COSPAR BRIEFING TO ESSC-63

Jean-Claude WORMS

Executive Director

CREATED AT THE DAWN OF THE SPACE AGE TO OFFER A NEUTRAL FORUM FOR SPACE SCIENTISTS WORLD-WIDE

COSPAR Assembly, Washington, 1962

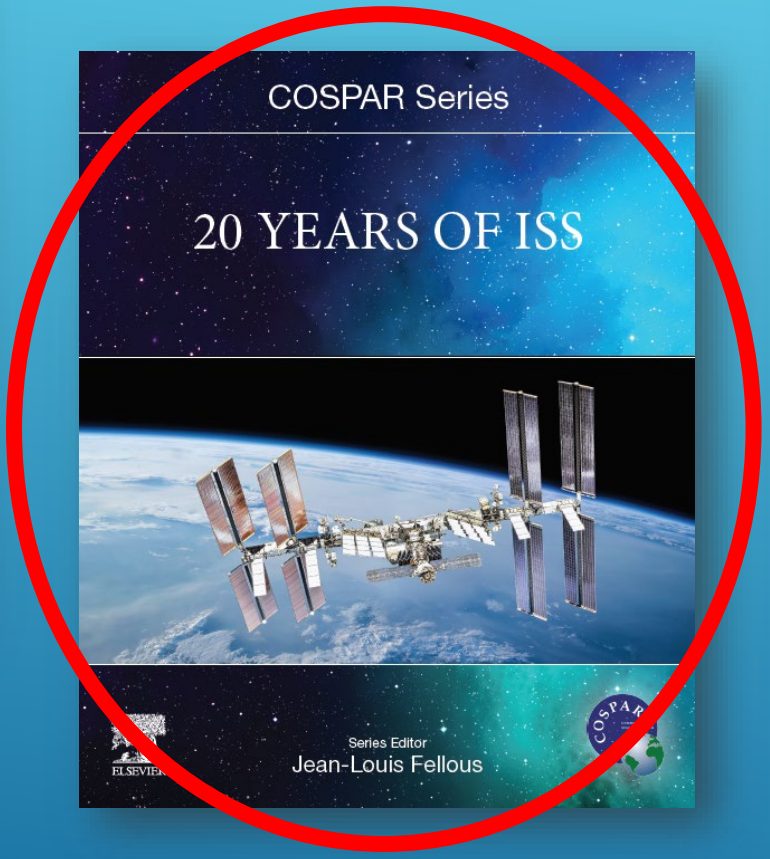
Statement by the President of COSPAR

COSPAR expresses its deep dismay and concern regarding the invasion of Ukraine by Russia and the resulting grave humanitarian crisis.

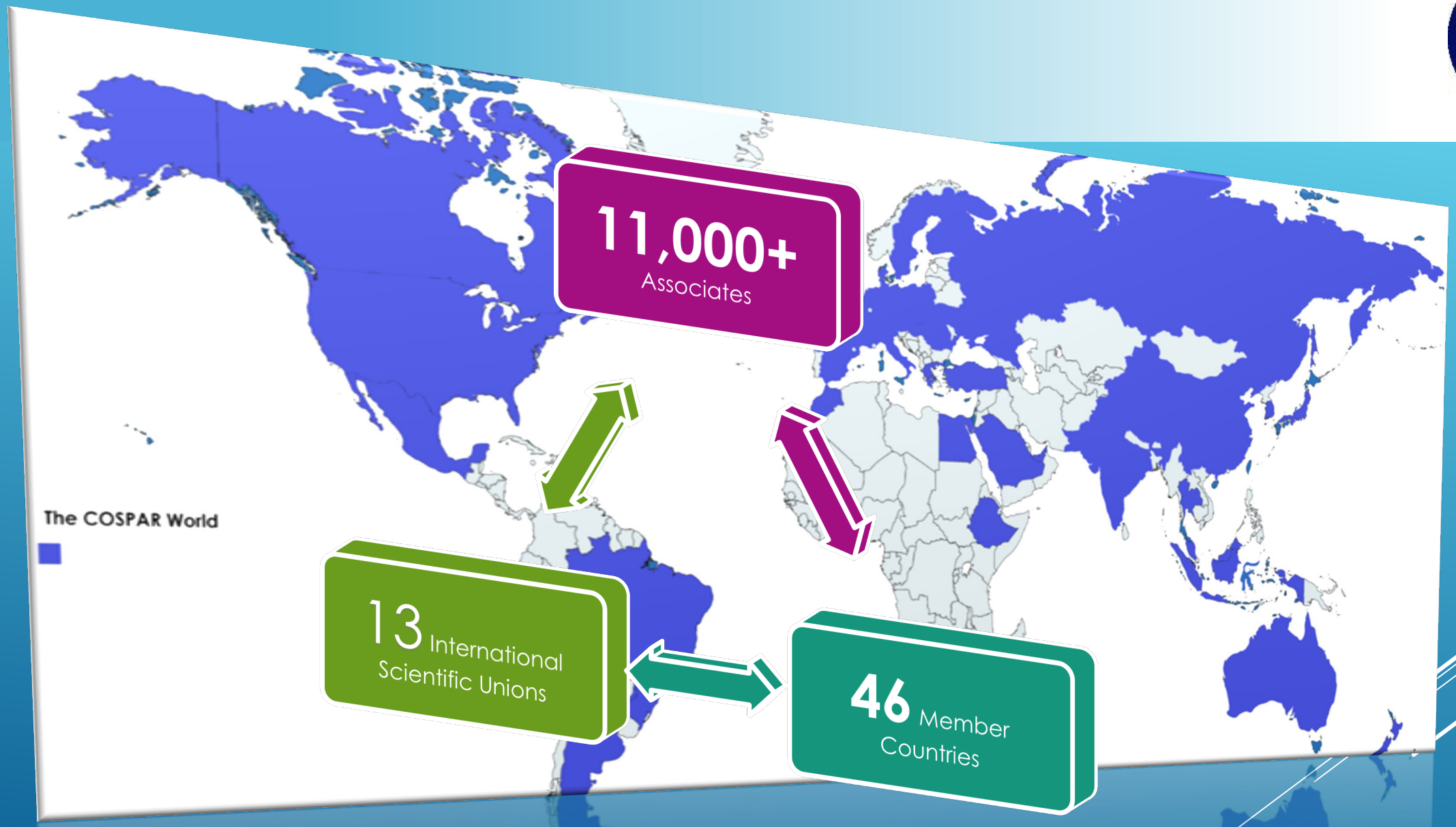
COSPAR reaffirms its long-standing position that science is a platform for dialogue even in times of profound geopolitical conflict, and therefore a resource on which to capitalize to restore and preserve peace.

