Soliciting Community Input*

to NASA's Living With A Star Program

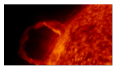
for Focused Science Topics (FSTs)

https://lwstrt.org/communityinput/input/

https://lwstrt.org/communityinput/viewinput/2023/

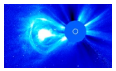
**** This community input will be used to influence the FSTs for ROSES LWS solicitations in 2024 and beyond.***

Outline



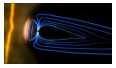
i. Introduce the LWS Program Analysis Group.

ii. Brief overview of Strategic Science Areas and Focused Science Topics.



iii. Review the 2021 and 2022 solicited FSTs.

iv. Review the remaining FSTs for which we are soliciting comments.



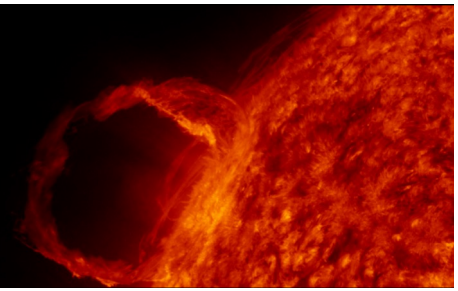
v. Introduce the website for inputting new FST ideas and comments on the remaining FSTs.

vi. Describe the Executive Committee's process for crafting new FSTs from these inputs.

vii. Brief overview of how NASA uses the FSTs.

viii. Q&A.

NASA Living with a Star Program Analysis Group



LPAG Purpose:

The NASA Living with a Star (LWS) Program Analysis Group (LPAG) serves as a community-based interdisciplinary forum for soliciting and coordinating community input for Living with a Star objectives and for examining the implications of these inputs for architecture planning, activity prioritization and future exploration.

LWS Program Ex Officio:

Simon Plunkett, *NASA HQ*
Madhulika Guhathakurta, *NASA HQ*
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Executive Committee (EC) Co-Chairs:

Sabrina Savage, *NASA MSFC*
Anthea Coster, *MIT Haystack Observatory*

EC Members:

Ian Cohen, *Space Science Institute*
Robert McCoy, *University of Alaska-Fairbanks*
Olga Verkhoglyadova, NASA JPL
Ryan McGranaghan, *NASA JPL*
Fang Guo, *Los Alamos National Laboratory*
Heather Elliott, *Southwest Research Institute*
Alexei Pevtsov, *Los Alamos National Laboratory*
Thomas Immel, Space Sciences Laboratory, UC Berkeley
Chuanfei Dong, *PPPL Princeton University*
Angelos Vourlidas, *JHU APL*
Shasha Zou, *University of Michigan*

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

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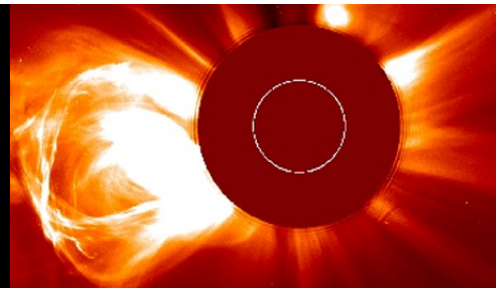
Strategic Science Areas & Focused Science Topics



SSAs are long-term targeted areas of system science to guide LWS activities. SSAs encapsulate the overarching goals for the overall LWS Science program, which supports physics-based enabling science to benefit life and society.

In December 2019*, the LPAG EC finalized a revised list of SSAs**.

I. Origins and Variability of Global Solar Processes
II. Solar Eruptive and Transient Heliospheric Phenomena
III. Acceleration and Transport of Energetic Particles in the Heliosphere
IV. Variability of the Geomagnetic Environment
V. Dynamics of the Global Ionosphere and Plasmasphere
VI. Ionospheric Irregularities
VII. Composition and Energetics of the Upper Neutral Atmosphere
VIII. Radiation and Particle Environment from Near Earth to Deep Space
IX. Solar Impacts on Climate
X. Stellar Impacts on Planetary Habitability

***2019 LPAG EC Report:** https://lwstrt.gsfc.nasa.gov/assets/docs/lpag/LPAG_EC_report_2019_12_31.pdf | ****SSAs:** https://lwstrt.gsfc.nasa.gov/strategic-science-areas-ssas

