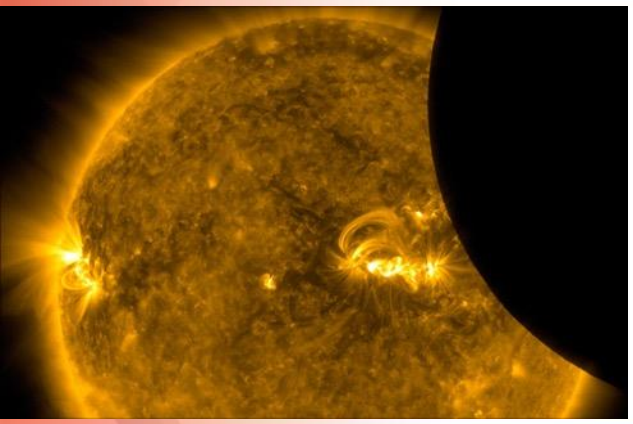
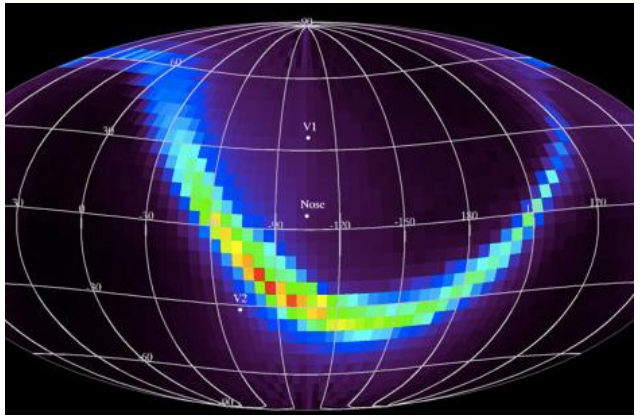
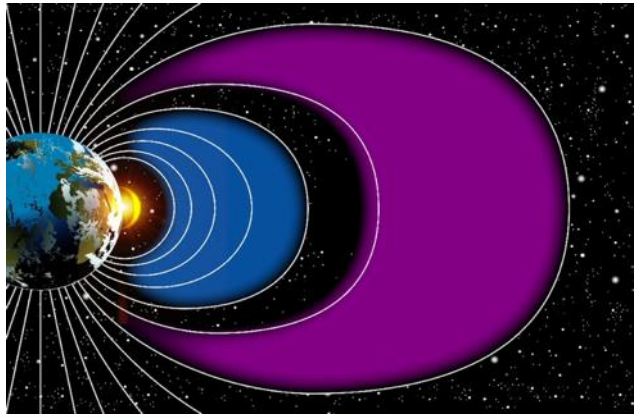
SCIENCE