COSPAR states that our capacity to work collaboratively on global challenges such as climate change and space research is only equal to our capacity to maintain strong collaboration amidst geopolitical turmoil. The isolation and exclusion of important scientific communities is detrimental to all.

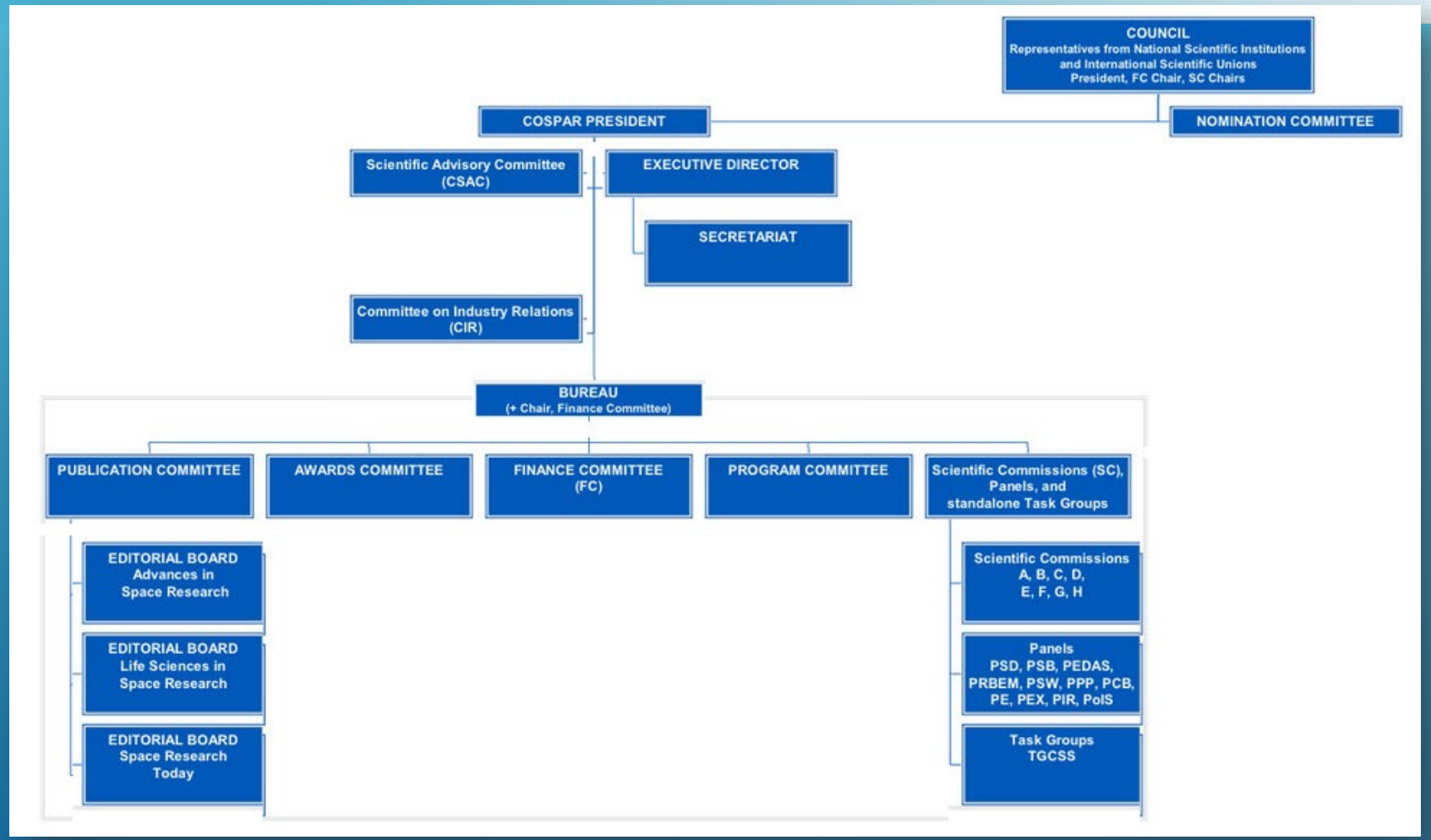
COSPAR pledges to advance equal participation and collaboration between scientists from all countries in its activities and to adhere to its principle that all of its activities are conducted with the highest ethical standards.



