will include tutorials on formal and informal established standards as well extensive discussion periods to identify needed improvements to these standards. Tutorials will include file storage formats, data and metadata models, as well as the IRBEM and SpacePy software libraries.

PRBEM.2 Radiation Environment across the Solar System: Observations, Measurements, and Models for Current and Future Space Missions

MSO/DOs: Yoshizumi Miyoshi (Nagoya University, Japan), Junga Hwang (KASI, S. Korea), Wousik Kim (NASA JPL, Caltech, USA)

Organizing Committee: TBD

Event Information: Radiation is a ubiquitous phenomenon in the realm of space. Discerning the nature of this space-borne radiation is an arduous scientific endeavor, while developing technology and engineering methods to safeguard spacecraft from the deleterious effects of radiation constitutes a critical aspect of the same. Many countries are currently in the process of devising plans for the return of humans to the Moon, as well as charting a course for a future manned mission to Mars. In all these undertakings, the study of space radiation plays an integral role in terms of both scientific inquiry and technological advancement. This session solicits the submission of papers and presentations that are relevant to the furthering of our comprehension of the space radiation environment in Geospace, Moon, Mars and the heliosphere.

PRBEM.3 Development and Validation of Numerical and Empirical Radiation Belts Models

MSO/DO: Antoine Brunet (ONERA, France), Leonid Olifer (University of Alberta, Canada)

Organizing Committee: Solène Lejosne (UC Berkeley, USA), Wen Li (Boston University, USA), Shinji Saito (NICT, Japan), Dedong Wang (GFZ, Germany)

Event Information: Energetic electrons and protons trapped in the Van Allen radiation belts are a major threat to the safe and continuous operation of spacecraft near Earth. The design of the space-based infrastructure capable of withstanding

this threat relies heavily on the accurate modeling of the radiation belt environment, and of the various physical processes driving its dynamics. This session focuses on innovative radiation belt modeling methods, model updates and results, and model validation. In particular, we invite contributions focused on global radiation belt models, long-term simulations using physics-based, statistical, data-assimilative, and machine learning models. We also encourage submissions about model validation and intercomparison, in particular in the case of extreme magnetic storm events.

PSB.1 **Scientific Ballooning: Recent Developments in Technology and Instrumentation**

MSO/DO: Hideyuki Fuke (ISAS/JAXA, Japan), Vincent Dubourg (CNES, France)

Organizing Committee: Mark Pearce (KTH Royal Institute of Technology, Sweden), Tetsuya Yoshida (JAXA, Japan)

Event Information: Balloons are used in scientific research in the fields of astrophysics, solar and space physics, planetary and earth sciences and atmospheric science. They are designed and operated for a wide variety of mission types. They drift in the troposphere, in the lowermost or medium stratosphere for a duration ranging from hours to months.

A research mission can be accomplished in a single or multiple coordinated balloon flights. As an example, a mission can be designed to test innovative space borne instruments or to complement space-borne systems, and to calibrate and validate satellite instrument by in-situ measurements in the atmospheric science field.

It can also be designed as a self-standing experiment, taking benefit of the unique capabilities of the balloon flight profiles. The balloon borne experiments benefit from new technologies in the area of instrumentation, in particular on the aspects of miniaturization, as well as from the advances in the balloon system design. A dialog between scientists and balloon system designers is very helpful. One of the main goals of this panel is to help advance this dialog.

The panel is organized according to the following topics:

1. Presentation of national programs.
2. Mission concepts (earth and planetary).
3. Scientific Instruments.
4. Balloon system design, analysis and performance.
5. Gondola design and service systems.
6. Meteorological balloons for professional Atmospheric science and Astrophysics.
7. Public outreach and education of new generation of scientists.

Discussions focusing on low-cost small-sized balloons are transferred to a new Event of PSB.2.

PSB.2 **Low-Cost Balloon Flights as a Learning Tool**

MSO/DO: Sandip Kumar Chakrabarti (Indian Centre for Space Physics, India), TBD

Organizing Committee: TBD

Event Information: With the miniaturization of instruments, it has become possible to do considerable amount of science using low-cost balloons (LCBs) of less than 10 kilogram category. These balloons would be about 5000 cum in volume, with payloads less than 10 kilogram. They could be used to test prototypes and due to low-cost, these could be repeated more often. This session seeks papers from all the Amateur and Professionals who have carried out scientific studies, using low cost stratospheric balloons.

The event will give priority to these following topics:

- A. Study of atmospheric parameters using LCBs
- B. Study of Ozones using LCBs
- C. Doing high energy Astrophysics using LCBs (X-ray studies of Solar flares, pulsars, black holes, neutron stars etc.)
- D. Microgravity experiments using LCBs
- E. Biological experiments using LCBs (exposure of cosmic radiations to seeds etc.)
- F. Testing nanosats/CubeSats using LCBs
- G. Technological challenges in making LCBs (plastic or rubber)

PSD.1 Satellite Dynamics: New Developments and Challenges for Earth and Solar System Sciences

MSO/DO: Heike Peter (PosiTim UG (haftungsbeschränkt), Germany), Francesco Topputo (Politecnico di Milano, Italy)

Organizing Committee: Adrian Jäggi (Astronomical Institute University of Bern, Switzerland), Shuanggen Jin (Shanghai Astronomical Observatory, China), Urs Hugentobler (Technische Universität München, Germany)

Event Information: The aim of the Panel on Satellite Dynamics is to support activities related to the detailed description of the motion of artificial celestial bodies. This goal should be achieved by improving the current theories of motion and by evaluating their determining forces in a more sophisticated way. Detailed theoretical understanding of the dynamics of satellites should coincide with the results of precise tracking in order to obtain the most precise knowledge possible of the orbit and the corresponding orbital positions. The scope of the Panel on Satellite Dynamics entails the positioning of a wide range of objects in space, including Earth orbiting satellites for Earth observation such as GRACE-FO, Swarm, Jason series, the Copernicus Sentinels, the future GENESIS mission and navigation satellite systems such as GPS, GLONASS, Galileo, Beidou, QZSS or tracking systems such as SLR and DORIS. In addition, positioning plays an important role in the success of the continuously growing number of today's and tomorrow's missions to explore the Solar System. Recent and future missions have to deal with complex trajectories and innovative propulsion and braking techniques to visit multiple bodies (e.g., Cassini, Dawn, JUICE), small unconventional bodies (e.g., Hera, OSIRIS-REx, Lucy), and harsh and unknown environmental conditions challenging our technical capabilities (e.g., Messenger, Venus Express, BepiColombo, JUNO). Both advances in the modeling of spacecraft dynamics and the theoretical understanding of space observables (e.g., range, Doppler, VLBI, optical) are required to allow for a more efficient exploration and a deeper understanding of our Solar System. Limiting errors in Precise Orbit Determination (solar radiation pressure, time variable gravity fields, phase center corrections, attitude variations, etc...) are of critical interest for many stakeholders. Moreover, formations of satellites are being realized and proposed for Earth observation and fundamental sciences, that impose very severe constraints on (relative) positioning and orbit and attitude control solutions (e.g. micro-propulsion).

Satellite orbit determination requires the availability of tracking systems, well established reference frames and accurate station coordinate solutions, detailed force and satellite models, and high-precision time and frequency standards.