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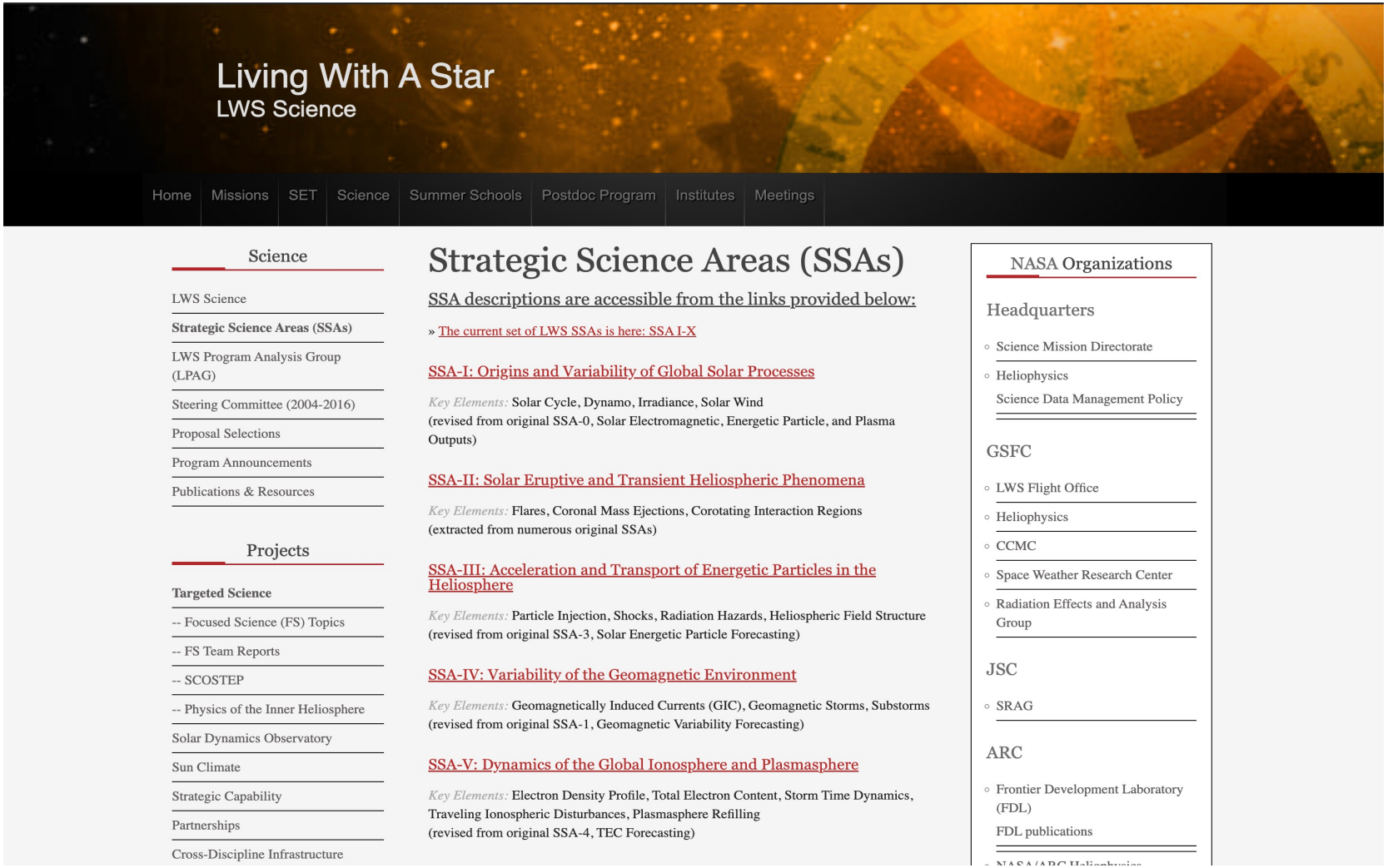

SSA-I: Origins and Variability of Global Solar Processes

Key Elements: Solar Cycle, Dynamo, Irradiance, Solar Wind

Executive Summary

The goal of this SSA is to derive a better understanding, leading to a predictive capability, of the processes that drive the formation, interaction, and emergence of magnetic flux systems from within the solar interior, and of the processes that generate the background particle (solar wind) and radiation (irradiance) outputs of the Sun on time scales longer than transient events.