IMPACT ON ISS VOLUMES IN COSPAR BOOK SERIES


11,000+
Associates
13 International Scientific Unions
46 Member Countries
The COSPAR World

GOVERNANCE STRUCTURE



BUREAU MEMBERS

- The Bureau is composed of eight members, elected for 4 years (renewable once)
  - Len Fisk (USA), President (second and final term)
  - Karl Heinz Glassmeier (Germany) VP
  - Catherine Césarsky (France) (second term)
  - Masaki Fujimoto (Japan)
  - Manuel Grande (UK)
  - Charles Kennel (USA)
  - Pietro Ubertini (Italy)
  - Chi Wang (China)

ABOUT IDEA

- Define roadmap to achieve Inclusion, Diversity, Equity and Accessibility (IDEA) across the entire organization and its membership, and enhance corresponding work, with two short-term objectives
  - Promoting diversity and gender equality in all of its activities, and fight any form of discrimination or harassment.
  - Continue to encourage meaningful roles in all activities for younger scientists
- Appointment of an IDEA Coordination Officer

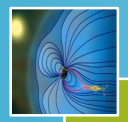
SC	Topics covered	Chair
A	Space Studies of the Earth's Surface, Meteorology and Climate	Ralph Kahn (USA)
B	Space Studies of the Earth-Moon System, Planets, and Small Bodies of the Solar System	Bernard Foing (France/Netherlands, Acting)
C	Space Studies of the Upper Atmospheres of the Earth and Planets Including Reference Atmosphere	Andrew Yau (Canada)
D	Space Plasmas in the Solar System, including Planetary Magnetospheres	Nicole Vilmer (France)
E	Research in Astrophysics from Space	Tomaso Bellini (Italy)
F	Life Sciences as Related to Space	Tom K. Hei (USA)
G	Materials Sciences in Space	Marc Avila (Germany)
H	Fundamental Physics in Space	Claus Laemmerzahl (Germany)

SCIENTIFIC COMMISSIONS

PANEL	Chair
Technical Panel on Satellite Dynamics (PSD)	Heike PETER (Germany)
Panel on Technical Problems related to Scientific Ballooning (PSB)	Tetsuya YOSHIDA (Japan)
Panel on Potentially Detrimental Activities in Space (PEDAS)	Carolin FRUEH (USA)
Panel on Radiation Belt Environement Modeling (PRBEM)	Paul O'BRIEN (USA)
Panel on Space Weather (PSW) – hosting ISWAT	Maria KUZNETSOVA (USA)
Panel on Planetary Protection (PPP)	Athena COUSTENIS (France)
Panel on Capacity Building (PCB) sub-panel: Capacity Building Fellowship Program and Alumni (PCB-FA)	Carlos GABRIEL (Spain) Mariano Méndez (Netherlands)
Panel on Education (PE)	Michel BOER (France)
Panel on Exploration (PEX)	Frances WESTALL (France)
Panel on Interstellar Research (PIR)	Ralph McNUTT (USA)
Panel on Space and Social Sciences and Humanities (PSSH)	Isabelle SOURBES-VERGER (France)
Panel on Innovative Solutions (PoIS)	Eric SMITH (USA)
Task Group on establishing a Constellation of Small Satellites (TGCSS) Sub-group on Radiation Belt Sub-group on Atmosphere	Daniel BAKER (USA) Ji WU (China) Mohammed MEFTAH (France)

Small Satellites

- **TGCSS**
  - Developing a constellation of small satellites for science
  - Interest expressed in NASA, Asia, Europe VIDEO
  - COSPAR-INSPIRE partnership LINK
  - Upcoming international call for ideas
  - Support from Chinese launch firm



Space Weather

- **PSW**
  - Panel on SW enables the development of predictive forecasting techniques
  - Active international network coordination (e.g. ISWAT)
  - Update to SW COSPAR Roadmap LINK
  - All SW relevant partners world-wide are contributing

Innovative Solutions

- **PoIS**
  - New panel created in early 2021 LINK
  - Chaired by Eric Smith (Lockheed Martin)
  - Forum for COSPAR Associates to present and discuss new technologies for research
  - 3 sessions in Athens Assembly (07/22)

Planetary Protection

- **PPP**
  - Provides accepted guidelines on planetary protection requirements to guide compliance with the UN OST of 1967
  - Recent evolution of the panel LINK membership (scientists from COSPAR Commissions, and space agencies)

Social Sciences and Humanities

- **PSSH**
  - Establish a dialogue with SSH scholars
  - Chair: Isabelle Sourbès-Verger (CNRS)
  - Give a role to COSPAR in line with current challenges in term of their interaction with society at large
  - New project: sustainability of space exploration

SOME PANEL ACTIVITY EXTRACTS

INDUSTRY CONNECTIONS

- Industry Partners
  - Lockheed Martin since 2020 (also Silver Sponsor Athens 2022)
  - Northrop Grumman since 2020
- New Committee on Industry Relations, advising the COSPAR President (Nelson Pedreiro – Lockheed)
  - 16 companies, "old" and "new" space
  - 6 meetings so far and a strategic plan with 22 actions
- Work with industry rather than having them work without us altogether…