Contributions covering all recent developments and plans in ground, satellite or probe positioning and navigation are solicited as well as contributions on current progress on establishment, maintenance and improvement of reference systems in Geo- and planetary sciences.

PSD.2 Precision Orbit and Attitude Determination of Small Satellites, CubeSats, and Constellation and their Scientific Applications

MSO/DO: Shin-Chan Han (University of Newcastle, Australia), Adrian Jäggi (Astronomical Institute, University of Bern, Switzerland)

Organizing Committee: TBD

Event Information: The recent paradigm shift in space technology toward miniaturized sensors, smaller spacecraft, and more affordable launches is opening an unprecedented level of accessibility to data collection from space-based platforms. The technology sector has realized the concept of operating numerous small satellites with different payloads for spatially and temporally dense in situ data collection and for operational purposes. Information from these platforms is becoming increasingly reliable and relevant not only to the scientific community but also to the public.

Integrity of these space-borne measurements, however, is not warranted without knowledge on geolocation and orientation of satellite platforms.

With the size of satellites decreasing, maintaining stability of small platforms becomes more challenging and, thus, knowing precise orbit and attitude becomes more important.

This session welcomes presentations discussing technical advances in precision orbit and attitude determination, particularly for small or nano satellites, as well as scientific results from the small satellites.

PSSH.1 The Challenges of Space Activities from the Perspective of Human and Social Sciences

MSO/DOS: Isabelle Sourbès-Verger (CNRS, France), Jean-Claude Worms (COSPAR Executive Director, France), Niklas Hedman (UNOOSA, Austria)

Organizing Committee: Ram Jakhu (Institute of Air and Space Law Mc Gill University, Canada), Susmita Mohanty (Spaceport SARABHAI, India), Kazuto Suzuki (Inst. of Geoeconomics, Japan), Tidiane Ouattara (African Union, Ethiopia)

Event Information: The way space is being occupied and the logic behind it are changing very rapidly. The multiplication of small satellites, the reduction of launch costs and the emergence of new actors are the main characteristics, with, in parallel, private investments that are gaining in importance, particularly in the United States. The implications are multiple and deserve a particular analysis by crossing the disciplinary approaches, as intended by the founding approach of PSSH. If space research is increasing by taking advantage of this trend, the main change is the vision of space as an infrastructure of services to complete the terrestrial systems. The data then are becoming essential, creating new ambitions for outer space uses.

In addition to these traditional activities, new applications are being developed in the field of human exploration, with a focus on the Moon and an interest in space tourism. If the global economic model remains uncertain, the needs generated by activities such as IOS and ISRU should lead to the emergence of a space ecosystem with its economic and political imperatives.

In this context, there is a growing interest in space but also new doubts about the legitimacy of these practices, their sustainable nature, the governance principles to be promoted... The objective of Busan is to bring together researchers from different back- grounds by crossing themes and disciplinary approaches in order to feed the reflections of decision-makers but also to inform public opinion on these crucial issues for all the citizens of Planet Earth.

PSW.1 **Parameterising Performance Assessment within the Space Weather Domain: Validation and Verification at Different Stages in the R2O2R Process**

MSO/DO: Alexi Glover (ESA, Germany), Maria Kuznetsova (NASA GSFC /Heliophysics Science Division, USA)

Organizing Committee: Suzy Bingham (Met Office, UK), Mark Dierckxsens (BIRA- IASB, Belgium), Mamoru Ishii (NICT, Japan), Young-Sil Kwak (KASI, S. Korea), Marcin Latocha (Seibersdorf, Austria), Stefaan Poedts (KU Leuven, Belgium), Yihua Zheng (NASA, USA)

Event Information: In developing and providing space weather services, clear understanding of the expected performance of those services, including their constituent components is essential.

Validation and verification of space weather capabilities is being addressed by numerous international activities, but as yet a community-wide consensus on how to address this at different stages of the R2O2R process, for the wide range of space weather capabilities required has not been reached.

This event encourages dialogue between modellers, application developers and service providers in order to review current performance assessment activities and available tools, to build upon successes, to identify challenges, and to further develop community strategy, supported by actions, for continuous assessment of space weather predictive capabilities as highlighted in the COSPAR Space Weather Roadmap. Presentations from International Space Weather Action Teams focusing on capability assessments are encouraged as are all presentations addressing both coordinated validation frameworks and individual case studies.

This event will also include a discussion panel focussing on tools and techniques to characterise progress towards operational readiness and on enabling feedback from operations to the research domain

PSW.2 **Space Weather at Planetary Bodies in the Solar System**

MSO/DO: Zhonghua Yao (Inst. of Geology and Geophysics, CAS, China), Insoo Jun (NASA JPL, USA)

Organizing Committee: Hermann Opgenoorth (Umeå University, Sweden)

Event Information: Significant perturbations of particle fluxes and electromagnetic fields throughout the solar system are known as space weather effects. Being able to predict the propagation of such effects and their impacts on various planetary environments, and to design missions around the study of these effects, is crucial for successful planetary explorations. We invite descriptions of space weather effect measurements in interplanetary space or planetary environments, as well as models, comparisons, and methods that aid in understanding the fundamental plasma processes and improving predictions. Moreover, we welcome the presentations that explore how the space weather environment at solar system

bodies affects the design criteria for instruments and missions in exploratory programs. In addition, we also encourage presentations that examine the topic of planetary space weather in light of the recent COSPAR space weather roadmap.

PSW.3 [Preparation for a New Ionospheric Space Weather Scale for Trans-ionospheric Radio-wave Propagation](#)

MSO/DO: Norbert Jakowski (DLR, Germany), Tim Fuller-Rowell (University of Colorado, USA)

Organizing Committee: TBD

Event Information: Main goal is to pave the way for defining a new NOAA Ionospheric Space Weather Scale to augment the current geomagnetic storms (G), solar radiation storms (S), and radio blackouts (R) Scales. The recommendation for a new “T” scale will target applications and systems that are impacted by disturbances in trans-ionospheric radio wave propagation, such as satellite communication, remote sensing radars, and global Navigation Satellite Systems (GNSS) navigation, positioning, and timing. To reach this goal, broad international discussion and collaboration is required organized by the ISWAT G2B-04 activity initiated by COSPAR. In addition, the Coordinated Ionospheric Study on Scales and Indices (CISSI) established via ISWAT G2B-04 will provide an excellent data base for comparative studies and related conclusions on indices and their application potential. The session will include contributions related to how to combine ground and space-based data sources to maximize data coverage used to drive the new scale, establishing the relationship between the various indices, validation, suggestions for defining the thresholds levels for the scale and occurrence rates, and exploring the inclusion of probabilities. Papers are also encouraged exploring and identifying user needs, and how a new scale would target different user applications.