Scope

The properties of the solar interior are required as constraints for investigations of the solar magnetism that lies at the heart of our interaction with the Sun. Largely masked from direct observation, the feedback between the solar magnetic field and large-scale flows within the solar interior drive the persistent modulation of our star's electromagnetic, energetic particle, and plasma outputs that in turn drive variability throughout the space environment and the upper terrestrial atmosphere. Characterizing the properties of the solar convective interior remains a significant challenge and yet an understanding of these properties is needed in order to predict long-term solar inputs to the space environment and Earth's atmosphere. Also, it is necessary to understand the mechanisms that convert magnetic energy into enhanced irradiance, coronal heating, and solar wind acceleration, so that adequate forecasting capabilities can be developed.

The "unusual" temporal extension and depth of the 2009 solar minimum, in addition to the episodic but relatively subdued output of Solar Cycle 24, have underlined deficiencies in established theories. These conceptual roadblocks have placed a premium on observational investigations of solar interior structure and understanding large-scale evolutionary patterns visible in the historical data such as the "torsional oscillation" and even the "given" patterns of differential rotation, as well as meridional circulation. Furthermore, measurements of solar wind properties have indicated that the wind acceleration, heating and ionization mechanisms were also affected by the depth of the 2009 minimum. The causes of such changes need to be understood and their effects on the background solar wind need to be established.

SSAs: https://lwstrt.gsfc.nasa.gov/strategic-science-areas-ssas

Each SSA descriptions includes:

Scope, Models, Observations, Predictive Goals, Measures of Success, Types of Investigations

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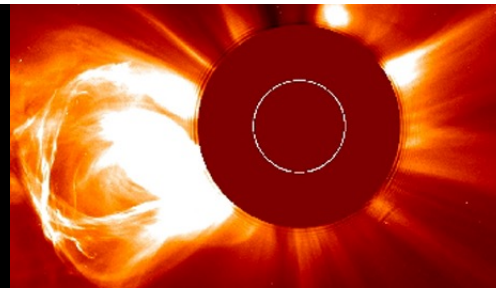
Strategic Science Areas & Focused Science Topics



FSTs are one of the major ways the community can influence NASA research topics.
The topics we are soliciting now will contribute to the ideas used by NASA HQ for 2+ years to craft the final ROSES LWS solicitations.

In 2020, the LPAG EC finalized **22** Focused Science Topics topic write-ups:

- 6 of these FSTs have been used to construct the ROSES 2021 and 2022 calls.
- 16 potential FSTs remain, and we solicit your comments on these remaining topics.
- For 2023, the primary focus of the LPAG EC is to solicit input for the development of an updated set of draft FSTs.

➢ **New FSTs will be used for ROSES 2024 and beyond.**

***2020 LPAG EC Report: https://lwstrt.gsfc.nasa.gov/assets/docs/lpag/LPAG_2020_Report.pdf**

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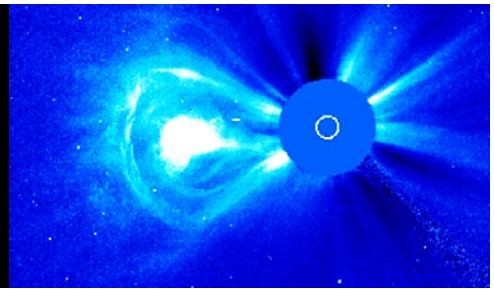
2021/2022 Selected FSTs



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

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

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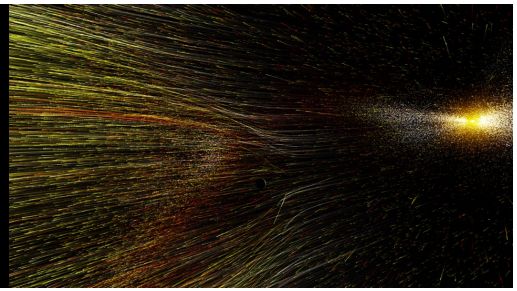
Remaining / Rollover 2020 FSTs



1. Connecting Space Weather and Thermospheric Composition
2. Multi-scale High-Latitude Forcing on Ionosphere-Thermosphere System
3. Understanding Ionospheric Conductivity and Its Variability
4. Solar Eclipses as a Naturally Occurring Ionosphere-Thermosphere Laboratory
5. Ion-Neutral Coupling in the Ionosphere-Thermosphere system
6. Connecting Auroral Phenomena with Magnetospheric Phenomena
7. Synergistic View of the Global Magnetosphere
8. Understanding Space Weather Effects and Developing Mitigation Strategies for Human Deep Space Flight
9. Physical Processes Responsible for the Birth and Evolution of the Solar Wind
10. Solar Flare Energetic Particles and Their Effects in Large Solar Energetic Particle Events