COMMITTEE ON INDUSTRY RELATIONS

Airbus (France) – Helene Boithias

Arianespace – Aaron Lewis, VP

BAE Systems (UK) – Julian Cracknell, CTO

Ball Aerospace – Mike Gazarik, VP

Ball Aerospace – LaNetra Tate

Blue Origin – Steve Squyres, Chief Scientist

Fleet Technologies – Flavia Tata Nardini, CEO

Korea Aerospace Industries – Chang Han Lee

Northrup Grumman – Steve Krein, VP

Planet Labs - Robbie Schingler, Co-Founder

Planet Labs – Tanya Harrison

Raytheon – David Appel, VP

Rocket Lab – Peter Beck, Founder/CEO

Rocket Lab – Andrew Bunker, VP

Rocket Lab – Morgan Bailey

Thales Alenia Space/F – Christophe Valorge, CTO

Thales Alenia Space/I – Massimo Comparini, SEVP

United Launch Alliance – Tory Bruno, CEO

United Launch Alliance - John Reed, CTO

United Launch Alliance – Brandon Eden

Virgin Galactic – Sirisha Bandla, VP

Voyager – Eric Stallmer, EVP

Lockheed Martin – Nelson Pedreiro, VP (CIR Chair)

Lockheed Martin – Mary Snitch (also COSPAR ICO)

CIR ACTIVITY

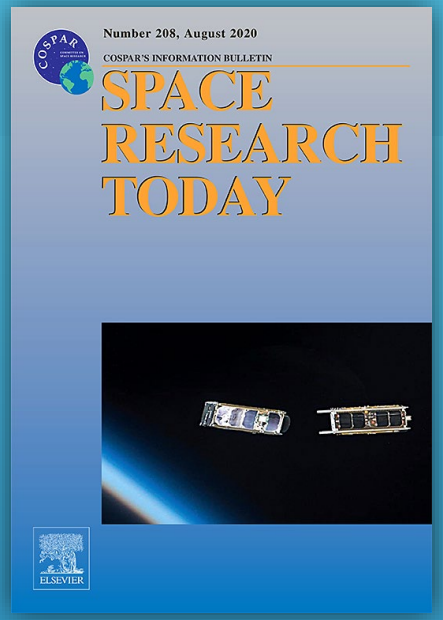
- Y2021
  - CIR established
  - Developed value proposition for industry engagement in COSPAR
  - Formulated recommendations and strategy to promote industry engagement in COSPAR
- Y2022
  - Kicked off implementation of recommendations and strategic plan
  - COSPAR newsletter, Space Research Today, article publication
  - COSPAR appointment of DEI officer: Mary Snitch
  - Creation of Industry Corner: NIRCam article in development (Marcia Rieke & Alison Noraff)
- COSPAR 44th Scientific Assembly in Athens, Greece
  - CIR in-person meeting: Wednesday, July 20, 11 am to Noon
  - COSPAR sponsorship request

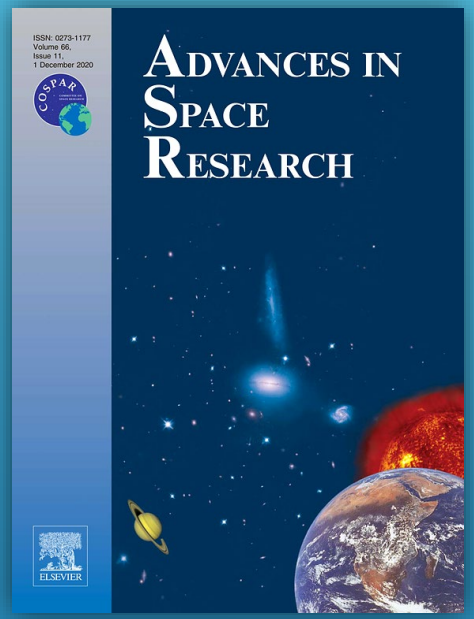
STRATEGIC PLAN STATUS

- 2022 Assembly Events - Sirisha Bandla & Eric Stallmer
- JWST Panel - Aaron Lewis
- Industry Representation on Committees - Chang Han Lee
- Diversity & Inclusion Workshop - Mary Snitch

ORGANIZING INDUSTRY-LED SESSIONS IN ATHENS

- Changing Access to Space
  - Panel to discuss how access to commercial space is changing the way research is conducted, and how the research community and industry can work together to create access that is accessible to a wider scientific community
  - Proposed Speakers include:
    - Government : Thomas Zurbuchen, NASA; someone from ESA?
    - Orbital industry : Eric Stallmer, Voyager Space
    - Suborbital industry : Sirisha Bandla, Virgin Galactic
    - Researcher: SwRI, CNR
    - Researcher 2: Someone utilizing commercial remote sensing data
- JWST panel
  - CIR Organizer: Aaron Lewis, VP Arianespace
  - Proposed speakers (2): Stéphane Israël (CEO Arianespace) + Thomas Zurbuchen (NASA AA) - TBC





COSPAR PUBLICATIONS

- 44th COSPAR Assembly
  16-24 July 2022
- 3500+ abstracts submitted
- 144 scientific sessions
- www.cospar-assembly.org

COSPAR 2022 SCIENTIFIC ASSEMBLY

45TH COSPAR ASSEMBLY (2024)