PSW.4 [Information Architecture and Innovative Solutions in Space Weather. Inter-facing and Coordination between Different Efforts on Standardization](#)

MSO/DOs: Arnaud Masson (Telespazio UK for ESA, ESAC, Spain), Vladimir Kalegaev (Skobeltsyn Institute of Nuclear Physics-SINP, Russia), Shing Fung (NASA GSFC, USA)

Organizing Committee: Brian Thomas (NASA GSFC, USA), Jan Reerink (ESA-ESAC, Netherlands)

Event Information: Over the past 10 years, a paradigm shift has happened in the world of science and information technology. Open science is becoming a driver for the development of heliophysics information architecture, as implied by the recent recommendation on Open Science approved by UNESCO in November 2021. In parallel, artificial intelligence (AI) and machine learning (ML) technologies are already part of our daily life, profoundly impacting our societies. This reality is far different from when the 2015-2025 COSPAR/International Living With a Star (ILWS) Space weather roadmap was laid down by Schrijver et al. (2015).

Hence, when the COSPAR International space weather Action Teams (ISWAT) initiated community-wide efforts, back in 2018 (with an inaugural meeting in February 2020), to update and develop a new Living space weather roadmap, four ISWAT overarching activities were eventually established: assessment, information architecture and data utilization, innovative solutions and education/outreach. These topics are indeed transversal activities across all subfields of space weather research, focusing on either the variability of different heliophysics domains or physical phenomena and their specific space weather impacts.

Here, we invite contributions related to the information architecture, innovative solutions, open science infrastructures, modelling activities and standardisation efforts.

PSW.5 [Community-Driven COSPAR Space Weather Roadmap](#)

MSO/DO: Maria Kuznetsova (NASA GSFC, USA), Mario M. Bisi (Rutherford Appleton Laboratory, UK)

Organizing Committee: TBD

Event Information: This session will present the high-level summary of the community-driven COSPAR Space-Weather Roadmap highlighting key areas of impact, collaboration, opportunities, and collaborative-working, both within COSPAR, and more globally. The session is envisaged to have a number of key speakers that contributed to the making of the

updated roadmap as well as key speakers from other international/global entities such as WMO and ISES. In addition, ideas/thoughts on how aspects of the updated roadmap can be achieved will be expected in the session as well as there being a panel/QA component of the session.

PSW.6 **Improving Predictive Capabilities of Radiation Environment in Support of Human Exploration and Robotic Missions**

MSO/DO: Kathryn Whitman (University of Houston, USA), Insoo Jun (NASA JPL, USA)

Organizing Committee: TBD

Event Information: In this session we aim to discuss the wide array of topics related to improving our predictive capabilities of the radiation environment that affects humans and hardware in space. As we prepare to expand our human presence to the Moon and Mars and the spacecraft systems supporting those missions become more complex and sensitive, space weather prediction and forecasting for the lunar and Martian environments becomes increasingly critical. We recognize that improvements in prediction of the space radiation environment will require a multi-pronged approach, so we encourage solutions-based discussion from many viewpoints:

- Energetic particles that make up the space radiation environment are related to a wide array of physical phenomena extending from the solar surface through the inner heliosphere and out to the heliopause. What are the unknowns that need to be addressed through fundamental science to increase our predictive capabilities? What new measurements and experiments are required to address these fundamental science needs?
- What is required to improve our prediction models, including the improvement of existing techniques and the use of new ones, advancements in computational infrastructure, and the curation of historical data sets for benchmarking and the development of new models?
- Which data streams must be supported operationally or provided in real-time to enable effective space weather forecasting for the phenomena relevant to changes in the radiation environment?
- What new space weather infrastructure and services could be implemented for effective prediction of the lunar and Martian environments?

In addition to papers/presentations that respond to the questions posted above, comments on the highest priority or most impactful actions that can lead to large advancements in the short term are also welcome.

PSW.7 **International Space Weather Cooperation**

MSO/DO: Ki-Chang Yoon (Korean Space Weather Center, Korea), Mamoru Ishii (NICT, Japan)

Organizing Committee: Luca Spogli (INGV, Italy), Joaquim Costa (INPE, Brazil), Pornchai Supnithi (KMUTL, Thailand)

Event Information: International co-operation is critical in various aspects in space weather research and operation. It is difficult to cover ground-based observation network globally by one country. Also in the satellite-based observation, there are many international cooperation for saving costs and developing higher spec instruments. In this way, we need to share observational data and products.

In this session, under the cooperation with PSW. 5 and 9, we discuss the current examples and future aspects of international space weather cooperation. Some successful examples of bilateral, multilateral, regional and global cooperation will be presented and discuss lessons learned and path forward.

PSW.8 **The Geomagnetic Environment Leading to GIC Impacts on Power-infrastructure**

MSO/DO: Hermann Opgenoorth (Umeå University, Sweden), Jennifer Gannon (Computational Physics Inc., USA)

Organizing Committee: TBD

Event Information: Geomagnetic Disturbances (GMDs) and Geomagnetically Induced Currents (GICs) pose a significant threat to ground-based infrastructure, including power grids and pipelines. GICs are the result of a chain of events beginning with fluctuations in the solar wind, continuing with enhancements in ionospheric and magnetospheric current systems, and resulting in geomagnetic and geo-electric fluctuations that drive the hazard at ground level. In recent years there have

been significant advances in measurements of driver and response, modeling of magnetospheric, ionospheric and ground-level processes, and validation using GIC measurements, but gaps and uncertainties remain. This session encourages presentations that discuss the drivers of the GIC hazard from the solar wind through the magnetosphere and ionosphere to the ground, and also stimulate the discussion of what is still needed to improve specification and mitigation of this important space weather hazard.

PSW.9 **International Space Weather Missions and Coordination: Current and Planned Missions**

MSO/DO: Juha-Pekka Luntama (ESA, Germany), TBD

Organizing Committee: Mamoru ISHII (NICT, Japan), KyungSuk Cho (KASI, S. Korea), Andrew Monham (EUMETSAT, Germany)

Event Information: Our society and our daily activities are increasingly depending on applications and services that require space-based elements of the infrastructure for their function. Space weather is a constant hazard that can have adverse impacts on both space- and ground-based critical infrastructure and severely disturb dependent services and applications. Space weather is also a hazard for human and robotic exploration of the Moon and other targets in our solar system. As we do not have means to control our space environment, our best protection against space weather and the best approach to mitigate the adverse impacts are provisions of timely, accurate and actionable space weather information, nowcasts and forecasts to the operators and users of critical infrastructure. Space weather service provision and advances in the underpinning science require comprehensive observation systems both in space and on ground.

The aim of this session is to provide a forum to provide a good overview of current and planned space weather missions covering both operational and scientific space missions. The presentations in the session are expected to promote discussion about how well the current and planned missions cover the needs of the data users and developers of predictive models and decision-making tools, what observations are missing and what new observations would make a significant improvement in space weather nowcasting and forecasting. We also want to foster discussion about how coordination of space weather monitoring could be improved globally. The session will welcome abstracts covering all types and sizes of space weather monitoring missions including missions in place or being planned by private industry.

PSW.10 **Radio Observations for Space Weather**

MSO/DO: Mario M. Bisi (Rutherford Appleton Laboratory, UK), TBD

Organizing Committee: TBD

Event Information: This session will aim to bring together all the key aspects of the uses of radio techniques, both on the ground and in space, for space weather and space climate advancement. Areas to be covered would include observations, modelling, the use of radio data in models, multi-faceted/multi-technique approaches where radio data form a substantial element of the investigations, and new instrumentation/ architectures/infrastructure(s).