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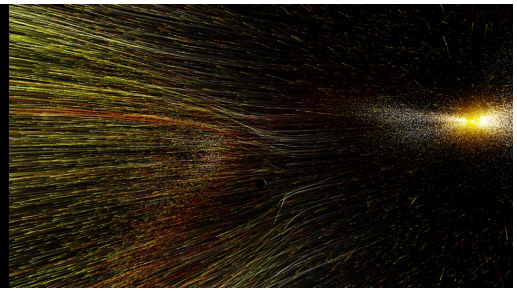
Remaining / Rollover 2020 FSTs

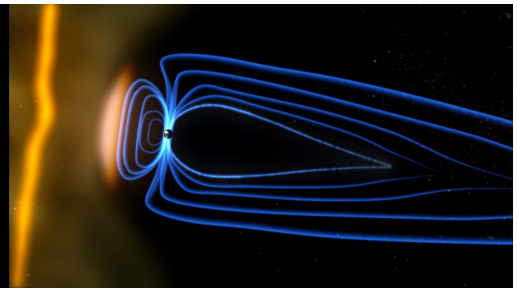


11. Understanding the Transport Processes of Solar Energetic Particles from Their Origins to the Entire Inner Heliosphere
12. Extreme Solar Events - Probabilistic Forecasting and Physical Understanding
13. Towards a Quantitative Description of the Magnetic Origins of the Corona and Inner Heliosphere
14. Understand Energy Partition and Energy Release Processes in Eruptive Events
15. Atmospheric Evolution and Loss to Space in the Presence of a Star
16. Stellar Impact and Extreme Activity on Exoplanetary Atmospheric Loss and Habitability

Note: Community input from years prior to 2020 were included in the development of the 2020 FSTs and are therefore carried over.

Community Input Solicitation

Due Date: July 21 , 2023



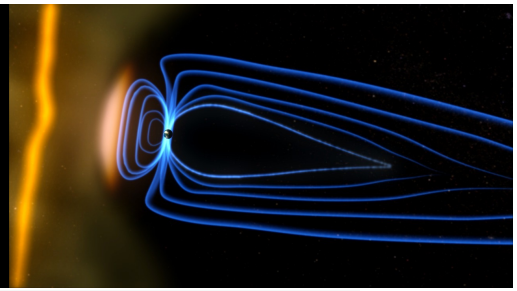
The LPAG EC is soliciting community input to aid in the development of the next cycle of FSTs that will feed into the LWS ROSES science calls for 2024 and beyond.

- Suggested science topics should be organized around achieving the goals set out in the Strategic Science Areas* (SSAs).
- Enter **new FST suggestions** via https://lwstrt.org/communityinput/input/.
- View and Comment on **new and rollover FST community input** via https://lwstrt.org/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.

***SSAs:** https://lwstrt.gsfc.nasa.gov/strategic-science-areas-ssas

Community Input Solicitation

Due Date: July 21, 2023



New FST input page (1/4)

Community Input for Focused Science Topics

Topic Title

Discipline:

select all that apply

- [ ] Solar
- [ ] Heliospheric
- [ ] Magnetospheric
- [ ] Ionosphere-Thermosphere-Mesosphere (ITM)
- [ ] Sun-Climate Connection
- [ ] Sun-as-a-Star
- [ ] Other (*please clarify in Comment section below*)

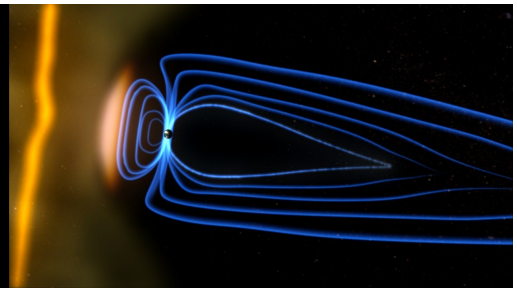
Science goals and descriptions of suggested Focused Science Topic

Example input: Specific FST goals, timeliness, knowledge gaps to be filled, potential user community

New FST Input: https://lwstrt. org/communityinput/input/

Community Input Solicitation

Due Date: July 21, 2023



New FST input page (2/4)

Envisioned Focused Science Topic Implementation Strategy:

select most relevant options

- [ ] Data Analysis
- [x] Data Model Comparison
- [ ] Database Development
- [ ] Simulations
- [ ] Theory and Model Development
- [ ] Tools and Analysis Techniques
- [ ] Other Investigations

Please elaborate on how the proposed FST can be implemented successfully

Measures of success:

Examples: How relationships may be established and tested; statistical errors may be reduced; or prediction capability may be improved; and what criteria may be devised, etc.

