Masha's Metric Meeting

~~Tracking understanding~~

~~Tracking Progress~~

Tracking Progress towards LWS goals

The goal of the Living With a Star (LWS) Program is to develop the scientific understanding needed for the United States to effectively address those aspects of the connected Sun-Earth system that may affect life and society. The LWS Targeted Research and Technology (TR&T) program element solicits proposals leading to a physics-based understanding of the integral system linking the Sun to the Earth both directly and via the heliosphere, magnetosphere, and ionosphere. The program's objectives can be achieved by data analysis, theory and modeling, and the development of tools and methods (e.g., software). **LWS is a crosscutting program whose goals and objectives relate to NASA's Exploration Initiative, as well as NASA's Strategic Enterprises**,namely (and in no priority order):

- *Aeronautics* - LWS characterizes those aspects of the Earth's radiation belt environment needed to design reliable electronic subsystems for use in air and space transportation systems;
- *Biological and Physical Research* – LWS defines the radiation environment beyond the Earth's magnetosphere to enable exploration of interplanetary space by humans;
- *Earth Science* - LWS improves our understanding of the effects of solar variability and disturbances on terrestrial climate change;
- *Exploration Systems and Space Flight* - LWS develops the knowledge needed to predict solar energetic particle events that affect the safety of humans and technology in space; and
- *Space Science* - LWS quantifies the physics, dynamics, and behavior of the Sun-Earth system over the 11-year solar cycle.

The LWS TR&T Science Definition Team (SDT) Report, 2003, located at URL: **http://lwstrt.gsfc.nasa.gov/images/pdf/TRT_SDT_Report.pdf** identified particular scientific topics to be addressed using measurements by the LWS space flight missions, as well as data from other missions, and also by employing theory and modeling efforts. Among these topics are: the role of solar variability in climate and in stratospheric chemistry; ionospheric perturbations and scintillations; neutral thermosphere composition and density; geomagnetically-induced currents; energetic particles in the magnetosphere and atmosphere; and radiation associated with explosive events on the sun. The hazards to and effects on society, space-based systems, and human space flight are of particular importance to this program. Significant progress toward quantitative understanding and predictive capability with respect to these problems will require large-scale, integrated modeling activities. Recognizing the need for activities that would be broader and more sustained than those that can be supported by a traditional NASA grants program, the TR&T Science Definition Team Report recommended that "…large modeling activities that address coupling across traditional science domains in the Sun-Earth chain specifically be included as strategic capabilities." The TR&T SDT also recommended the formation of a TR&T Steering Committee in order to update periodically the designated strategic capabilities for future NRAs. The report of this Steering Committee is available at the Web site given above.
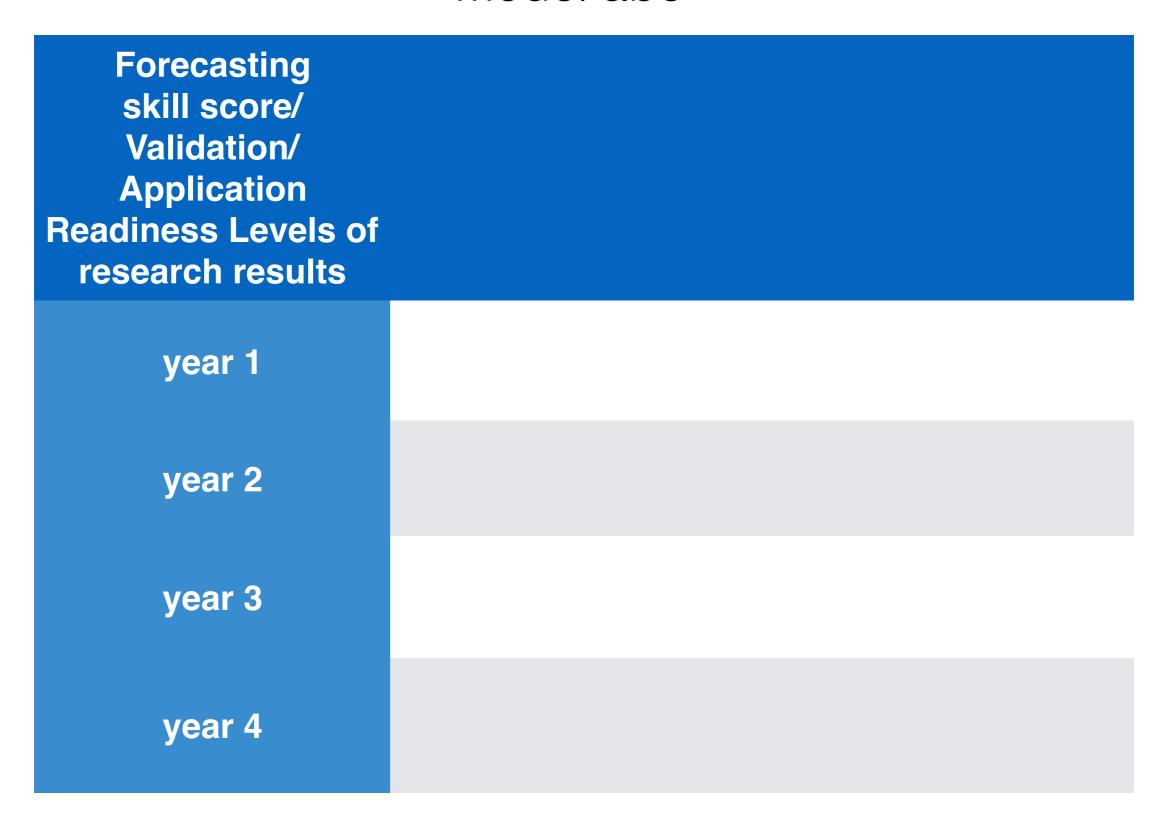
LWS Strategic Science Areas

SSA - 0, Drivers of solar system environment: formation, emergence of magnetic flux systems in the solar interior, impact on geospace/atmosphere

SSA - 1, Geomagnetic Variability

SSA - 2, Satellite Drag

SSA - 3, Solar Energetic Particle

SSA - 4, Total Electron Content (TEC)

SSA - 5, Ionospheric Scintillation

SSA - 6, Radiation Environment

Ability to forecast accurately.

Lets us know how well the model works and indirectly if we've included all "important" physics.

Model abc

Forecasting skill score/ Validation/ Application Readiness Levels of research results	
year 1	
year 2	
year 3	
year 4	

Physics included in the model

Although including a set of specific physical processes may not produce the most accurate model, it will ultimately give us a better more complete model and understanding of the system.

Model abc

physical process/ mechanism	
year 1	
year 2	
year 3	
year 4	

Measure/show progress in
1) Research understanding -> the FST's themselves?
2) ==research to operations continuum -> LWS==
3) operations.

- Need to identify science questions that will advance forecasting (near, intermediate, and distant future)
- Need to identify and address societal needs
- Need to identify the science questions that will advance critical understanding

Try to data mine what LWS has already done/contributed to find perhaps generic metrics to track understanding.

have a metric for hybrid improvements of empirical -> physics modeling

Goals for this group:
1) Need for a summary slide that can be taken and explained to a non-scientist/politician.
2) International working workshop to get community input
    1) Invitation only?
    2) Application based?
    3) Open to all no questions asked?
3) Others?

Potential session outlines?

Higher level sessions than SSA's or FST's

How do you measure progress for:
-> scientific understanding
-> scientific forecasting
-> science benefits for societal needs
others?

SWPC proposal for O2R facility

[SWAP Action 5.6.2]
Modeling O2R
Notional Concept of Operations

Future Modeling O2R