It is envisaged that key members of the COSPAR ISWAT teams working with radio observations/ data/ modelling will participate in the session as well as some overviews of the key elements of the updated COSPAR space-weather roadmap where radio plays a key role now and in the past, and where it is envisaged to do so in the future. It is envisaged that there will be a panel/QA session also.

TGCSS.1 **Small Spacecraft - Big Science**

MSO/DO: Daniel N. Baker (LASP / University of Colorado, USA), Amal Chandran (LASP / University of Colorado, USA)

Organizing Committee: TBD

Event Information: The Committee on Space Research (COSPAR) in 2019 established a new Task Group to develop an "actionable" plan for an international constellation of small satellites. It was suggested that a particularly useful constellation would be one that measures the plasma conditions in the ionosphere, with sufficient measurement density to substantially improve space weather forecasts.

The COSPAR team, known formally as the Task Group on establishing a Constellation of Small Satellites (TGCSS), began its deliberative work in early March of 2020. In addition to detailing the key science objectives for this program, the Task Group members agreed to start addressing several implementation issues and concerns. The Task Group members have recognized two important and distinct aspects of the COSPAR Action Plan. One branch of activity should be geared toward harnessing and taking good advantage of what international COSPAR adherents already are doing in the smallsat realm. By identifying and orchestrating such efforts, COSPAR is able to perform a worthwhile service to the space community and the nations of the world. The other aspect of this plan is to build capacity amongst nations and institutions that presently have little (or no) space involvement or experience. By bringing more developing nations to the "space exploration table", COSPAR will greatly increase and benefit the entire space enterprise.

In the spirit of moving into the implementation phase, this session will cover topics directly related to the identified mission concepts and allow participating teams to build connections:

1. Recommended payload options and calibration.
2. Reference spacecraft system design concepts and lessons learned.
3. Data aggregation, dissemination, and analysis concepts.
4. Supporting ground systems, testing recommendations.

TGIGSP.1 [ISTPNext: International Coordination in Heliophysics](#)

MSO/DO: Larry Kepko (NASA GSFC, USA), Rumi Nakamura (Space Research Institute, Austrian Academy of Sciences, Austria)

Organizing Committee: Larry Kepko (NASA GSFC, USA), Rumi Nakamura (Austrian Academy of Sciences, Austria), Yoshifumi Saito (JAXA, Japan)

Event Information: Heliophysics is the study of the Sun and its effects throughout the solar system. It covers an incredible range of scales, from plasma physics at the electron scale to the boundary that separates our solar system from interstellar space. It also includes a diverse array of sub disciplines and expertise, with measurements spanning in situ particles and fields from the ionosphere out to the Sun's corona, to remote sensing of the Sun, heliosphere, and near-Earth environment at multiple wavelengths and in energetic neutral atom observations. Many of the biggest unanswered science questions that remain across Heliophysics center around the interconnectivity of the different physical systems, and the role of mesoscale dynamics in modulating, regulating, and controlling that interconnected behavior. Answering these long-standing questions on the Sun-Heliosphere and Geospace as system-of-systems requires a coordinated, deliberate, worldwide scientific effort, akin to the highly successful ISTP program, with the Heliophysics Great Observatories serving as focal points. We solicit papers that provide scientific frameworks for understanding the Sun-Heliosphere and Geospace as Systems of systems, and papers that highlight approaches for (or obstacles to) a holistic, whole-of-science approach that incorporates space-based and ground-based observations, advanced numerical modeling, and AI/ML tools and methods. These approaches could include anything from data standards to mission concepts to agency programmatic. We welcome active participation from all career stages and disciplines within our global Heliophysics community.

TGII.1 [Accessing Opportunities for All in STEM Education and Careers - Reversing Historical Global Trends - How will IDEA Influence Systematic Change](#)

MSO/DO: Mary Snitch (Lockheed Martin Space, USA), Margaret Fraiser (American Geophysical Union, USA)

Organizing Committee: TBD

Event Information: Leaders from around the globe who are dedicated to advancing Inclusion, Diversity, Equity and Accessibility in their organizations and communities will discuss challenges and also opportunities to have impactful careers in the scientific work- force. While a focus will be gender equity and the role of mentorship, the broad discussion will address all underrepresented groups. Join the conversation on how IDEA encompasses all communities and welcomes all researchers across COSPAR programs.

COSPAR Scientific Commission (SC) and Panel Structure

SC A on Space Studies of the Earth's Surface, Meteorology and Climate

Chair: Ralph Kahn (USA)

Vice-Chair: Jérôme Benveniste (ESA/ ESRIN)

- o Task Group on GEO (TG GEO)

Sub-Commission A1 on Atmosphere (incl. Troposphere and Stratosphere), Meteorology and Climate

Sub-Commission A2 on Ocean Dynamics, Productivity, and the Cryosphere

Sub-Commission A3 on Land Processes and Morphology

SC B on Space Studies of the Earth-Moon System, Planets, and Small Bodies of the Solar System

Chair: Hajime Yano (Japan)

Vice-Chairs: Bernard Foing (Netherlands),

Rosaly Lopes (USA)

Sub-Commission B1 on Small Bodies

Sub-Commission B2 on International Coordination of Space Techniques for Geodesy - a joint Sub-Commission with IUGG/IAG Commission I on Reference Frames

Sub-Commission B3 on The Moon

Sub-Commission B4 on Terrestrial Planets

Sub-Commission B5 on Outer Planets and Satellites

Sub-Commission B6/E4 on Exoplanets Detection, Characterization and Modelling

SC C on Space Studies of the Upper Atmospheres of the Earth and Planets, Including Reference Atmospheres

Chair: Andrew Yau (Canada)

Vice-Chairs: Paolo Fagundes (Brazil), Duggirala Pallamraju (India), Erdal Yigit (USA)

Sub-Commission C1 on the Earth's Upper Atmosphere and Ionosphere

Sub-Commission C2 on the Earth's Middle Atmosphere and Lower Ionosphere

Sub-Commission C3 on Planetary Atmospheres and Aeronomy

- o Task Group on Reference Atmospheres of Planets and Satellites (RAPS)
- o URSI/COSPAR Task Group on the International Reference Ionosphere (IRI)
- o COSPAR/URSI Task Group on Reference Atmospheres, including ISO WG4 (CIRA)

Sub-Commission C5/D4 on Theory and Observations of Active Experiments

SC D on Space Plasmas in the Solar System, Including Planetary Magnetospheres

Chair: Nicole Vilmer (France)

Vice-Chairs: Agnieszka Gil-Swidarska (Poland), Jie Zhang (USA)

Sub-Commission D1 on the Heliosphere

Sub-Commission D2/E3 on the Transition from the Sun to the Heliosphere

Sub-Commission D3 on Magnetospheres

Sub-Commission C5/D4 on Theory and Observations of Active Experiments

SC E on Research in Astrophysics from Space

Chair: Tomaso Belloni (Italy)

Vice-Chairs: Eugene Churazov (Germany), Brigitte Schmieder (France), Wenfei Yu (China)

