NSF's National Solar Observatory

Helio2024: call for White Papers

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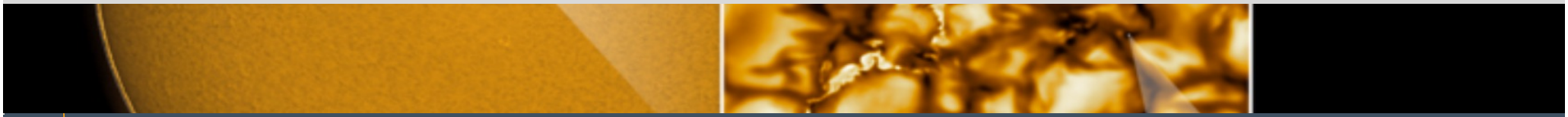

Helio2024 website

- NSO website to help coordinate activities
  https://nso.edu/heliophysics-decadal-survey-2024/
- Helio2024 Statement of task:
  NAS site & detail PDF with NSF and NOAA requests
- Call for White Papers
  WP specifications & FAQ
- Links to Helio2050, LPI website, Ground Based (February) Workshop and

https://docs.google.com/spreadsheets/d/1mn-RMMlorf-8fO0Vt-Mw1g4CC0o_RzKfBOoijgRSP_w/edit#gid=677557249

- WPs presented at the February Workshop
  Abstracts
  Update as needed
- Links to NAS webinars: Decadal process. How to write a WP?

Visit websites, decide if you want to join or invite to your WP, avoid duplicities, advocate for NSO mission (DKIST, SOLIS, GONG, ngGONG)

Helio2024 scope

1. **Provide an overview of the current state of solar and space physics science and applications, including:**

   a. Topics historically part of solar and space physics decadal surveys, including:

      i. The structure of the Sun and the properties of its outer layers in their static and active states,

      ii. The characteristics and physics of the interplanetary medium from the surface of the Sun to interstellar space beyond the boundary of the heliosphere, and

      iii. The consequences of solar variability on the atmospheres and surfaces of other bodies in the solar system, and the physics associated with the magnetospheres, ionospheres, thermospheres, mesospheres, and upper atmospheres of the Earth and other solar system bodies;

   b. New and emerging frontiers where solar and space physics expertise enables significant advances, including but not limited to

      i. science related to the interstellar medium, astrospheres (including their stars), exoplanets, and planetary habitability, and

      ii. applications related to robotic and human exploration in and beyond low-Earth orbit and the lunar environment; and

   c. The space weather pipeline from basic research to applications to operations, including the research-to-operations-to-research loop that strengthens forecasting and other predictive capabilities.

2. **Describe the highest priority science goals to be addressed in the period of the survey**. In doing so:

   a. Identify the focused parts of those goals where measurable progress can be made, where frontiers can be expanded, and that improve possibilities for scientific growth in the future; and

   b. Note where an interdisciplinary or system science approach is needed.

3. **Develop a comprehensive ranked research strategy that provides an ambitious, but realistic, approach to address these science goals.** The strategy will include consideration of:

   a. The combination of ground- and space-based investigations to enhance progress on the prioritized science goals.

   b. Data and computing infrastructure needed to support the research strategy and the long-term utility, usability, and accessibility of acquired data;

   c. Technical, risk, and cost assessments of recommended major investments, when deemed useful;

   d. Decision rules that can accommodate reasonable projected budget deviations or changes in activities' urgency; and

   e. The international landscape, inter-agency collaborations, public-private relationships, and innovative partnerships.

Helio2024 scope

4. **Assess the state of the profession, encompassing, but not limited to:**

   a. Identifying the workforce expertise and capabilities needed to implement the scientific and technical priorities identified by the survey, including the identification of paths for entry into the community, needs for professional development, and challenges to workforce retention;

   b. Evaluating the health and vitality of the community working in the solar and space physics subfields, which includes:

      i. Assessing, to the greatest extent possible, the subfields against the metrics for health and vitality established by the Foundation for Assessing the Health and Vitality of the NASA Science Mission Directorate's Research Communities [study report due to be published Q1 2022], and

      ii. Identifying challenges to the community responding to new and emerging scientific fields;

   c. Identifying issues of concern regarding diversity, equity, accessibility, and inclusion; and

   d. Recommend, using established best practices, actions to improve the health and vitality of the community.

Helio2024 call for WPs

- WPs should identify a **category**: *Basic Research; Space Weather Application; Infrastructure/Workforce/Other Programmatic*
- WPs should identify primary **topic** (*Solar Physics,…*)
- WPs can identify a secondary topic (*Space Weather Research to Operations to Research Loop,…*)
- Length, Format, cover, abstract, figures, references, file type, file format, filename, etc.
- Submission via link (not available yet)
- Due Date: August 18, 2022
- Questions: SSPHdecadal@nas.edu

Helio2024 call for WPs

Space missions or ground-based investigations

White papers that include notional concepts for space missions or ground-based investigations should include the following:

- A summary of the science goals that the investigation is intended to achieve,
- A description of the investigation including notional estimated costs and schedule, in as much detail is possible, and
- Technology development needs.

NSF has specific requests related to the NSF mid-scale program. White paper concepts related to a specific NASA or NSF programs should categorize such investments as follows:

- NSF programs: Mid-scale Research Infrastructure 1 or 2, Mid-Scale Innovations Program in Astronomical Sciences, or Major Research Equipment and Facilities Construction.

Operational space weather projects may be considered for NOAA, and relevant ground-based projects may be considered for NOAA and/or NSF.

Implications for ngGONG & DKIST 2nd generation of instruments

NSO's participation in the Helio 2024 Workshop

1. **Rimmele, T. et al. *Second Generation Instrumentation for DKIST***
2. Reardon, K. et al. *Infrared Imaging Spectropolarimeter to Probe the Solar Atmosphere*
3. Asai, A. et al. *Near InfraRed Tunable Filter (NIRTF) for a 2nd Generation Instrument of DKIST*
4. Tarr, L.A. et al. *Data Driving Our Way to 2032*
5. Schad, T. A. et al. *Ground-Based Coronal Physics in the Next Decade: The DKIST View*

1. **Pevtsov, A. A. et al. *Future Ground-Based Facilities for Research in Heliophysics and Space Weather Observations***
2. Jain, K. et al. *Farside Imaging of the Sun — A Crucial Component in Future Space Weather Forecasting*
3. Petrie, G. J. D et al. *Improving Polar Field Observations from the Ground*
4. Tripathy, S. C. et al. *Advancing the Understanding of Subsurface Structure and Dynamics of Solar Active Regions: An Opportunity with ngGONG*
5. Bertello, L. et al. *Multi-Height Measurements of the Solar Vector Magnetic Field*

1. Criscuoli, S. et al. *Ground-Based Monitoring of the Variability of Visible Solar Spectral Lines for Improved Understanding of Solar and Stellar Magnetism and Dynamics*
2. Tremblay, B. et al. *Coupling Models and Observations to Probe Fundamental Physical Processes*
3. Tarr L. A. et al. *A Catalog of Waves*
4. Hofmann, R. A. et al. *Spectral Inversion Techniques: Purpose, Limitations, and Improvements*
5. Cauzzi, G. et al. *Community Education to Foster Facility Engagement: The Example of the DKIST Data Training Workshops*

Idea's for other WPs

- Multi-height helioseismology
- Multimessenger heliophysics: coordination? Interdisciplinary approaches.
- Data oriented (cloud computing, AI)
- Solar reference spectra for exoplanet transit spectroscopy
- Etc.