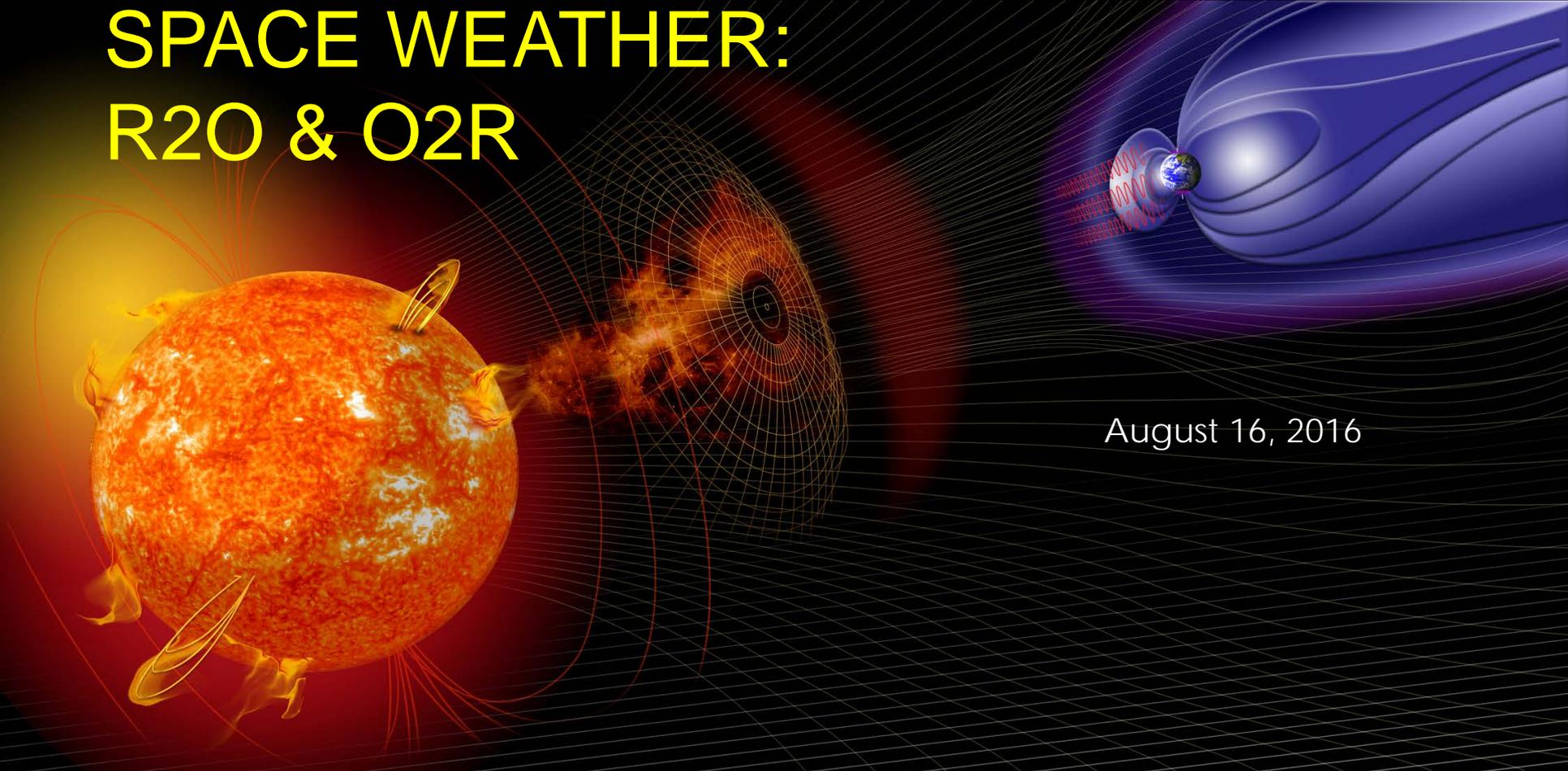


SPACE WEATHER: R20 & O2R



August 16, 2016

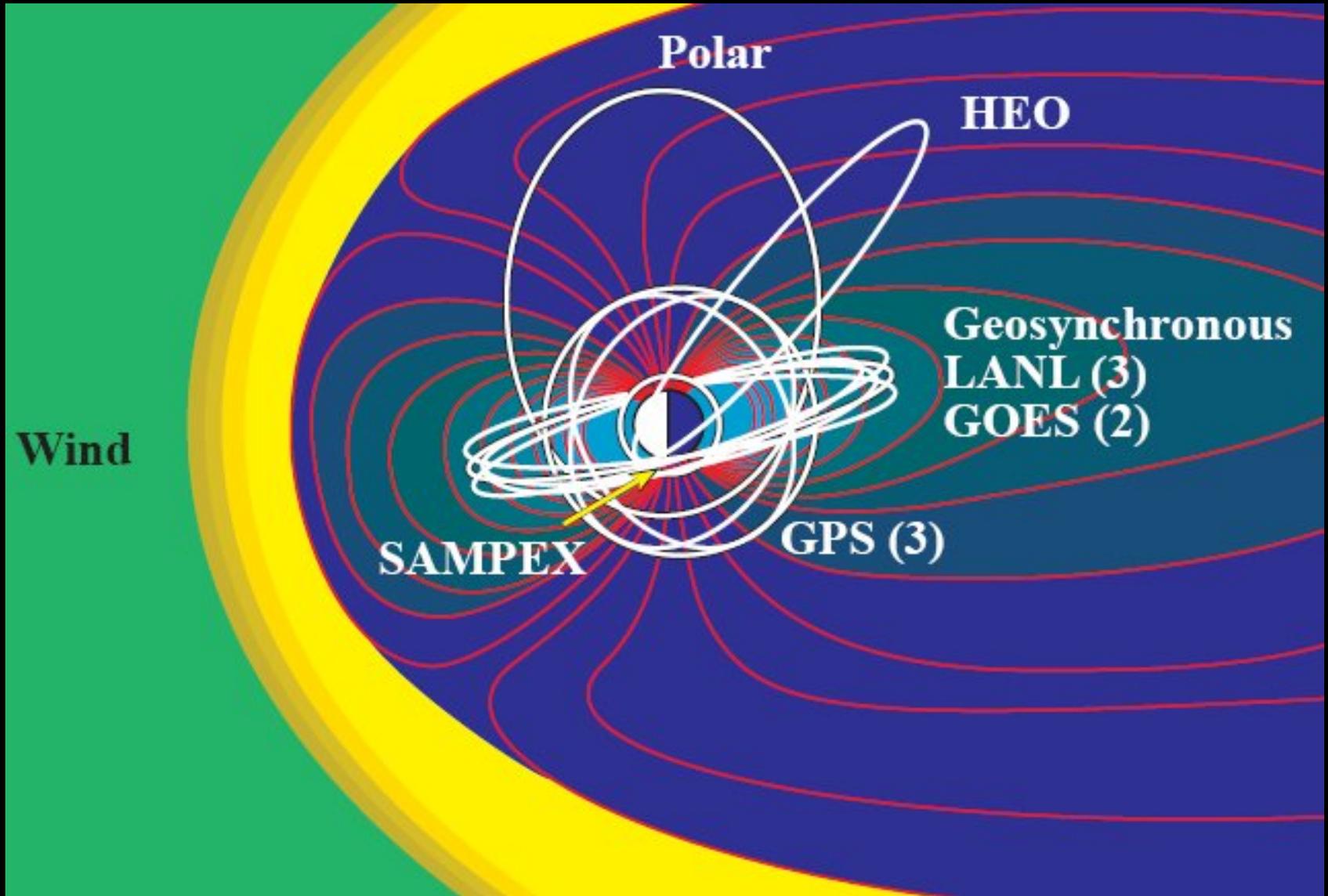
D. N. Baker

Laboratory for Atmospheric and Space Physics
University of Colorado - Boulder

Experience Base

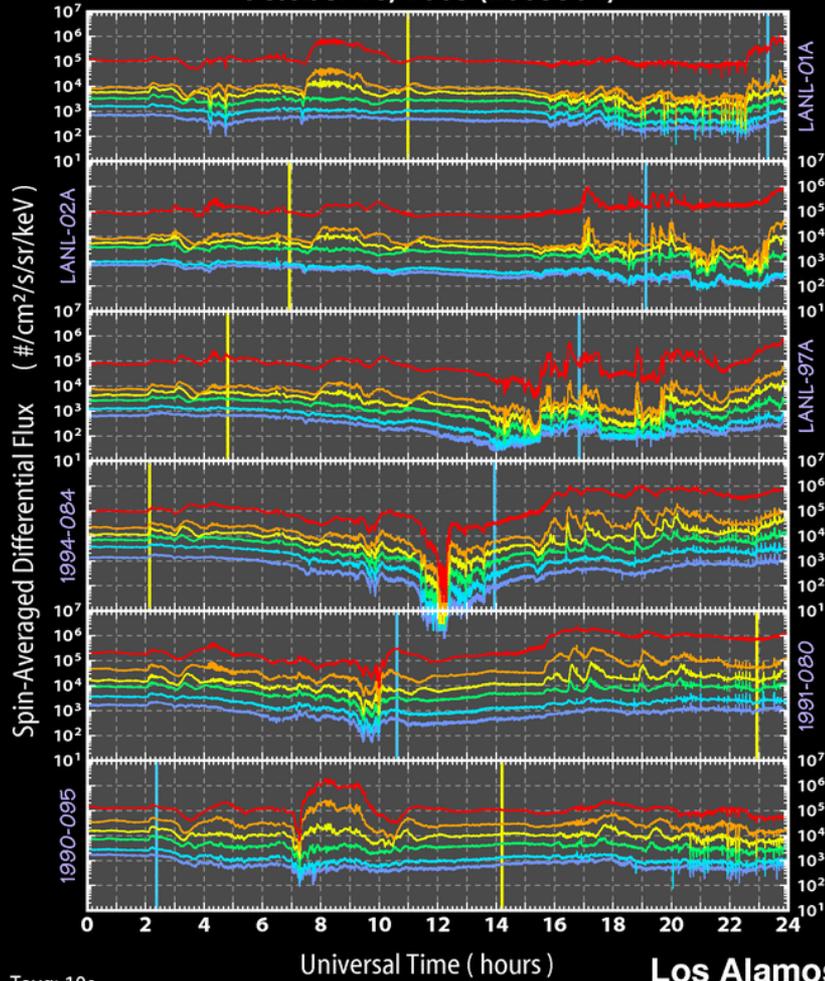