New FST Input: https://lwstrt. org/communityinput/input/

Community Input Solicitation

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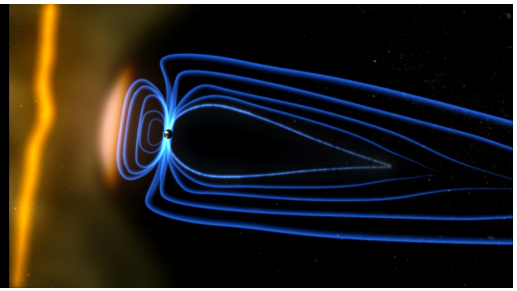


Applicability to NASA Heliophysics and LWS:

Example input: Relevance to and impact on SSAs (see SSAs and LWS 10 Year Vision Report), Heliophysics Decadal Survey goals, etc.

New FST input page (3/4)

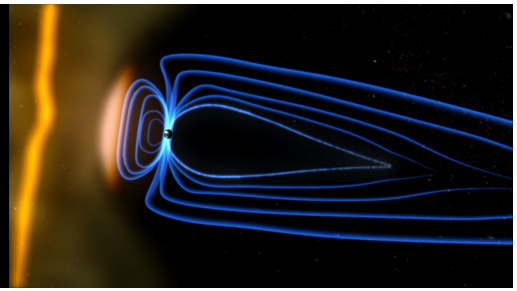
Please identify the LWS-TRT Strategic Science Areas (SSAs) that the suggested research topic will address.

- ☐ SSA-I: Origins and Variability of Global Solar Processes
- ☐ SSA-II: Solar Eruptive and Transient Heliospheric Phenomena
- ☐ SSA-III: Acceleration and Transport of Solar Energetic Particles
- ☐ SSA-IV: Variability of the Geomagnetic Environment
- ☐ SSA-V: Dynamics of the Global Ionosphere and Plasmasphere
- ☐ SSA-VI: Localized Ionospheric Irregularities
- ☐ SSA-VII: Composition and Energetics of the Neutral Upper Atmosphere
- ☐ SSA-VIII: Radiation and Particle Environment from Near Earth to Deep Space
- ☐ SSA-IX: Stellar Impacts on Planetary Habitability
- ☐ SSA-X: Solar Impacts on Climate

New FST Input: https://lwstrt.org/communityinput/input/

Community Input Solicitation

Due Date: July 21, 2023



New FST input page (4/4)

Name

For internal use only. Will not be displayed.

e.g. John Doe

Affiliation

For internal use only. Will not be displayed.

e.g. NASA GSFC

Email

For internal use only. Will not be displayed.

e.g. john.doe@example.com

I'm not a robot

reCAPTCHA
Privacy - Terms

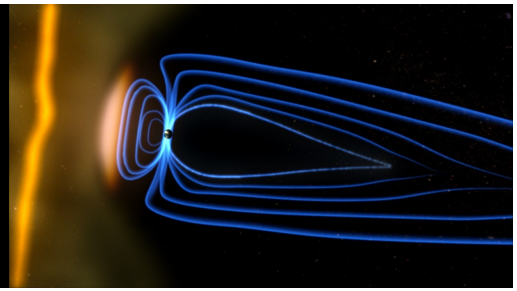
Submit

Note: A delay in the display of input and comments is possible due to IT security reasons.