National Aeronautics and Space Administration







NASA Living With a Star Status: Presentation to HPAC

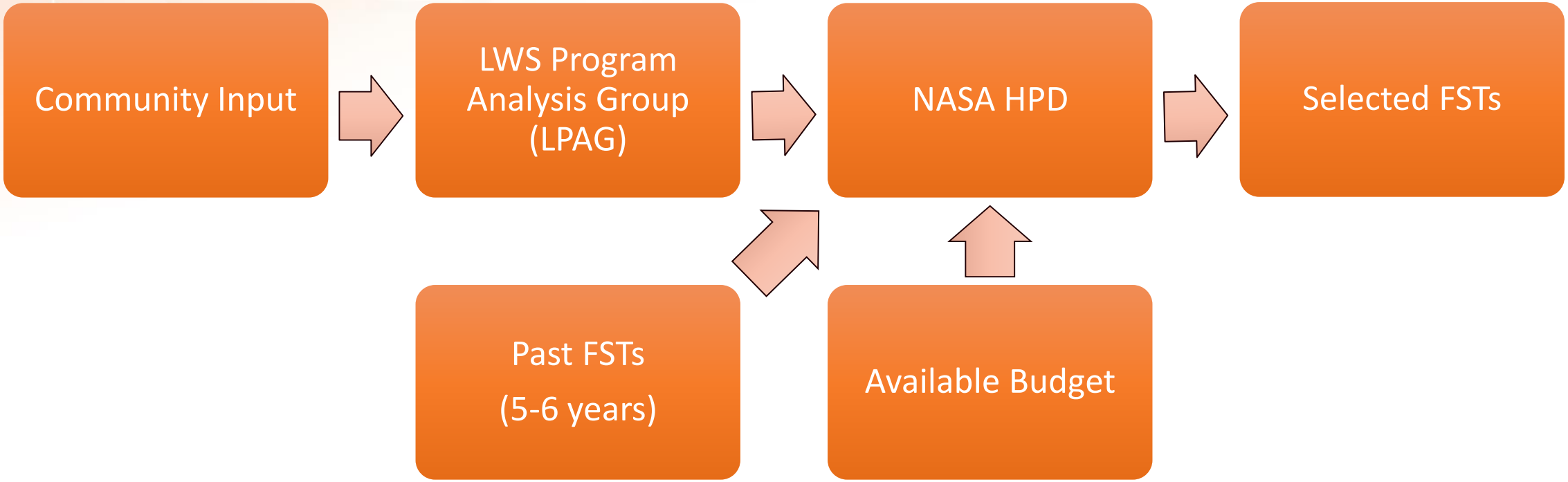
NASA HQ

19 December, 2018

FST Development and Selection Process

Community are LPAG members

Acts as Executive Committee



Draft FSTs and Dates – ROSES 2019

ROSES 2019 Draft FSTs

- The Variable Radiation Environment in the Dynamical Solar and Heliospheric System
- Fast Reconnection Onset
- Magnetospheric and Ionospheric Processes Responsible for Rapid Geomagnetic Changes
- Hemispherical Asymmetries in Magnetosphere – Ionosphere – Thermosphere Coupling Processes: Fundamental Causes and Myriad Manifestations

Important Dates

- ROSES 2019 LWS Amendment: February 2019
- Step 1 Proposals: ~October 2019 – after ROSES 2018 selections
- Step 2 Proposals: ~January 2020

FST #1: Variable Radiation Environment

Goals

- Determine the influence of solar and heliospheric plasma dynamics on high-energy particle radiation environments within the heliosphere
- Determine the influence of major solar eruption events on the high-energy particle environment near Earth and in interplanetary space
- Improve models of cosmic ray modulation in the heliosphere, high-energy particles from major solar eruptions, and Forbush decreases due to extreme CME events.

Applicability to NASA Heliophysics and LWS

- Addresses SSA-0, SSA-3, and SSA-6.

FST #2: Fast Reconnection Onset

Goals

- Establish an understanding of the critical conditions for the onset of fast reconnection at a current sheet in various regimes relevant for heliophysics
- Determine onset criteria for fast reconnection, and how the reconnection speed depends on these various regimes
- Investigate global- and local-scale processes that lead to reconnection in the solar corona, solar wind, and Earth's magnetosphere
- Establish predictive parameters for the onset of reconnection that can be implemented in large-scale MHD codes for the solar corona, solar wind, and Earth's magnetosphere.

Applicability to NASA Heliophysics and LWS

- Addresses SSA-0, SSA-1, SSA-3, and SSA-6.

FST #3: Magnetosphere – Ionosphere Processes Responsible for Rapid Geomagnetic Changes

Goals

- Determine solar wind parameters, magnetospheric conditions, and ionospheric properties that affect the rate of change of the geomagnetic field in the coupled solar wind – magnetosphere – ionosphere system
- Establish a predictive capability for geomagnetically induced current (GIC) events.

Applicability to NASA Heliophysics and LWS

- Addresses SSA-0 and SSA-1.

FST #4: Hemispherical Asymmetries in Magnetosphere – Ionosphere – Thermosphere Coupling

Goals

- Understand the fundamental causes of hemispherical asymmetries in magnetosphere – ionosphere – thermosphere coupling processes
- Determine the drivers of the observed asymmetries and how these drivers interact with each other
- Determine how these asymmetries affect time-dependent changes in TEC and neutral density.

Applicability to NASA Heliophysics and LWS

- Addresses SSA-2 and SSA-4.

