NATIONAL ACADEMIES Sciences Engineering Medicine

Committee on Solar and Space Physics

Report to Space Studies Board, 20 November 2024

J. Clemmons for the CSSP, Co-Chair

University of New Hampshire

NOVEMBER 2022 UPDATE

CSSP Committee membership

James Clemmons, Co-Chair
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Laila Andersson
University of Colorado

Roman G. Gomez
Southwest Research Institute

Hantao Ji
Princeton University

KD Leka
NorthWest Research Associates, Nagoya U. / ISEE

Wayne A. Scales
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TBD, Co-Chair

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Harvard-Smithsonian Center for Astrophysics

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Montana State University

Nicholas M. Pedatella
NSF National Center for Atmospheric Research

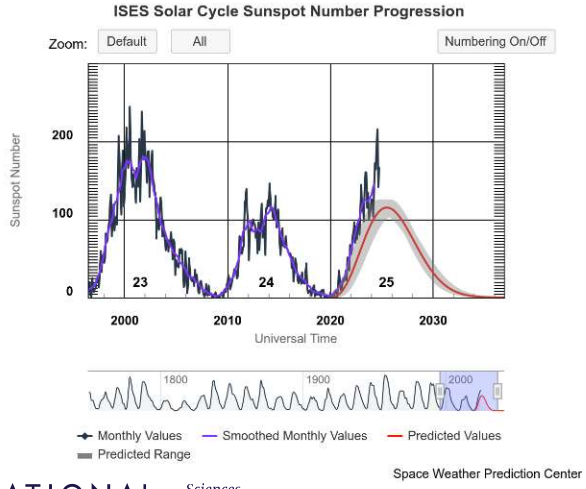
Phyllis L. Whittlesey
University of California, Berkeley

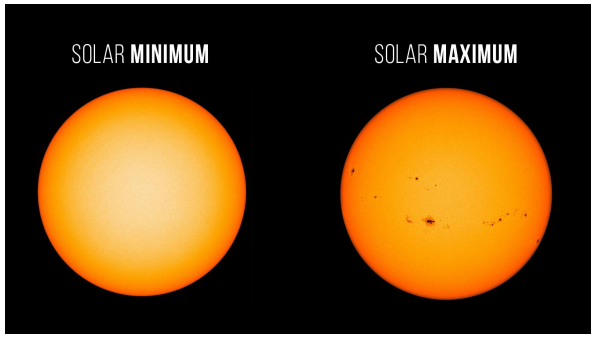
NASEM Staff

Abigail Sheffer
Study Director

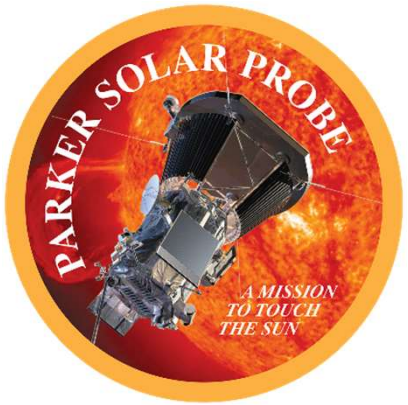
Solar and Space Physics Highlights

- Solar maximum has officially arrived:
  - https://science.nasa.gov/science-research/heliophysics/nasa-noaa-sun-reaches-maximum-phase-in-11-year-solar-cycle/
  - Larger maximum than predicted, similar to cycle 23
- NASA's Parker Solar Probe headed toward closest approach to Sun
- The "Heliophysics Big Year" continues to live up to its billing!





https://svs.gsfc.nasa.gov/vis/a010000/a014600/a014683/002_Sunspot_ComparisonAUG.png



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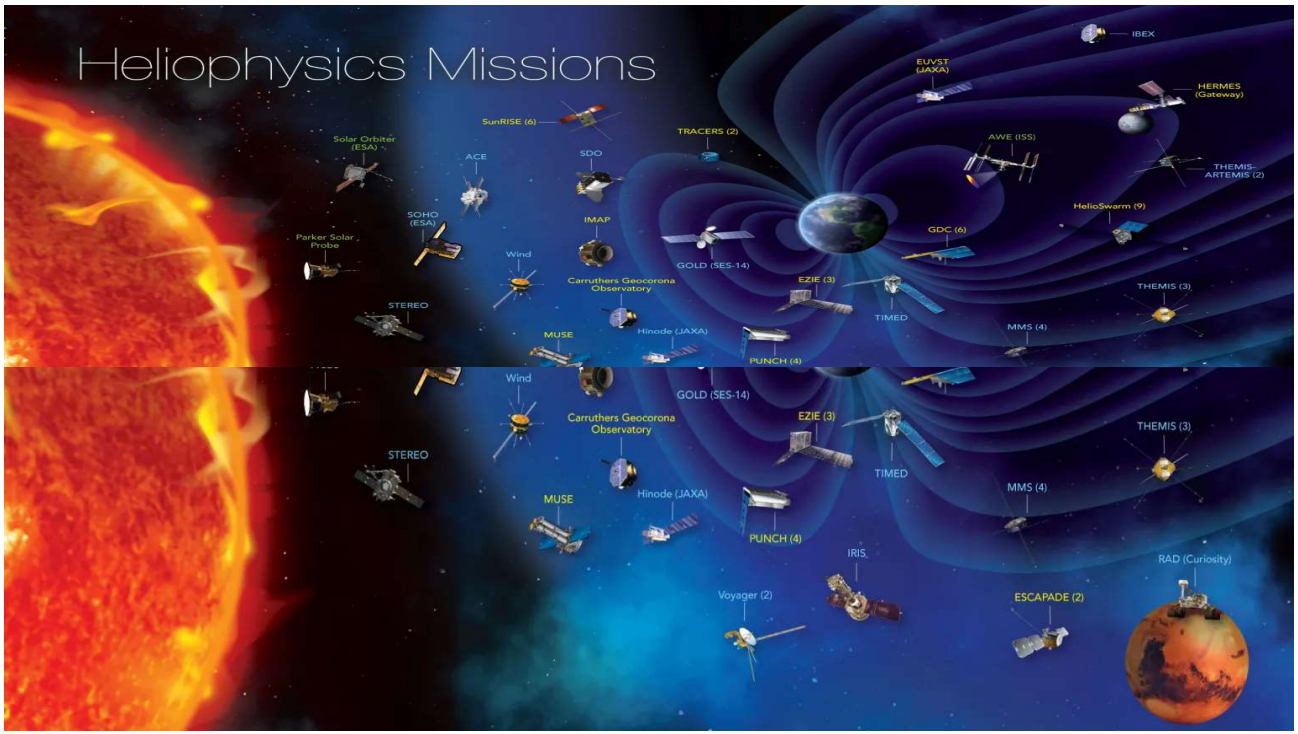
Heliophysics Science Fleet and Near-term Launches