Sub-Commission E1 on Galactic and Extragalactic Astrophysics

Sub-Commission E2 on the Sun as a Star

Sub-Commission D2/E3 on the Transition from the Sun to the Heliosphere

Sub-Commission B6/E4 on Exoplanets Detection, Characterization and Modelling

SC F on Life Sciences as Related to Space

Chair: T. Hei (USA)

Vice-Chairs: Giorgio Baiocco (Italy), John Kiss (USA), Petra Rettberg (Germany), Yeqing Sun (China)

Sub-Commission F1 on Gravitational and Space Biology
Sub-Commission F2 on Radiation Environment, Biology and Health
Sub-Commission F3 on Astrobiology
Sub-Commission F4 on Natural and Artificial Ecosystems
Sub-Commission F5 on Gravitational Physiology in Space

SC G on Material and Fluid Sciences in Space Conditions

Chair: Marc Avila (Germany)
Vice-Chairs: Katharina Brinkert (UK), Jeff Porter (Spain), Alvaro Romero-Calvo (USA)

SC H on Fundamental Physics in Space

Chair: Manuel Rodrigues (France)
Vice-Chairs: O. Bertolami (Portugal), Sven Hermenn (Germany)
P. McNamara (ESA/ ESTEC)

Technical Panel on Satellite Dynamics (PSD)

Chair: Heike Peter (Germany)
Vice-Chairs: Adrian Jäggi (Switzerland), Shuanggen Jin (China), Francesco Topputo (Italy)

Panel on Technical Problems Related to Scientific Ballooning (PSB)

Chair: Mattias Abrahamsson (Sweden)
Vice-Chairs: Vincent Dubourg (France), Hideyuki Fuke (Japan), Edward Udinski (USA)

Panel on Potentially Environmentally Detrimental Activities in Space (PEDAS)

Chair: Carolin Frueh (USA)
Vice-Chair: Carmen Pardini (Italy)

Panel on Radiation Belt Environment Modelling (PRBEM)

Chair: Yoshi Miyoshi (Japan)
Vice-Chairs: Antoine Brunet (France), Yuri Shprits (Germany), Yihua Zheng (USA)

Panel on Space Weather (PSW)

Chair: Maria Kuznetsova (USA)
Vice-Chairs: Joaquim E.R. Costa (Brazil), Sharafat Gadimova (UN-OOSA), Nat Gopalswamy (USA), Hermann Opgenoorth (Sweden)

Panel on Planetary Protection (PPP)

Chair: Athena Coustenis (France)
Vice-Chairs: Peter Doran (USA), Niklas Hedman (UN-OOSA)

Panel on Capacity Building (PCB)

Chair: Juan Carlos Gabriel (Spain)
Vice-Chairs: Diego Altimirano (UK), Dieter Bilitza (USA), M. Chantale Damas (USA), Nimit Kumar (India), Denise Perrone (Italy), Randall K. Smith (USA), Z. “Bob” Su (Netherlands), Mpho Tshisaphungo (South Africa)
PCB Fellowship Program and Alumni

Panel on Education (PE)

Chair: Rosa Doran (Portugal)
Vice-Chair: M. Chantale Damas (USA), Sandra Benitez Herrera (Spain), Gustavo Rojas (Portugal)

Panel on Exploration (PEX)

Chair: TBD

Vice-Chairs: Bernard Foing (ESA/ESTEC), Chris McKay (USA), Frances Westall (France)

Panel on Interstellar Research (PIR)

Chair: Ralph McNutt (USA)

Vice-Chair: Robert Wimmer-Schwein-gruber (Germany)

Panel on Innovative Solutions (PoIS)

Chair: Eric H. Smith (USA)

Vice-Chairs: George Danos (Cyprus), Irina Kitiashvili (USA)

Panel on Social Sciences and Humanities (PSSH)

Chair: Isabelle Sourbès-Verger (France)

Vice-Chair: Niklas Hedman (Austria)

Task Group on the Establishment of a Constellation of Small Satellites (TGCSS)

Chair: Daniel Baker (USA)

Vice-Chairs: Amal Chandran (USA)

Task Group on Establishing an International Geospace Systems Program (TGIGSP)

Chair: Larry Kepko (USA)

Vice-Chairs: Rumi Nakamura (Austria), Yoshi Saito (Japan)

Task Group on IDEA (Inclusion, Diversity, Equity, and Accessibility) Initiative (TGII)

Chair: Mary Snitch (USA)

COSPAR Scientific Assembly

Preview of Special Events

A number of special lectures and events are planned in Busan, and information will be posted as it becomes available at this page. As a preview, please see the two descriptions below for events already advanced in the planning process.

Inclusion, Diversity, Equity, and Accessibility (IDEA) Lunch Panel: "Leveraging Psychological Safety as an IDEA Principle to Advance Scientific Discovery"

Join leaders from NASA's Jet Propulsion Laboratory and other global experts on the necessity for creating psychologically safe environments to ensure inclusion and open scientific expression. Often our notions of the creation of science are based on the historic "Eureka" moments of a single brilliant individual, be it Einstein, Marie Curie, or Newton. In reality much of science is conducted in teams. And yet, academia does very little to prepare our scientists for team leadership. To create high functioning, high performing teams, a critical component is psychological safety, a term coined by Professor Amy Edmondson of Harvard Business School. Psychological safety occurs when all individuals in the team feel safe to take risks and speak up without fear of shame or reprisal. In space science, some of the biggest "fails" have occurred when there was low psychological safety and team members were afraid to speak up.

The IDEA panel at COSPAR will examine how organizations are working to cultivate psychological safety, how gender, cultural, and social identity differences affect psychological safety, and ways of overcoming those challenges.

COSPAR Committee on Industry Relations Panel Discussion: Space 2050 – Our Future Shaped by Today's Space Technology Advances

What will the future of space look like in 2050? What technologies will be required to enable future capabilities in space and how close are we to creating them? The leader of Lockheed Martin's space innovation labs shares a vision for the future of space and showcases key technologies being developing to expand space missions and humanity beyond our home world. The 2050 vision invites discussion about the future of space in five areas: a "smart" world enabled by ubiquitous communications, extraplanetary operations, space logistics, mission operations command utilizing artificial intelligence and machine learning, and space defense to strengthen 21st Century Security. These areas dive deeper into dynamic mission environments and the emerging technological advancements necessary to operate productively and safely.

Associated Events

As in past years, a variety of organizations will plan scientific, business, and/or social events around the COSPAR Scientific Assembly. COSPAR encourages organizations planning such events to make them known to the Secretariat before mid-April 2024 so that if appropriate they can be referenced on the Scientific Assembly webpage, app, and/or in the program book.

IAA Day

The International Academy of Astronautics will host its regular Academy Day at the COSPAR Scientific Assembly on Saturday, 13 July 2024, 9:30 – 16:00. Updates on current Academy activities will be provided by IAA leaders. The highlight of Academy Day however will be a technical program comprised of four or five invited lectures on the latest results from Earth and space science research. Featured lectures will be presented by renowned scientists in the respective fields of space science including astronomy, Earth science, heliophysics and planetary science. Lectures will be tailored for a scientifically savvy audience most of whom are not experts in the particular field of the specific lectures. Details will be posted in spring 2024.

COSPAR and Joint Awards and Medals

Anyone may submit a nomination. See the specific instructions below under each category of award or <https://cosparhq.cnes.fr/awards>.