Strategic Capabilities

- Strategic Capabilities (SCs) are large-scale models and tools that can test understanding and serve as prototypes for prediction schemes
- SCs were last competed as a NASA – NSF Partnership for Space Weather Modeling in ROSES 2011 (successful proposals funded in CY 2013)
- ROSES 2019 will include a call for SC proposals
- Potential topics for investigation may include (based on 2015 LWS Vision):
  - Derive a model, or coupled set of models, to specify the global neutral density in the heliosphere and its variations over time
  - Derive a unified model of CME propagation, SEP acceleration and transport within the context of realistic models of the corona and inner heliosphere
  - Derive a model, or coupled set of models, to specify the global ion density in the ionosphere and plasmasphere and its variation over time under varying geomagnetic conditions
  - Provide improved specification and prediction of the radiation environment from geosynchronous orbit, through the radiation belts and thermosphere, into the troposphere.

Backup Slides

LWS Science Selections – ROSES 2017

- Proposals were solicited for 4 FSTs:
  - Understanding the Onset of Major Solar Eruptions
  - Toward a Systems Approach to Understanding Energetic Particle Acceleration and Transport on the Sun and in the Heliosphere
  - Ion Circulation and Effects on the Magnetosphere and Magnetosphere – Ionosphere Coupling
  - Understanding Physical Processes in the Magnetosphere – Ionosphere/Thermosphere/ Mesosphere System During Extreme Events
- Proposals were due in February 2018
  - A total of 117 Step 2 proposals were received
- Selections were announced in October 2018
  - 30 proposals (26%) were selected for funding, and organized into 4 FST teams (see next slide).

New FST Teams – ROSES 2017

FST #1: Understanding the Onset of Major Solar Eruptions	FST #2: Toward A Systems Approach to Understanding Energetic Particle Acceleration and Transport	FST #3: Ion Corculation and Effects on the Magnetosphere and Magnetosphere – Ionosphere Coupling	FST #4: Physical Processes in the Magnetosphere – ITM System During Extreme Events
Linton (NRL) - LEAD	Cohen (Cal Tech) - LEAD	Kistler (UNH) - LEAD	Fuller-Rowell (UC Boulder) - LEAD
Antiochos (GSFC) Barnes (NWRA) Fan (UCAR) Lynch (UC Berkeley) Savcheva (SAO) Scherrer (Stanford)	Dayeh (SWRI) Gary (NJIT) Lario (JHU/APL) Li (UAH) St. Cyr (GSFC) Vourlidas (JHU/APL) Zhao (Florida Tech)	Chi (UCLA) Jahn (SWRI) Jordanova (LANL) Lyon (Dartmouth) Sanchez (SRI Int'l)	Bazulukova (UMD) Coster (MIT) Datta-Barua (Illinois Tech) Kang (CUA) Oppenheim (BU) Pulkkinen (GSFC) Siskind (NRL) Sitnov (JHU/APL)

Enhancing the Effectiveness of Multi-Team Science

- Identify a shared overarching goal or set of goals that is central to the FST, is compelling to all participants, and may be attainable within the timeframe of the project
- Identify roles and responsibilities for each team and team member
- Develop team charters that lay out the scope of work for each team and achieve consensus on the approach.

- Be aware of the characteristics of effective teams (and teams of teams), and the challenges of working in teams (particularly diverse, geographically separated virtual teams)
- See the 2015 NRC Report on *Enhancing the Effectiveness of Team Science*.