- Prime phase
- Extended phase
- Future
  - PUNCH (2025)
  - IMAP (2025)
  - TRACERS (2025)
  - EZIE (2025)
  - ESCAPADE (2025)



https://science.nasa.gov/heliophysics/missions/mission-fleet-diagram/

HPD has a large fleet of operating missions and will welcome several new missions in 2025

Adapting to Budget Declines

- The discipline is in a transition from one Decadal Survey to the next
- Almost certainly there will be a new take on decision rules in the new DS
- At present we are working with the decision rules from the 2013 DS
- The 2013 DS has the following ranked priorities that its decision rules are weighed against
  1. Completion of then already-selected missions
  2. Implementation of the DRIVE initiative, a research- and workforce-focused program
  3. Execution of a robust Explorer program
  4. Launch of strategic missions in the STP and LWS lines, including IMAP, GDC, DYNAMIC, and MEDICI
- Decision rules from 2013 DS
  A. STP and/or LWS missions should be reduced in scope or delays, with more detailed language for Solar Probe Plus reviews should certain budget triggers occur
  B. Reduce recommended increase in cadence for Explorer, but not below current cadence
  C. Delay implementation of DRIVE augmentation

Adapting to Budget Declines (2)

- Good news: Most of the prioritized core program has been accomplished!
  - DS 2013 priorities 1-3 have been accomplished
- Less good news: The fourth DS priority has fallen behind
  - Strategic missions have not been able to keep pace with the DS 2013 priorities
  - One of the four missions mentioned (IMAP) is poised to launch next year, just outside the decadal window
  - Two missions, GDC and DYNAMIC, are still in pre-formulation, but one (GDC) has been recommended for termination, and the other is tied to that mission
  - The fourth mission, MEDICI, has not had any work started

Adapting to Budget Declines (3)

- In the case of a continued budget decline:
  - Retention of a skilled workforce is a high priority. Attrition of the workforce not only damages individual careers and short-term science progress but also inhibits the ability of the community to change the trajectory
  - Early warnings of difficulties are of high importance. The timescales inherent in the federal budgetary process makes early warnings difficult. The CSSP discussed that future presentations by national agencies could include “stoplight” charts where green, yellow, or red are used to give a quick understanding of progress on the decadal priorities
  - As discipline committees were designed to do, the CSSP can assess and provide feedback on potential changes in decadal implementations by conducting informal discussions or by authoring short reports

Expanding Outreach and Engagement

- CSSP believes that there is an urgent, perhaps even existential, need to engage in effective outreach and engagement
- CSSP received two presentations on outreach and engagement during our September, 2024, meeting
- In the context of what can be done under the auspices of the Academies, discussion centered on communication among interested parties
  - Positive changes include NASA doing more with virtual townhall meetings and NSF holding “virtual office hours” with program officers
- Although CSSP has had some wide-ranging discussions of expanding outreach and engagement activities through the Academies, we have not had enough time together to develop crisp concepts. We plan to have more detailed discussions of ideas through our monthly telecons and semiannual meetings, and will seek input from speakers on this topic as available

Conclusions

- The CSSP and the solar and space physics community is enjoying
  - The changing space weather conditions that provide a path to improve our understanding and prediction skills
  - The promise of imminent, unprecedented close-up views of the Sun and its physics
  - The large potential provided by new missions beginning in 2025
- The CSSP and the solar and space physics community looks forward to the rejuvenation of national priorities for solar and space science through the imminent release of the new Decadal Survey
- The CSSP recognizes the need to be able to optimize work in solar and space science should non-optimal budgets be implemented
- The CSSP recognizes the need for more effective outreach and engagement for solar and space physics, and is eager to explore what can be done under the auspices of the Academies