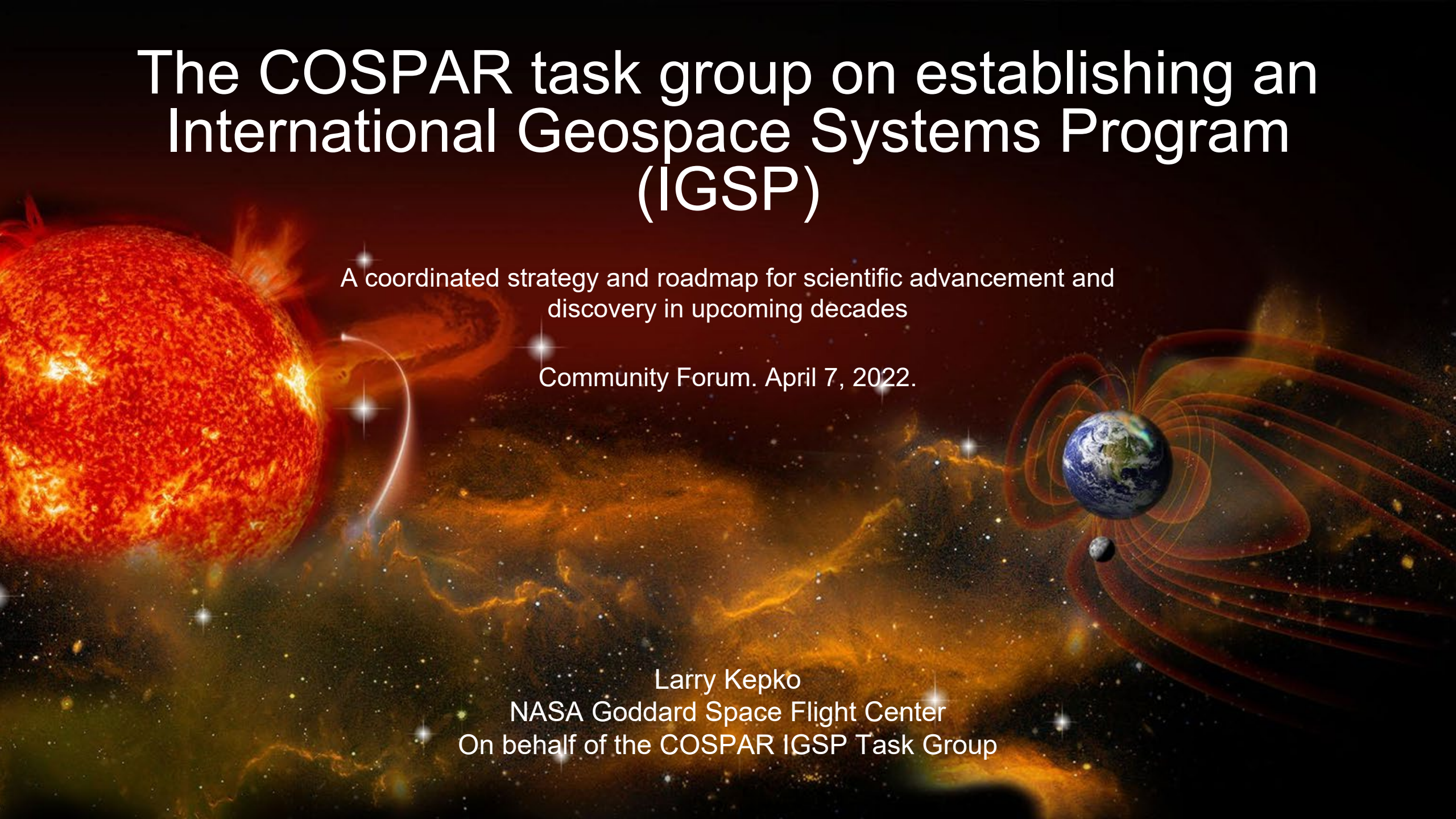
- South Korea will host the 45th Scientific Assembly in Busan

5th COSPAR Symposium, April 2023, Singapore
Space Science with Small Satellites

- Strengthening joint activities of COSPAR and UNOOSA (PP, debris, SW, sustainable space exploration)
- Improving COSPAR Support to Developing Space Programs (Capacity Building Workshops, support to early-career scientists)
- TG2C2 (climate change) – to start
- TGIGSP – Establishing an International Geospace Systems Program

OTHER ACTIVITIES

The COSPAR task group on establishing an International Geospace Systems Program (IGSP)



A coordinated strategy and roadmap for scientific advancement and discovery in upcoming decades

Community Forum. April 7, 2022.

Larry Kepko
NASA Goddard Space Flight Center
On behalf of the COSPAR IGSP Task Group

COSPAR Task Group on establishing an International Geospace Systems Program (IGSP)

A coordinated strategy and roadmap for scientific advancement and discovery in upcoming decades

Chair
Larry Kepko (USA)

Vice-Chairs
Rumi Nakamura (Austria)
Yoshi Saito (Japan)

Members
Matt Taylor (NL)
Chi Wang (China)
Eric Donovan (Canada)
Geoff Reeves (USA)
Jonny Rae (UK)
Xochitl Blanco-Cano (Mexico)
Dibyendu Chakrabarty (India)
Yannis Daglis (Greece)
Junga Hwang (Korea)
Benoit Lavraud (France)
Anatoli Petrukovich (Russia)
Clezio Marcos De Nardin (Brazil)
Minna Palmroth (Finland)

Our group formed last Fall, started meeting weekly in January.

Our goals over the next few months are to:

- Refine the open scientific questions of geospace, with a focus on mesoscales where major questions remain.
- Draft possible observation scenarios
- Engage in discussions with researchers and space agency representatives about possible implementation strategies

Our product will be a COSPAR scientific roadmap, with publication in Advances in Space Research.