- Group Leader: Los Alamos National Laboratory
 - Geostationary orbit data lead
 - GPS instruments and science
- Laboratory Chief: NASA Goddard Space Flight Center
 - Science Center (heliophysics) leadership
 - Project and mission scientist (SMEX, ISTP,...)
- Institute Director: University of Colorado/LASP
 - Science management
 - Project leadership (e.g., CISM)
 - Lead investigator (SAMPEX, Cluster, RBSP, MMS,...)

Operational Spacecraft : Key for Science



LANL Geostationary Orbit Data

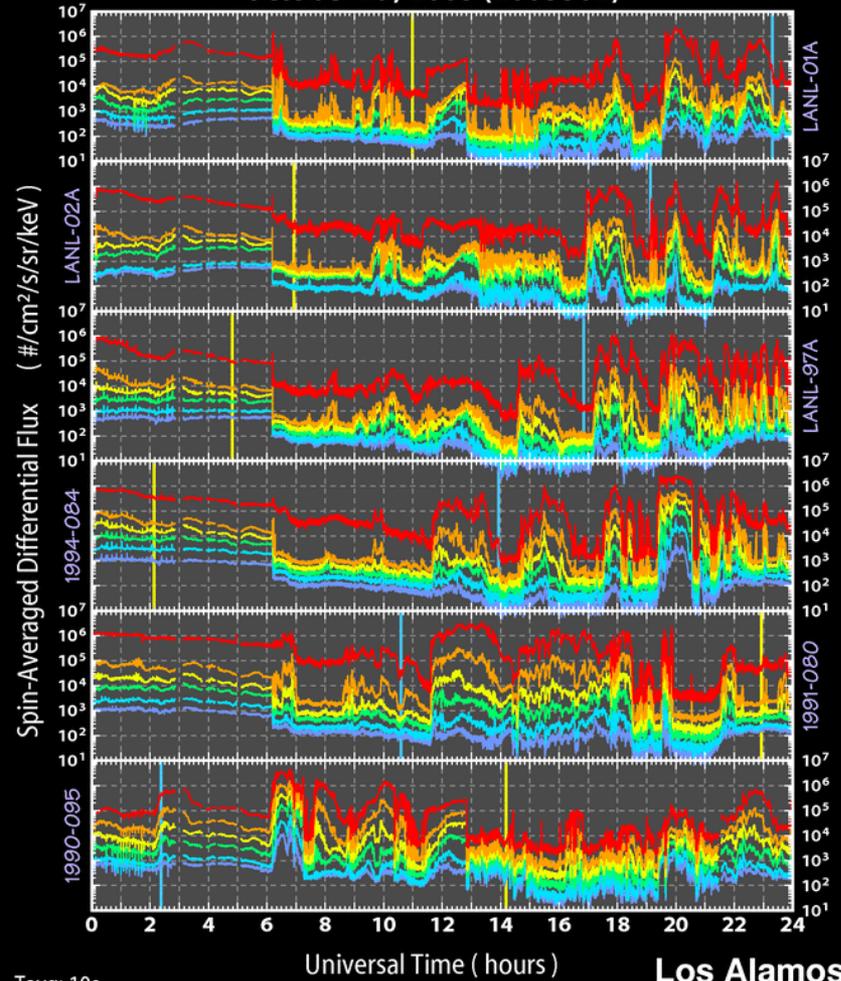
LANL Geosynchronous Electron Data (LoE)
October 28, 2003 (2003301)