LWS Science Solicitation – ROSES 2018

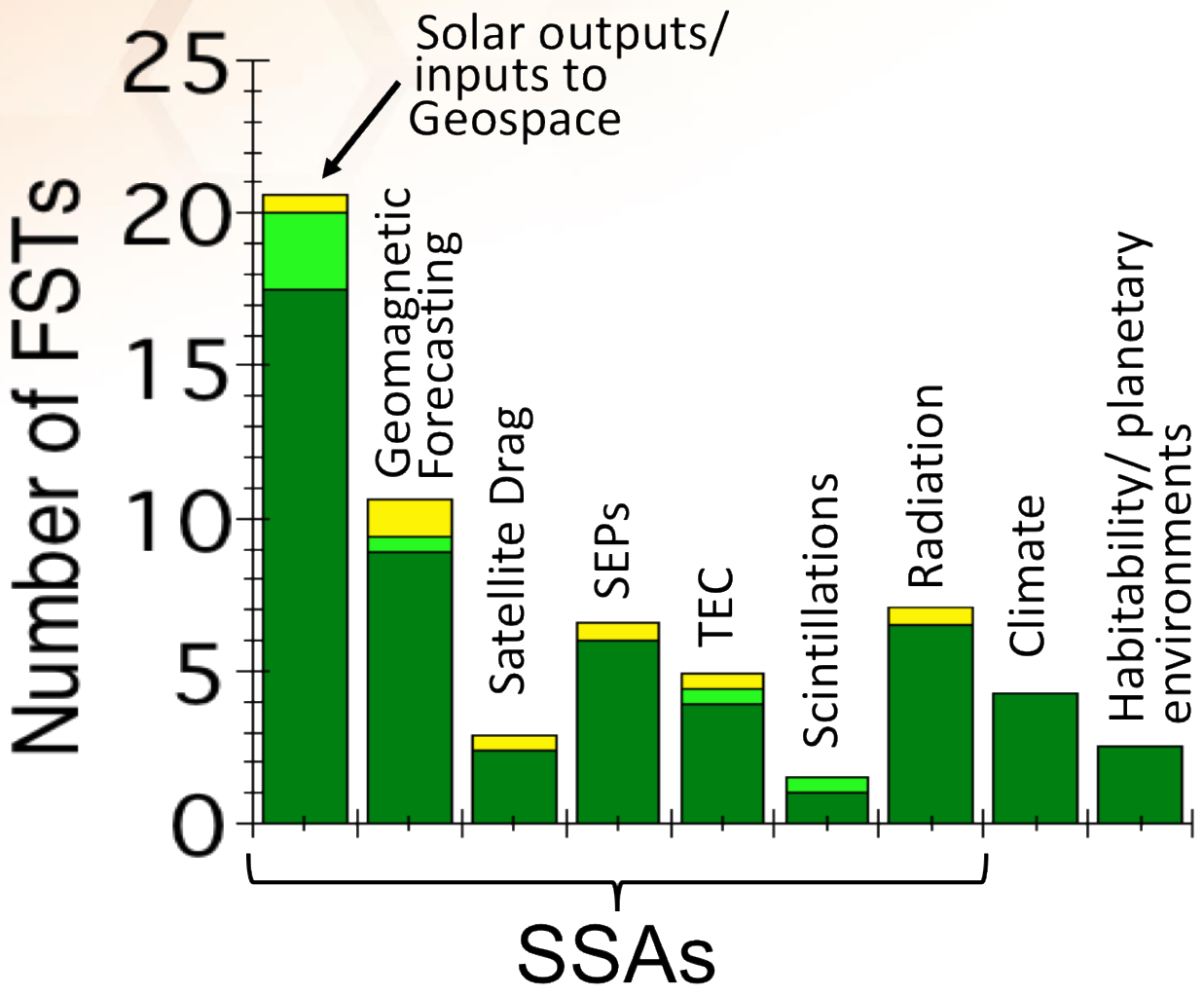
ROSES 2018 FSTs

- Understanding Global-Scale Solar Processes and their Implications for the Solar Interior
- Origins, Acceleration and Evolution of the Solar Wind
- Understanding the Response of Magnetospheric Plasma Populations to Solar Wind Structures
- Mid-Latitude and Equatorial Dynamics of the Ionosphere – Thermosphere System

Important Dates

- ROSES 2018 LWS Amendment: December 14, 2018
- Step 1 Proposals: February 14, 2019
- Step 2 Proposals: April 11, 2019

LWS FSTs Related to SSAs (2004 – 2019)



Total 61 FSTs
2004-2019

Note: Some FSTs fall under multiple SSAs. Counted as fractional FSTs that sum to 1.0