Builds on ISTP, feeds into all agencies future programs, and US upcoming Decadal

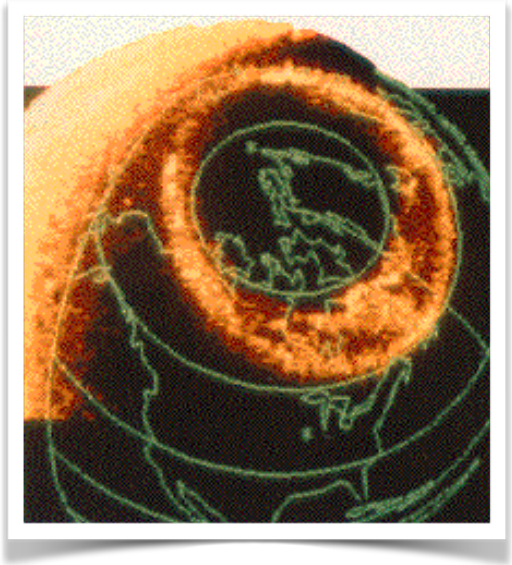
Space Physics has had 4 primary eras

The 5th era is up to us to define

Discovery era - Regions

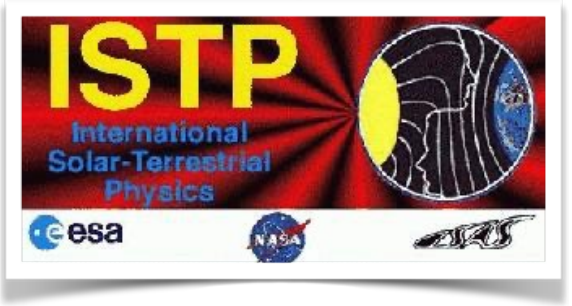
1958 - ~1975

Discovery era - Dynamics



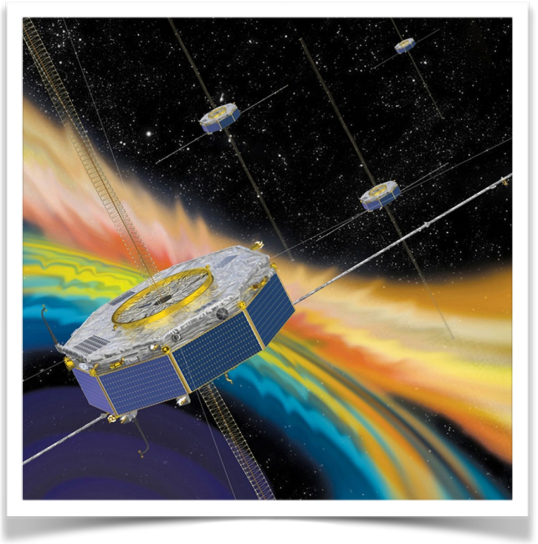
~1975-1990

Era of coarse system science (ISTP)



~1990-2005

Era of details



~2005-present

The 5th era should focus on the mesoscales, aka the “missing middle” and the magnetosphere as a System of Systems

We have studied both ends of the scale extensively

Large Scale

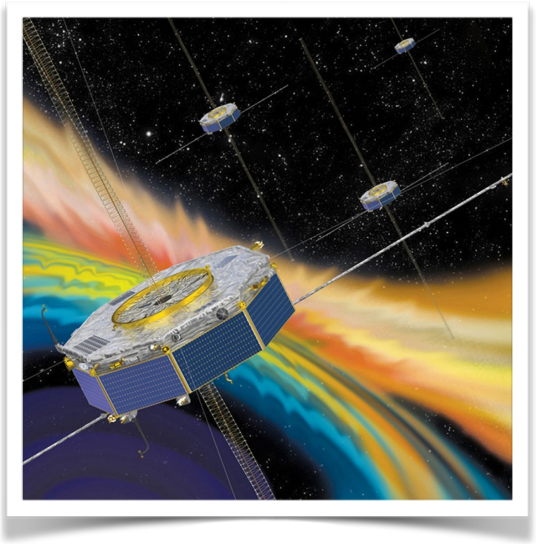
The "Missing Middle" of Mesoscales

Small Scale

Era of coarse system science (ISTP)