Tavg: 10s

Los Alamos
NATIONAL LABORATORY

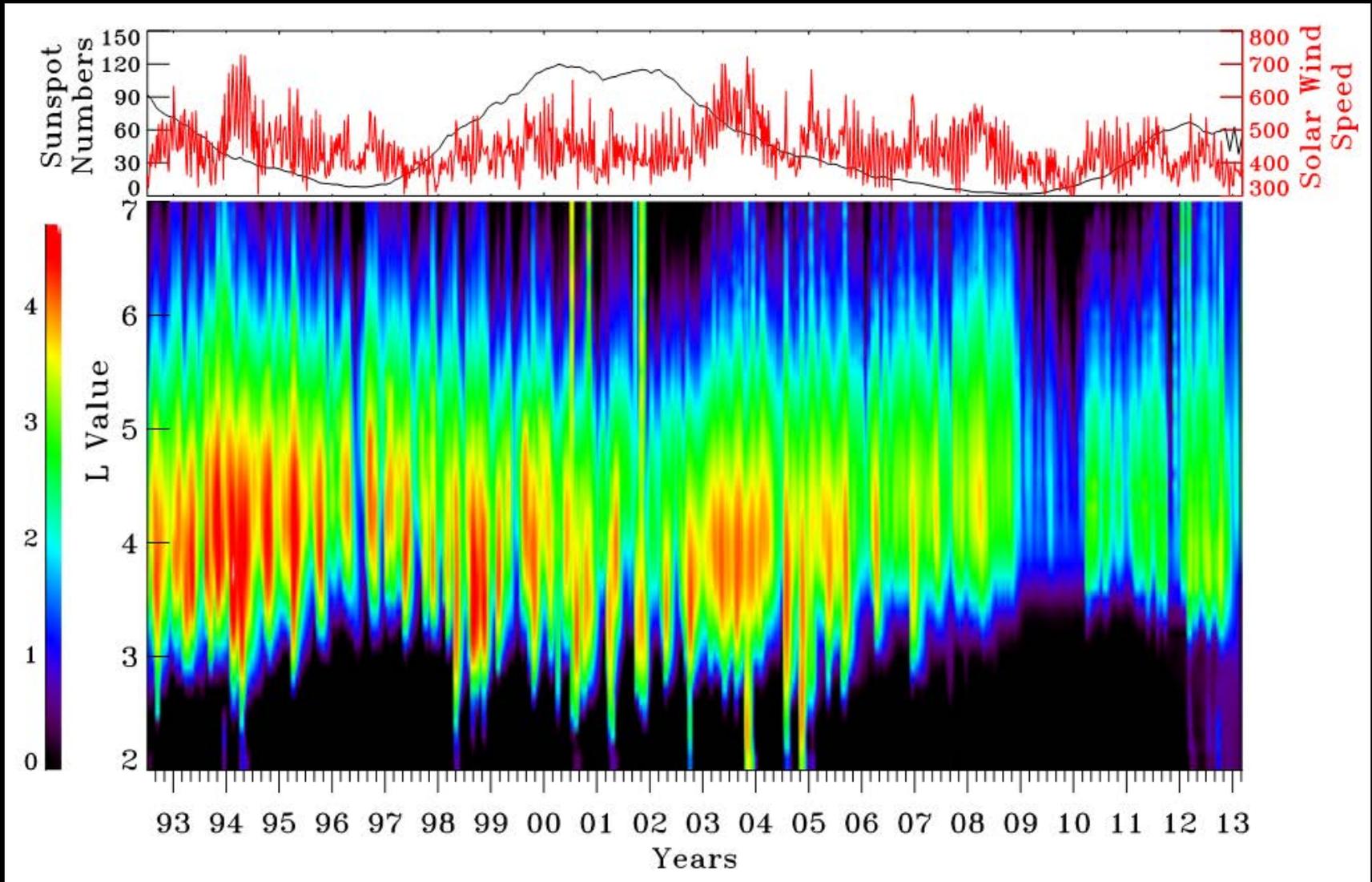
LANL Geosynchronous Electron Data (LoE)
October 29, 2003 (2003302)