New FST Input: https://lwstrt.org/communityinput/input/

Community Input Solicitation

Due Date: July 21, 2023



View and Input Page

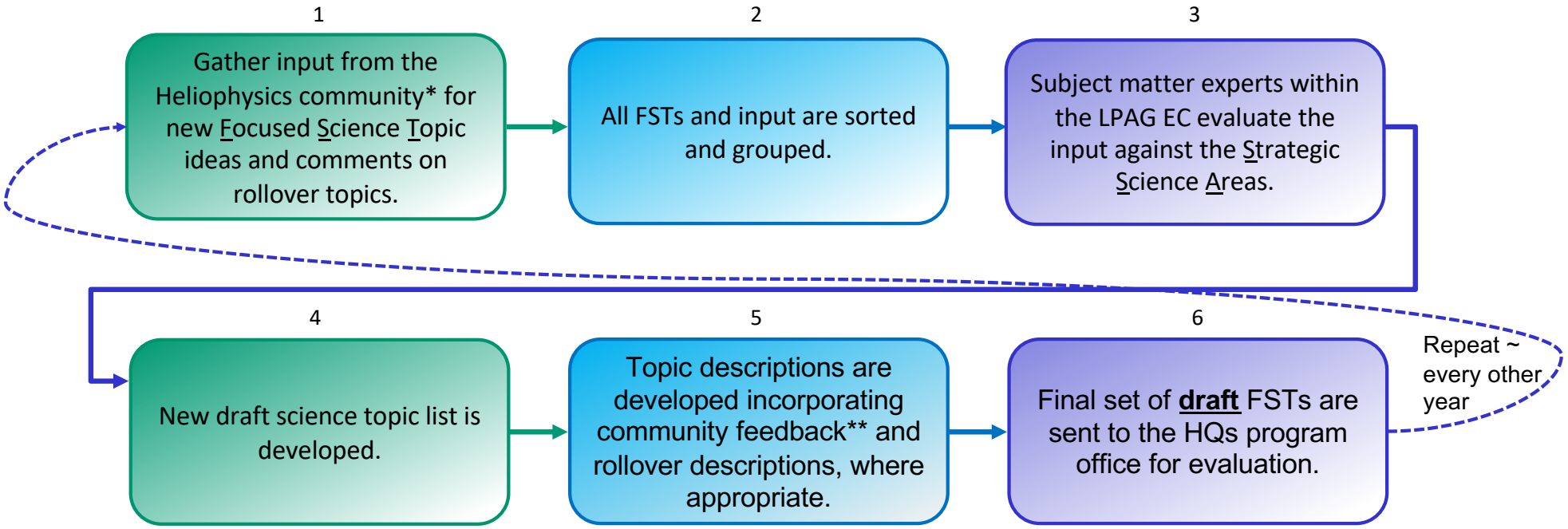
2023 Community Input for FSTs

Commenting is: o

Submission Date	Topic Title	LWS-TRT SSAs	Comments	View / Comment
July 10, 2023	Excitation, propagation, and dissipation of heliospheric plasma waves	SSA-I, SSA-II, SSA-III, SSA-IV, SSA-VI, SSA-VIII		
June 6, 2023	20-3 Multi-scale High-Latitude Forcing on Ionosphere-Thermosphere System	SSA-I, SSA-IV, SSA-V, SSA-VI, SSA-VII		
June 6, 2023	20-6 Solar Eclipses as a Naturally Occurring Ionosphere-Thermosphere Laboratory	SSA-I, SSA-V, SSA-VII		
June 6, 2023	20-7 Ion-Neutral Coupling in the Ionosphere-Thermosphere system	SSA-I, SSA-V, SSA-VII		
June 6, 2023	20-9 Connecting Auroral Phenomena with Magnetospheric Phenomena	SSA-I, SSA-IV, SSA-V, SSA-VI, SSA-VII		
June 6, 2023	20-12 Understanding Space Weather Effects and Developing Mitigation Strategies for Human Deep Space Flight	SSA-I, SSA-I, SSA-II, SSA-III, SSA-IV, SSA-V, SSA-VIII		
June 6, 2023	20-14 Physical Processes Responsible for the Birth and Evolution of the Solar Wind	SSA-I, SSA-I, SSA-II, SSA-III, SSA-IV, SSA-VIII, SSA-IX		
June 6, 2023	20-16 Solar Flare Energetic Particles and Their Effects in Large Solar Energetic Particle Events	SSA-I, SSA-I, SSA-II, SSA-III, SSA-VIII		
June 6, 2023	20-17 Understanding the Transport Processes of Solar Energetic Particles from Their Origins to the Entire Inner Heliosphere	SSA-I, SSA-III, SSA-VIII		
June 6, 2023	20-18 Extreme Solar Events --- Probabilistic Forecasting and Physical Understanding	SSA-I, SSA-I, SSA-II, SSA-III, SSA-IV, SSA-VIII		
June 6, 2023	20-20 Understand Energy Partition and Energy Release Processes in Eruptive Events	SSA-I, SSA-II, SSA-III, SSA-IV		
June 6, 2023	20-21 Atmospheric Evolution and Loss to Space in the Presence of a Star	SSA-I, SSA-I, SSA-II, SSA-IX, SSA-X		
June 6, 2023	20-22 Stellar Impact and Extreme Activity on Exoplanetary Atmospheric Loss and Habitability	SSA-I, SSA-I, SSA-II, SSA-IX, SSA-X	Comments 1	
June 6, 2023	20-1 Connecting Space Weather and Thermospheric Composition	SSA-I, SSA-II, SSA-IV, SSA-V, SSA-VII		