~1990-2005

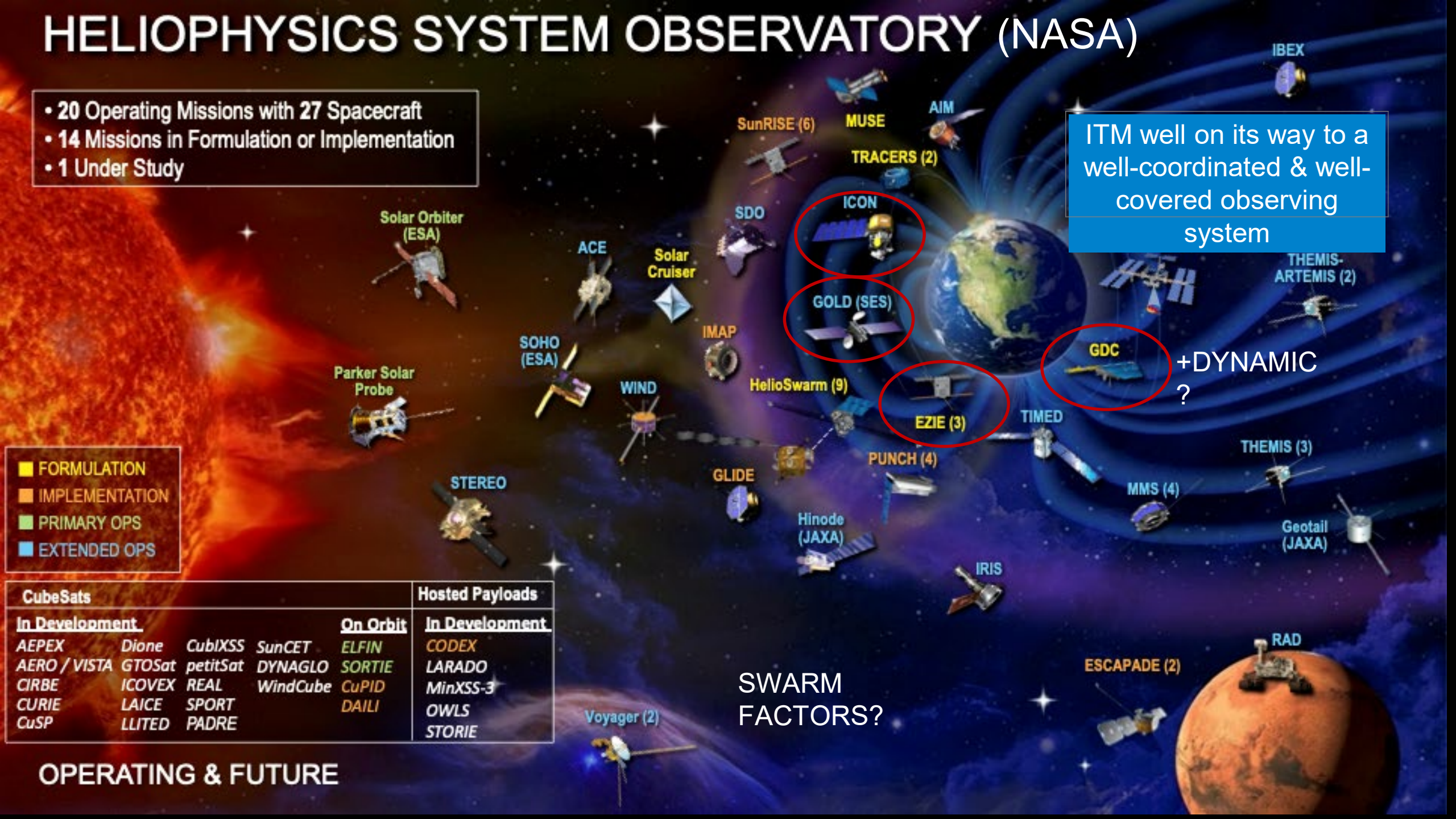
Era of details



~2005-present

The 5th era should focus on the mesoscales, aka the "missing middle", and the magnetosphere as a System of Systems observed at mesoscale resolution

HELIOPHYSICS SYSTEM OBSERVATORY (NASA)



CubeSats					Hosted Payloads
In Development				On Orbit	In Development
AEPEX	Dione	CubIXSS	SunCET	ELFIN	CODEX
AERO / VISTA	GTOSat	petitSat	DYNAGLO	SORTIE	LARADO
CIRBE	ICOVEX	REAL	WindCube	CuPID	MinXSS-3
CURIE	LAICE	SPORT		DAILI	OWLS
CuSP	LLITED	PADRE			STORIE

OPERATING & FUTURE

IN SUMMARY

- Magnetosphere is a "System of Systems"
- When these systems are plugged together, this leads to unexpected (emergent) behavior
- The magnetosphere is not well covered by our ad hoc fleet of limited and aging spacecraft (average age of MMS, Cluster, Geotail, and THEMIS is 17.5 years) → need to resolve the pixels of the very coarse picture
- Need for a coordinated strategy combining remote sensing of the inner magnetosphere system with a constellation of satellites further out
- Space exploration has always been an international effort, starting with IGY 1957-1958; ISTP, with launches starting in the 90s is an example of international cooperation & coordination, with a long-lasting legacy

ISTP was designed to study the system of systems (and HSO attempts it). What did it miss?

It missed (and continues to miss) the mesoscales.

Mesoscales are fundamental units of transport, and carry mass, momentum, and energy throughout and across systems.

Mesoscales also carry information about configuration changes.

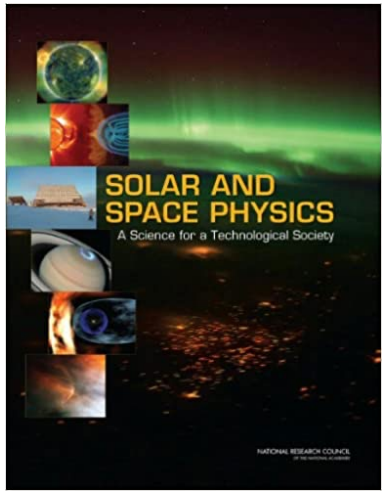
ISTP couldn’t do it. HSO cannot do it.

It is time to reimagine our approach.

What we need is a dedicated, focused, intentional effort to study the magnetosphere as a “System of Systems”, at mesoscale resolution.

