Science Advances Needed to Advance Space Weather Capabilities

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A few selections from 2012 and 2014 TR&T Steering Committee review (July 2014 and Oct 2015):

Fast magnetic reconnection

- Solar environment: explore explosive energy release, particle energization
- Magnetosphere environment: incorporate Hall and electron pressure tensor terms, explore driver of mass, momentum, and energy

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Magnetic Field Modeling

- Predict solar flare eruption – improve incorporation of photospheric vector fields and flows

- Predict solar wind magnetic field – improve solar synoptic maps, include key effects of polar fields (Solar Orbiter)

- Predict CME vector magnetic field at Earth – improve incorporate of B field in predictive ICME models

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Model integration

- Integrated studies of magnetosphere-thermosphere-ionosphere system.

- Synthesis of global magnetospheric models and particle models for predicting energization and loss of magnetospheric particles, generation of ionospheric electric fields.

Possible Approaches for Achieving these Space Weather Science Capabilities

- NASA LWS Focused Science Topics
  - Science investigations of large scale, cross-disciplinary space weather science questions.
  - 2015 TSC report: ask to work with users and modeling centers, such as CCMC.

- NASA LWS Strategic Capabilities
  - Development and integration of first-principles-based models of the coupled Sun-Earth system.
  - Deliver finished product to community via CCMC or other source.

- NASA / NSF Science Centers
  - To tackle they key science problems of solar and space physics that require multi-disciplinary teams of theorists, observers, modelers and computer scientists. (2013 Heliophysics Decadal Survey).

The LWS needs you

Submit and comment on LWS focused science and strategic capability topics by April 26, for ROSES 2017
lwstrt.gsfc.nasa.gov/steering-committee

Science topics should be organized around achieving the goals set out in the strategic science areas articulated in the LWS Ten Year Vision (http://lwstrt.gsfc.nasa.gov/images/pdf/LWS_10YrVision_Oct2015_Final.pdf),
Physics-based Understanding to Enable Forecasting of:

• SSA-0, Solar Electromagnetic, Energetic Particle, and Plasma Outputs Driving the Solar System Environment and Inputs to Earth's Atmosphere
• SSA-1, Geomagnetic Variability
• SSA-2, Satellite Drag
• SSA-3, Solar Energetic Particle
• SSA-4, Total Electron Content
• SSA-5, Ionospheric Scintillation
• SSA-6, Radiation Environment

The structure of a topic should indicate a target description, the targeted SSAs, goals and measures of success, types of investigations, interactions with user communities and expected deliverables.
Input may be entered through the LWS TR&T website:
http://lwstrt.gsfc.nasa.gov/input
And view/comment on submitted topics:
http://lwstrt.gsfc.nasa.gov/steering-committee/view-community-input