FST Development and Selection Process

Community are LPAG members

Acts as Executive Committee

Community Input → LWS Program Analysis Group (LPAG) → NASA HPD → Selected FSTs

Past FSTs (5-6 years) → Available Budget
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.
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

<table>
<thead>
<tr>
<th>FST #1: Understanding the Onset of Major Solar Eruptions</th>
<th>FST #2: Toward A Systems Approach to Understanding Energetic Particle Acceleration and Transport</th>
<th>FST #3: Ion Corculation and Effects on the Magnetosphere and Ionosphere Coupling</th>
<th>FST #4: Physical Processes in the Magnetosphere – ITM System During Extreme Events</th>
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<tbody>
<tr>
<td>Linton (NRL) - LEAD</td>
<td>Cohen (Cal Tech) - LEAD</td>
<td>Kistler (UNH) - LEAD</td>
<td>Fuller-Rowell (UC Boulder) - LEAD</td>
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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)

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

Total 61 FSTs 2004-2019

Solar outputs/inputs to Geospace

- Geomagnetic Forecasting
- Satellite Drag
- SEPs
- TEC
- Scintillations
- Radiation
- Climate
- Habitability/planetary environments