The NASA Living With A Star Program Analysis Group (LAPG): a call for input into the NASA Focused Science Topics

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The NASA Living with a Star (LWS) Program Analysis Group (LPAG) serves as a community-based interdisciplinary forum to:

- Solicit & coordinate community input for Living with a Star objectives
- Examine the implications of these inputs for architecture planning, activity, prioritization & future exploration

LPAG: https://lwstrt.gsfc.nasa.gov/lpag

The NASA Living With A Star Program Analysis Group (LAPG):

- **LPAG Executive Committee:**

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Call for Community Input to LWS Focused Science Topics

Release Date: Jun 14, 2023 *Due Date:* Jul 21, 2023

- The 2023 executive committee of the NASA Living with a Star (LWS) Program Analysis Group (LPAG) is beginning to develop the next round of input for ***LWS Focused Science Topics (FSTs)*** for ROSES 2024 and beyond. The LWS program provides an essential funding opportunity for Heliophysics, focusing on systems-science and driven by community interests and needs with potential topics ranging from solar dynamo to planetary habitability

- It is vital for the success of the LWS Science program that there be active community engagement in the development of FSTs. We are therefore asking the Heliophysics community to provide input by **July 21, 2023** for these topics.

- Suggested science topics should be organized around achieving the goals set out in the recently revised Strategic Science Areas (SSAs; https://lwstrt.gsfc.nasa.gov/strategic-science-areas-ssas).

- **New FSTs will be used for ROSES LWS Call**

Strategic Science Areas (SSAs)

SSA-I: Origins and Variability of Global Solar Processes

Solar Cycle, Dynamo, Irradiance, Solar Wind

SSA-II: Solar Eruptive and Transient Heliospheric Phenomena

Flares, Coronal Mass Ejections, Corotating Interaction Regions

SSA-III: Acceleration and Transport of Energetic Particles in the Heliosphere

Particle Injection, Shocks, Radiation Hazards, Heliospheric Field Structure

SSA-IV: Variability of the Geomagnetic Environment

Geomagnetically Induced Currents (GIC), Geomagnetic Storms, Substorms

SSA-V: Dynamics of the Global Ionosphere and Plasmasphere

Electron Density Profile, Total Electron Content, Storm Time Dynamics, Traveling Ionospheric Disturbances, Plasmasphere Refilling

Strategic Science Areas (SSAs)

SSA-VI: Ionospheric Irregularities

Scintillation, Polar Cap Absorption, Plasma Instabilities, Radio Wave Propagation

SSA-VII: Composition and Energetics of the Neutral Upper Atmosphere

Atmospheric Drag, Heating and Cooling, Waves and Tides

SSA-VIII: Radiation and Particle Environment from Near Earth to Deep Space

Radiation Damage, Human Exposure, Spacecraft Charging, Radiation Belts, Plasma Sheet, Heliospheric Energetic Particles

SSA-IX: Solar Impacts on Climate

Solar Irradiance, Energetic Particle Precipitation, Coupled Chemical and Dynamical Response of Atmosphere, Ozone Layer

SSA-X: Stellar Impacts on Planetary Habitability

Atmospheric Depletion and Stripping, Magnetospheric Shielding, Stellar Winds, Flares and Mass Ejections

Selected FSTs

2022: https://lwstrt.gsfc.nasa.gov/images/pdf/roses/B.5_NNH22ZDA001N-LWS.pdf

- Beyond F10.7: Quantifying Solar EUV Flux and its Impact on the Ionosphere - Thermosphere - Mesosphere System
- Coupling of the Solar Wind Plasma and Energy to the Geospace System

2021: https://lwstrt.gsfc.nasa.gov/images/pdf/roses/NNH21ZDA001N.pdf

- Impact of Terrestrial Weather on the Ionosphere-Thermosphere
- Magnetic Origins of the Corona and Inner Heliosphere
- Understanding the Large-Scale Evolution of the Solar Wind
- Pathways of Cold Plasma through the Magnetosphere

Draft Focused Science Topic Write-ups from the 2020 Community Inputs

1. Connecting Space Weather and Thermospheric Composition
2. Impact of Terrestrial Weather on the Ionosphere-Thermosphere
3. Multi-scale High-Latitude Forcing on Ionosphere-Thermosphere System
4. Understanding Ionospheric Conductivity and Its Variability
5. Beyond F10.7: Quantifying Solar EUV Flux and Its Impact on the Ionosphere-Thermosphere-Mesosphere System
6. Solar Eclipses as a Naturally Occurring Ionosphere-Thermosphere Laboratory
7. Ion-Neutral Coupling in the Ionosphere-Thermosphere system
8. Pathways of Cold Plasma through the Magnetosphere Pathways of Cold Plasma through the Magnetosphere
9. Connecting Auroral Phenomena with Magnetospheric Phenomena
10. Coupling of the Solar Wind Plasma and Energy to the Geospace System
11. Synergistic View of the Global Magnetosphere

The full list of topics that were developed from the last set of community input on FSTs by the previous LPAG committee in 2020 are available in the final report of that committee at: https://lwstrt.gsfc.nasa.gov/assets/docs/lpag/LPAG_2020_Report.pdf

Draft Focused Science Topic Write-ups from the 2020 Community Inputs (cont.)

12. Understanding Space Weather Effects and Developing Mitigation Strategies for Human Deep Space Flight
13. Evolution of Coronal Mass Ejections in the Corona and Inner Heliosphere
14. Physical Processes Responsible for the Birth and Evolution of the Solar Wind
15. Understanding the Large-Scale Evolution of the Solar Wind throughout the Heliosphere through the Solar Cycle
16. Solar Flare Energetic Particles and Their Effects in Large Solar Energetic Particle Events
17. Understanding the Transport Processes of Solar Energetic Particles from Their Origins to the Entire Inner heliosphere
18. Extreme Solar Events — Probabilistic Forecasting and Physical Understanding T
19. Towards a Quantitative Description of the Magnetic Origins of the Corona and Inner Heliosphere
20. Understand Energy Partition and Energy Release Processes in Eruptive Events
21. Atmospheric Evolution and Loss to Space in the Presence of a Star
22. Stellar Impact and Extreme Activity on Exoplanetary Atmospheric Loss and Habitability

Community Input Solicitation
Due Date: July 21, 2023

- **The LPAG EC is soliciting community input to aid in the development of the next cycle of FSTs that will feed into the LWS ROSES science calls for 2021 and beyond.**

  - Suggested science topics should be organized around achieving the goals set out in the recently revised Strategic Science Areas* (SSAs): https://lwstrt.gsfc.nasa.gov/strategic-science-areas-ssas

  - Enter **new FST suggestions** via https://lwstrt.gsfc.nasa.gov/communityinput/input/

  - View and Comment on **new and rollover FST community input** via https://lwstrt.gsfc.nasa.gov/communityinput/viewinput/2023/

    - Community input regarding updates to the rollover topics as well as the newly suggested topics is welcome through this View Input and Comment page.