View & Input: https://lwstrt.org/communityinput/viewinput/2023/

LPAG EC FST Development Process



*LPAG EC members can also provide input for topics. | **Community input and LPAG comments are archived on the website.

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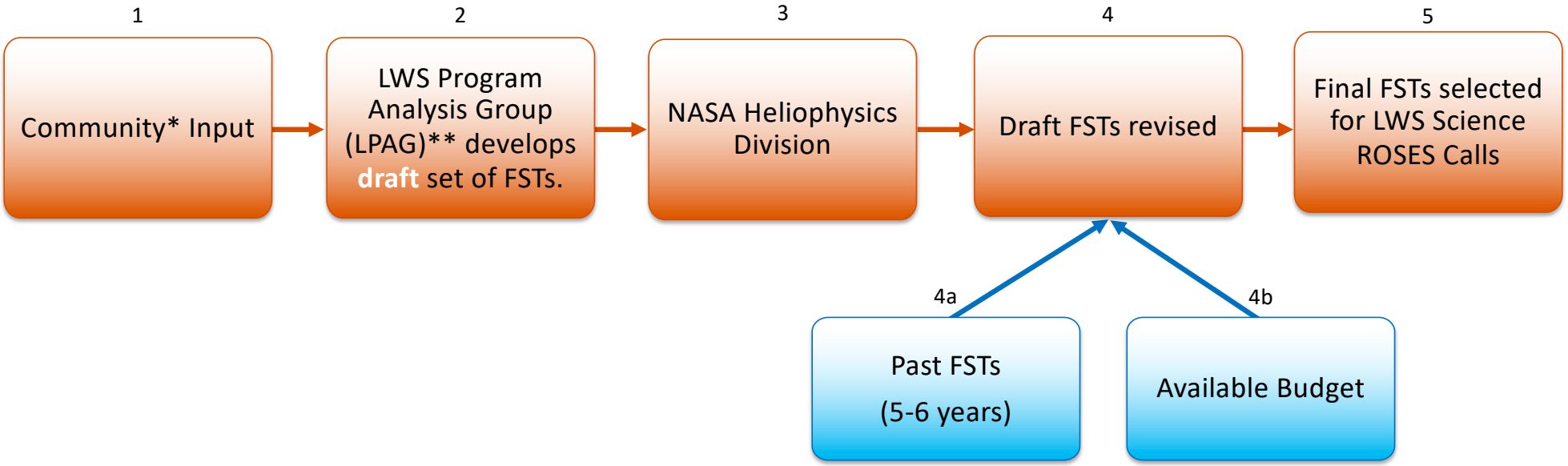
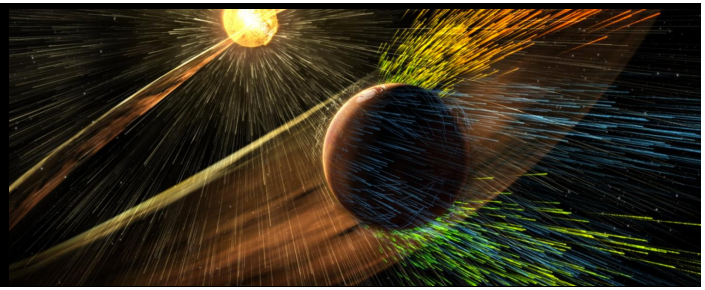
Incorporation of FSTs into ROSES



*Community are LPAG members. | **Acts as Executive Committee. Refer to previous slide.

viii Questions?



This is a chance for you to influence future research opportunities…

Please take advantage of this opportunity!

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