COSPAR Space Science Award

The COSPAR Award honours a scientist who has made outstanding contributions to space science. All scientists working in any field covered by COSPAR are eligible for this award.

Previous recipients:

2022 - James W. Head, III	2004 - Vasily I. Moroz
2022 - Alan Title	2002 - Stamatios M. Krimigis
2020 - William J. Borucki	2002 - Christopher T. Russell
2020 - Ken McCracken	2000 - Roger M. Bonnet
2018 - Jean-Pierre Bibring	2000 - Donald M. Hunten
2018 - Bruce T. Tsurutani	1998 - Catherine Cesarsky
2016 - Charles L. Bennett	1998 - Marcia Neugebauer
2016 - Anatoly I. Grigoriev	1996 - Norman F. Ness
2014 - David J. McComas	1996 - Minoru Oda
2014 - Jean-Loup Puget	1994 - Gerhard Haerendel
2012 - Janet Luhmann	1994 - Joachim E. Trümper
2010 - Günther Hasinger	1992 - Edward C. Stone Jr.
2010 - Steven W. Squyres	1990 - John A. Simpson
2008 - George Gloeckler	1988 - Konstantin I. Gringauz
2008 - Ken Pounds	1988 - S.L. Mandelshtam
2006 - Eberhard Gruen	1986 - Ludwig F. Biermann
2006 - Atsuhiko Nishida	1984 - James A. Van Allen
2004 - Jacques E. Blamont	

COSPAR International Cooperation Medal

This medal is awarded to a scientist who has made distinguished contributions to space science and whose work has contributed significantly to the promotion of international scientific cooperation. All scientists working in any field covered by COSPAR are eligible for this medal. This medal may also be awarded to a group of scientists.

Previous recipients:

2022 - WU Ji	2002 - Andre Brack
2020 - John Z. Kiss & F. Javier Medina	2000 - John H. Carver
2018 - Stas Barabash	1998 - Reimar Lüst
2016 - Lev Zelenyi	1996 - Anatoli I. Grigoriev
2014 - Carlé McGetchin Pieters	1994 - Ranjan R. Daniel
2012 - Roger-Maurice Bonnet	1992 - Hubert Curien
2010 - Lee-Lueng Fu & Yves Ménaud	1990 - Bengt Hultqvist
2008 - Marvin A. Geller	1988 - Cornelis de Jager
2006 - Raymond A. Greenwald	1986 - The Inter-Agency Consultative Group
2004 - Stephen S. Holt	1984 - Roald Z. Sagdeev

COSPAR William Nordberg Medal

This medal commemorates the work of the late William Nordberg and is awarded to a scientist who has made a distinguished contribution to the application of space science in a field covered by COSPAR.

Previous recipients:

2022 - Gerda Horneck	2004 - Louis J. Lanzerotti
2022 - Joyce E. Penner	2002 - Moustafa Chahine
2020 - Daniel J. McCleese	2000 - Kenichi Ijiri
2018 - Christoph Reigber	1998 - Anne M. Thompson
2016 - Gordon Greeley Shepherd	1996 - Charles Elachi
2014 - Mikhail Ya. Marov	1994 - Pierre Morel
2012 - Herbert Fischer	1992 - John Theodore Houghton
2010 - Kuo-Nan Liou	1990 - Desmond G. King-Hele
2008 - Joe Waters	1988 - S. Ichtiaque Rasool
2006 - John P. Burrows	

COSPAR Massey Award

This award honours the memory of Sir Harrie Massey, FRS, past Physical Secretary of the Royal Society and past member of the COSPAR Bureau. The award consists of a gold medal and a prize of 500 guineas. This award recognizes outstanding contributions to the development of space research, interpreted in the widest sense, in which a leadership role is of particular importance. These are the only requirements, and the award is open to candidates from any country.

Previous recipients:

2022 - Pascale Ehrenfreund	2004 - Yasuo Tanaka
2020 - Alexander Held	2002 - Jacques Paul
2018 - John Zamecki	2002 - Giovanni Bignami
2016 - Fiona A. Harrison	2000 - Stuart C. Bowyer
2014 - Eugene Churazov	1998 - Rashid A. Sunyaev
2012 - Neil Gehrels	1996 - Johannes Geiss
2010 - Harvey Tananbaum	1994 - Robert Wilson
2008 - Giovanni G. Fazio	1992 - Herbert Friedman
2006 - Charles Elachi	1990 - Hendrik C. van de Hulst

Nominations for the four awards above must be signed or endorsed by a COSPAR Bureau member, a representative of a COSPAR National or Scientific Union member, a member of the COSPAR Scientific Advisory Committee, a COSPAR Scientific Commission or Panel chair or vice-chair, or by a previous recipient of the honour.

COSPAR Distinguished Service Medal

This medal recognizes extraordinary services rendered to COSPAR over many years.

Previous recipients:

2022 - Willem Hermsen	2008 - Isaac Révah
2020 - Jean-Louis Fellous	2000 - Stanislaw Grzedzielski
2018 - Mariano Méndez	1996 - Richard C. Hart
2016 - David Halpern	1994 - Antal J. Somogyi
2012 - Peter Willmore	1993 - Jean-François Denisse
2010 - Margaret (Peggy) Ann Shea	1992 - Zdzislaw Niemirowicz

Nominations must be signed by a member of the COSPAR Bureau.

Nominations for the five awards listed above will be considered by an Awards Committee appointed by the COSPAR Bureau. After considering the recommendations of the Awards Committee, the Bureau will make a final selection.

Vikram Sarabhai Medal

This medal is awarded by the Indian Space Research Organization (ISRO) and COSPAR in honour of Vikram Sarabhai, considered one of the architects of modern India. The medal is awarded for outstanding contributions to space research in developing countries. For a candidate to be eligible for this award, her or his relevant work must have been carried out mainly in the five-year period ending one year before the COSPAR Scientific Assembly at which the medal is to be presented. This medal is open to candidates from any country.

Previous recipients:

2022 - Christine Amory-Mazaudier	2010 - Zuyin Pu	1998 - D. James Baker
2020 - Alexi Glover	2008 - Mangalathayil A. Abdu	1996 - U.R. Rao
2018 - Qiugang Zong	2006 - Marcos E. Machado	1994 - Jacques E. Blamont
2016 - Kohei Arai	2004 - Peter Willmore	1992 - C.-Y. Tu
2014 - Gurbax Singh Lakhina	2002 - Ronglan Xu	1990 - Vladimir A. Kotelnikov
2012 - Rafael Navarro-Gonzalez	2000 - Zhen-Xing Liu	

Jeoujang Jaw Award

The Jeoujang Jaw Award, bestowed jointly by the Chinese Academy of Sciences and COSPAR, recognizes scientists who have made distinguished pioneering contributions to promoting space research, establishing new space science research branches and founding new exploration programs.

Previous recipients:

2022 – No award	2014 - Professor Sir Martin Sweeting FRS
2020 - Wing-Huen Ip	2012 - Robert P. Lin
2018 - Sergey K. Krikalev	2010 - Calvin T. Swift
2016 - Cheng Fang	2008 - James L. Burch

Nominations for joint awards will be reviewed by the COSPAR Awards Committee. The Bureau will submit a short list of candidates, in order of preference, to the relevant Academy or Agency stating the total number of candidates and explaining the reasons for ordering the list as presented.