We have an opportunity in the 2030s to define a new era

Focused on mesoscales & cross-system coupling



GDC+DYNAMIC are the last of the strategic Heliophysics missions from the last Decadal survey (2013-2022). Nothing in the queue after that.
Release end of 2024, covers **2024-2033**

ESA is competing next fast & medium class missions **(2030s)**, EOP

JAXA discussing next Medium class missions (launch in **2031/36**)

The 2030s could be a golden era of internationally coordinated geospace science, finally answering long-standing, fundamental questions about the interaction of the sun and solar wind with our magnetosphere

Scientists are coordinating today, but high level synchronized movements are missing.

ESSC AND COSPAR

- COSPAR ex officio in ESSC since over 20 years
- Strong ties and some joint project/proposals
- ESSC survey: establishing channels with COSPAR is considered a Top-3 success for ESSC
- '*Work more with COSPAR*' is one of the 'O' in the SWOT analysis conducted by ESSC in 2020
- TGIGSP is one project where ESSC-SSEP and COSPAR could work together concretely
- Debris and sustainable space exploration is another

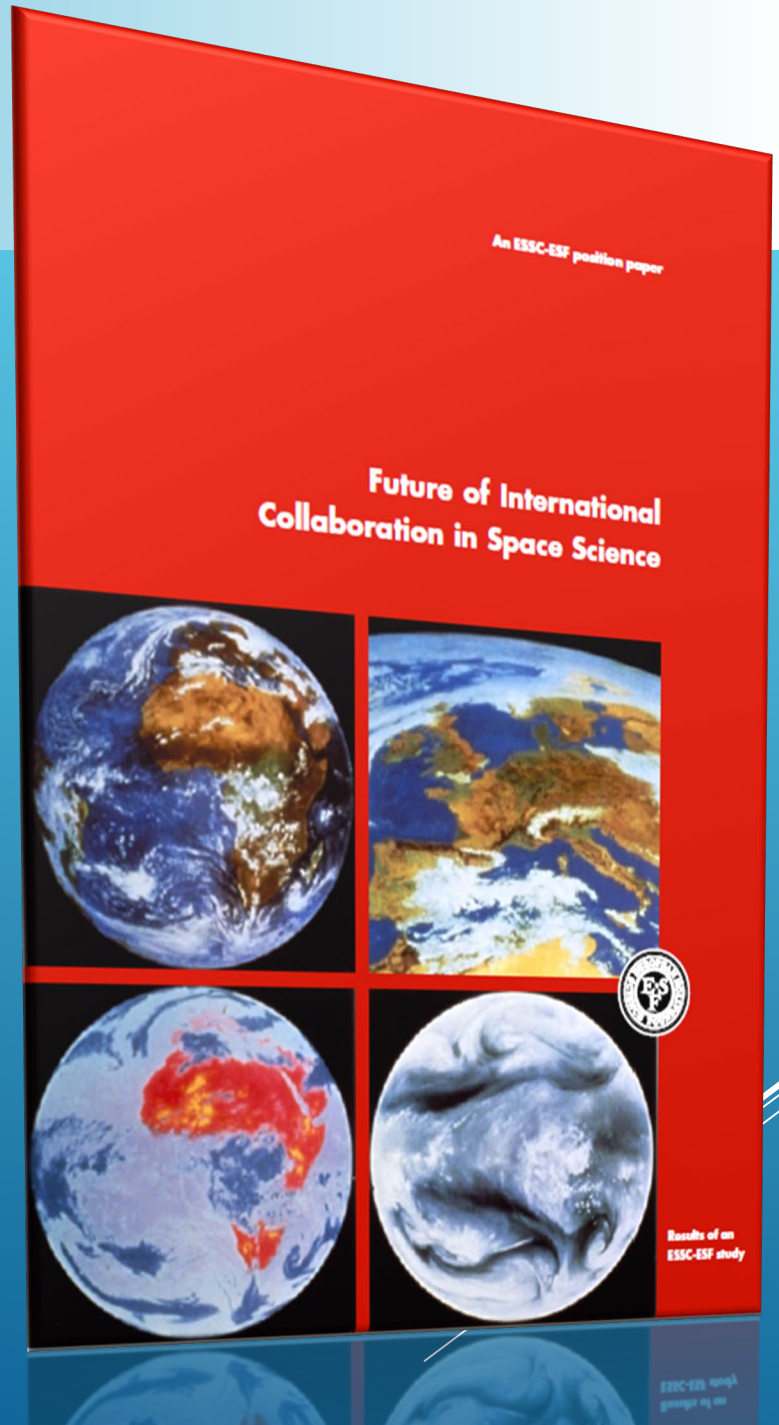
Recommendations

Proposed operational structure

- It is proposed to establish an Inter-Agency Scientific Collaboration Working Group (IA-SCWG), which would include responsible agency executives from, e.g. ESA, NASA, Japan, Russia.
- The aim of this IA-SCWG would be, on a regular basis, to:

  ⇒ provide a global forum for discussing collaboration on large missions (observatories, planetary exploration, data exploitation)

  ⇒ enable coordination of focused science missions (e.g. Explorer, F-type and national missions) within the roadmaps.
- The necessary input to the IA-SCWG would be provided by thematic panels; this would enable a "bottom-up" scientific input.
- In addition to the agency representation, scientific membership in this working group could be decided after consultation and advice from independent scientific advisory bodies, e.g. SSB, ESSC, SRC and others.
- The meeting cycle of the IA-SCWG should be annual.



IN A – NOT TOO – DISTANT PAST…

THANK YOU VERY MUCH

https://cosparhq.cnes.fr

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Committee on Space Research

@CosparHQ

COSPAR

Committee on Space Research - COSPAR