Nominations for joint awards must be signed or endorsed by a COSPAR Bureau member, a representative of a COSPAR National or Scientific Union member, a member of the COSPAR Scientific Advisory Committee, a COSPAR Scientific Commission or Panel chair or vice-chair, a member of the sponsoring Academy or Agency, or by a previous recipient of the honour.



COSPAR Outstanding Paper Award for Young Scientists

Candidate authors must be under 31 years of age at the time the manuscript is submitted for publication in *Advances in Space Research* or *Life Sciences in Space Research*. Candidates must be a first author, although multiple author papers are eligible. Authors of papers resulting from general submissions are eligible.

2022 recipients (see the COSPAR website for recipients from earlier years):

SC A: Lijuan Chen Florence Marti Indrajit Chowdhuri Muhammad Sarfraz Khan Babita Jangir Tadea Veng K.C. Arun Kumar	SC D: Alessia De Iuliis Shaoyu Lyu	PSB: Hangyue Zhang
SC B: Vladislav Zubko Andrea Viale Neil Bassett	SC E: Cecilia Mac Cormack Asheesh Bhargawa	PSD: Kenza K. Boudad Andrea Caruso Anaïs Delépaut Haibo Ge Johannes Kröger Corinne Lippe Dimitrios V. Psychas Fabian Schiemenz Maksim Shirobokov Kewei Xia Chihang Yang
SC C: Jon Bruno Alvarez Ting Lan Yuliya Kurdyeva Andre Luiz Almeida Silva Munawar Shah Sai Gowtam Valluri Duvvu Lissa Ian J. Cohen	SC F: Edward Greg Huang Andy Kwok Ashley Susan Nemec-Bakk	PSW: V. Lanabere
	SC G: Haotian Fan Italo Pinto Rodrigues	
	PEDAS: Nathan Reiland Minghe Shan Shaylah Mutschler Yunfeng Yu	
	PolS: Marco Grasso Rohith Reddy Sanaga	

The Publications Committee, based on the lists of recommended authors from the Editors-in-Chief, will recommend recipients for the Award to the Bureau which will take the final decision on attribution of the awards.

Nominations for all COSPAR and joint awards, except the Outstanding Paper Award, shall consist of:

- a filled in nomination form signed or endorsed by a person authorized to nominate,
- a curriculum vitae with a general description of the space research activity of the nominee, and
- a list of significant, selected publications, not more than about 25.
The publications most relevant to the award should be clearly identified.

All nominations must reach the COSPAR Secretariat no later than end November of the calendar year preceding the Scientific Assembly, i.e., 30 November 2023 for the Assembly to be held in 2024.

Further information and the nomination form are available at: <https://cosparhq.cnes.fr/awards>

Publication of Papers Resulting from Scientific Assembly Presentations

COSPAR encourages the publication of full papers resulting from presentations made at Scientific Assemblies in COSPAR's flagship journals *Advances in Space Research (ASR)* and *Life Sciences in Space Sciences (LSSR)*.

More information on these journals is at: <https://www.sciencedirect.com/journal/advances-in-space-research> and <https://www.sciencedirect.com/journal/life-sciences-in-space-research>

Instructions for Submission of Manuscripts to *Advances in Space Research* and *Life Sciences in Space Research*

Advances in Space Research (ASR) and *Life Sciences in Space Research (LSSR)* are the flagship journals for the COSPAR community. *ASR* and *LSSR* are indexed in ISI Web of Science and Scopus, and *LSSR* is also indexed in PubMed. Both journals are completely open to appropriate submissions from the scientific community, and individuals making presentations at COSPAR Scientific Assemblies are encouraged to submit their complete manuscripts to *ASR* and *LSSR*.

There are no deadlines for the submission of papers, except for Special Issues. Manuscripts must be appropriate for refereeing and should be written in good English. Draft, incomplete or poorly written manuscripts will be returned without review.

While there are no publication charges or page limits, papers are expected to be of a length appropriate for the subject. Both journals also support OpenAccess, and a 25% discount is offered to meeting participants, as COSPAR Associates. Manuscripts should be submitted electronically at: <https://www.editorialmanager.com/aisr/default.aspx> or <https://www.editorialmanager.com/lssr/default.aspx> where you can find also a Guide for Authors. Before you may submit a manuscript, you must first register on one of the websites listed above.

Authors will be asked when submitting manuscripts to *ASR* to select an appropriate category from among the following for their paper (if not for an approved Special Issue): Astrophysics; Solar System Bodies; Earth Sciences; Earth Magnetosphere and Upper Magnetosphere; Solar and Heliospheric Physics; Fundamental Physics and Material Sciences in Space; Astrodynamics and Space Debris; and Space Technology, Policy and Education. For *LSSR*, please select from the following categories: Astrobiology; Habitability and Life Support; Space Radiation measurement and Detection; Radiation Environment, Biology and Health; and Gravitational Biology on Plant and Animals. All authors will also be asked to propose names of 3-5 potential reviewers. Accepted papers will be given a digital object identifier (DOI) shortly after acceptance and appear in an electronic version on Science Direct, i.e. they may be cited before being printed. Elsevier supports OpenAccess as well as electronic supplements.

Scientists, engineers, and mission planners with manuscripts appropriate for *ASR* and *LSSR* are invited to submit their papers to the Elsevier editorial system for *ASR* and for *LSSR* at any time throughout the year. The journals cover all disciplines of space research.

Questions on submission procedures should be directed to the *ASR* Editor-in-Chief (Pascal Willis, pascal.willis.17@gmail.com), the *LSSR* Editor-in-Chief (Tom Hei, tkh1@cumc.columbia.edu) or any of the co-editors or associate editors, many of whom are present at Scientific Assemblies.

COSPAR Capacity Building Program

Call for Workshop Proposals

An important COSPAR activity is the Capacity Building Program, which consists of about three training workshops in developing countries each year for young space scientists, together with a related scheme of 5-10 COSPAR fellowships. Substantial grants are available for each workshop.

This Assembly presents an ideal opportunity for participants and Commissions to begin discussing ideas for proposals, from which a selection is made by a sub-group of the Panel on Capacity Building (PCB). Proposals may be submitted at any time and are evaluated as received. Members of the Panel are available to help (re)write proposals so that they best meet the goals of the program. Feel free to contact Panel members to discuss the best strategy before submitting a proposal. Given limited human and financial resources, in consultation with the organizers it may be necessary to schedule workshops later than the timeframe initially proposed. The time from proposal to workshop is on average about a year, so start the process well in advance.

Full details of this program may be found at: <https://cosparhq.cnes.fr/events/cospar-capacity-building-workshops/>

The program objectives are quite specific and it is important that proposals should be consistent with them. The description of the program includes information on the selection criteria.

Proposals/queries may be addressed at any time to the members of the Panel on Capacity Building:

- Juan Carlos Gabriel (juan.carlos.gabriel@gmail.com) - Chair
- Diego Altamirano (d.altamirano@soton.ac.uk)
- Dieter Bilitza (dbilitza@gmu.edu)
- M. Chantale Damas (mdamas@qcc.cuny.edu)
- Denise Perrone (denise.perrone@asi.it)
- Randall Smith (rsmith@cfa.harvard.edu)
- Z. “Bob” Su (z.su@utwente.nl)
- Mpho Tshisaphungo (mtshisaphungo@sansa.org.za)

COSPAR – Committee on Space Research

Furthering research, exploration, and the peaceful use of outer space through international cooperation



COSPAR was established by the International Council of Scientific Unions (ICSU), now the International Science Council (ISC), in October 1958 to continue the cooperative programmes of rocket and satellite research successfully undertaken during the International Geophysical Year of 1957-1958. The ICSU resolution creating COSPAR stated that its primary purpose was to "provide the world scientific community with the means whereby it may exploit the possibilities of satellites and space probes of all kinds for scientific purposes, and exchange the resulting data on a cooperative basis". Accordingly, COSPAR is an interdisciplinary scientific organization concerned with the promotion and progress, on an international scale, of all kinds of scientific research carried out with space vehicles, rockets and balloons. COSPAR's objectives are carried out by the international community of scientists working through ISC and its adhering National Academies and International Scientific Unions. Operating under the rules of ISC, COSPAR considers all questions solely from the scientific viewpoint and takes no account of political considerations.

Composition of COSPAR

COSPAR Members are National Scientific Institutions, as defined by ISC, actively engaged in space research and International Scientific Unions federated in ISC which desire membership. The COSPAR Bureau manages the activities of the Committee on a day-to-day basis for the Council – COSPAR's principal body – which comprises COSPAR's President, one official representative of each Member National Scientific Institution and International Scientific Union, the Chairs of COSPAR Scientific Commissions, and the Finance Committee Chair.

COSPAR also recognizes as Associates individual scientists taking part in its activities and, as Associated Supporters, public or private organizations or individuals wishing to support COSPAR's activities. Current members in this category are **Airbus Defence and Space SAS, Center of Applied Space Technology and Microgravity (ZARM)**, Germany; **China Academy of Launch Vehicle Technology (CALT)**, China; **China Academy of Space Technology (CAST)**, China; **Groupement des Industries Françaises Aéronautiques et Spatiales (GIFAS)**, France; the **International Space Science Institute (ISSI)**, Switzerland.

COSPAR also has an Industry Partner programme to encourage strategic engagement with relevant industries who wish to be involved in the activities of COSPAR and support its mission. The current Industry Partner is **Lockheed Martin Corporation**, USA.



COSPAR Bureau (2022-2026)

President: P. Ehrenfreund (Netherlands/USA)
Vice Presidents: C. Cesarsky (France), P. Ubertini (Italy)
Other Members: V. Angelopoulos (USA), M. Fujimoto (Japan), M. Grande (UK), P. Rettberg (Germany), I. Stanislawska (Poland), C. Wang (China)

COSPAR Finance Committee (2022-2026)

Chair: I. Cairns (Australia)
Members: C. Mandrini (Argentina), J.-P. St Maurice (Canada)

COSPAR Publications Committee

Chair: P. Ubertini (Italy)
Ex Officio: P. Ehrenfreund (Netherlands/USA), J.-C. Worms (France), R.A. Harrison (UK), T. Hei (USA), M. Shea (USA), P. Willis (France)
Other Members: A. Bazzano (Italy), M. Klimenko (Russia), G. Reitz (Germany), M. Story (USA), P. Visser (Netherlands)

COSPAR Secretariat

Executive Director:	J.-C. Worms	COSPAR Secretariat, c/o CNES, 2 place Maurice Quentin
Associate Director:	A. Janofsky	75039 Paris Cedex 01, France
Administrative Coordinator:	L. Fergus Swan	Tel : +33 (0) 1 44 76 74 41, +33 (0)4 67 54 87 77
Accountant:	A. Stepniak	E-mail: cospar@cosparhq.cnes.fr , Web: https://cosparhq.cnes.fr

Visit the website for details of [COSPAR governance](#)

Chairs & Vice-Chairs of COSPAR's Scientific Commissions

SC A on Space Studies of the Earth's Surface, Meteorology and Climate

R. Kahn (USA, Chair)
J. Benveniste (ESA/ESRIN)



SC E on Research in Astrophysics from Space

T. Belloni (Italy; Chair)
*E. Churazov (Germany),
B. Schmieder (France),
W. Yu (China)*



SC B on Space Studies of the Earth-Moon System, Planets, and Small Bodies of the Solar System

H. Yano (Japan; Chair)
B. Foing (Netherlands), R. Lopes (USA)



SC F on Life Sciences as Related to Space

T.K. Hei (USA; Chair)
*G. Baiocco (Italy), J. Kiss (Germany),
P. Rettberg (Germany),
Y. Sun (China)*



SC C on Space Studies of the Upper Atmospheres of the Earth and Planets, including Reference Atmospheres

A. Yau (Canada, Chair)
*P.R. Fagundes (Brazil),
D. Pallamraju (India), E. Yigit (USA)*



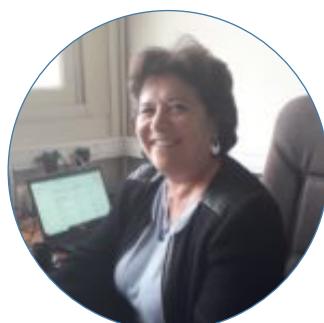
SC G on Materials Sciences in Space

M. Avila (Germany; Chair)
*K. Brinkert (UK), J. Porter (Spain),
A. Romero-Calvo (USA)*



SC D on Space Plasmas in the Solar System, including Planetary Magnetospheres

N. Vilmer (France, Chair)
A. Gil-Swiderska (Poland), J. Zhang (USA)



SC H on Fundamental Physics in Space

M. Rodrigues (France; Chair)
*O. Bertolami (Portugal), S. Hermenn (Germany),
P. McNamara (ESA/ESTEC)*



Chairs & Vice-Chairs of COSPAR's Panels

Panel on Capacity Building (PCB)

J.C. Gabriel (Spain; Chair)

D. Altamirano (UK), D. Bilitza (USA), M. C. Damas (USA), D. Perrone (Italy), R. Smith (USA), Z. Su (Netherlands), M. Tshisaphungo (S. Africa)

Panel on Radiation Belt Environment Modelling (PRBEM)

Y. Miyoshi (Japan; Chair)

A. Brunet (France), Y. Shprits (Germany), Y. Zheng (USA)

Panel on Exploration (PEX)

TBD,

B. Foing (Netherlands), C. McKay (USA), F. Westall (France)

Panel on Social Sciences and Humanities (PSSH)

I. Sourbès-Verger (France; Chair)

N. Hedman (Austria)

Panel on Planetary Protection (PPP)

A. Coustenis (France; Chair)

P. Doran (USA), N. Hedman (UNOOSA)

Panel on Potentially Environmentally Detrimental Activities in Space (PEDAS)

C. Frueh (USA),

C. Pardini (Italy)

Technical Panel on Satellite Dynamics (PSD)

H. Peter (Germany; Chair)

A. Jäggi (Switzerland), S. Jin (China), F. Topputo (Italy)

Panel on Innovative Solutions (PoIS)

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