Tavg: 10s

Los Alamos
NATIONAL LABORATORY

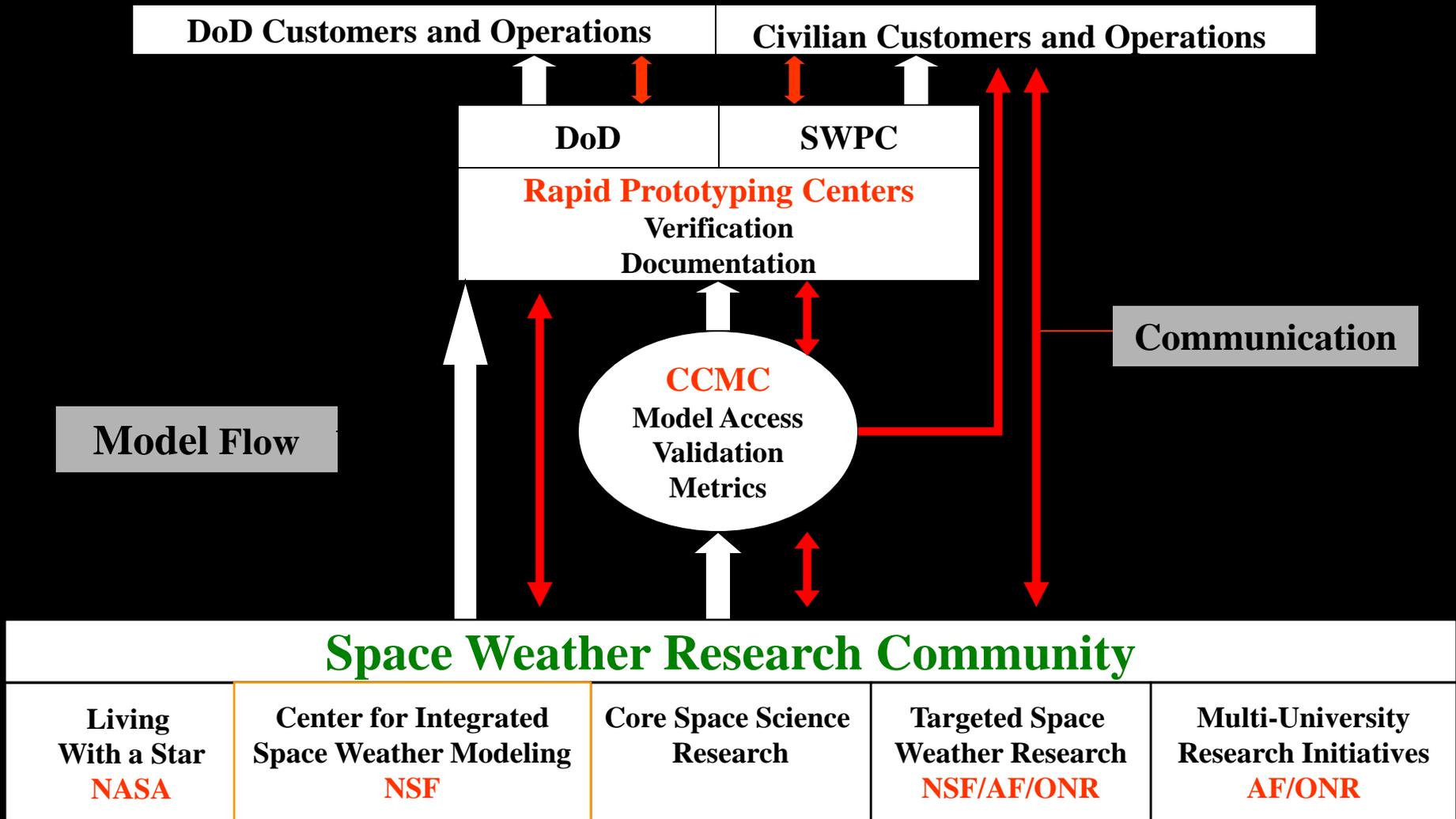
SAMPEX: Nearly Two Solar Cycles



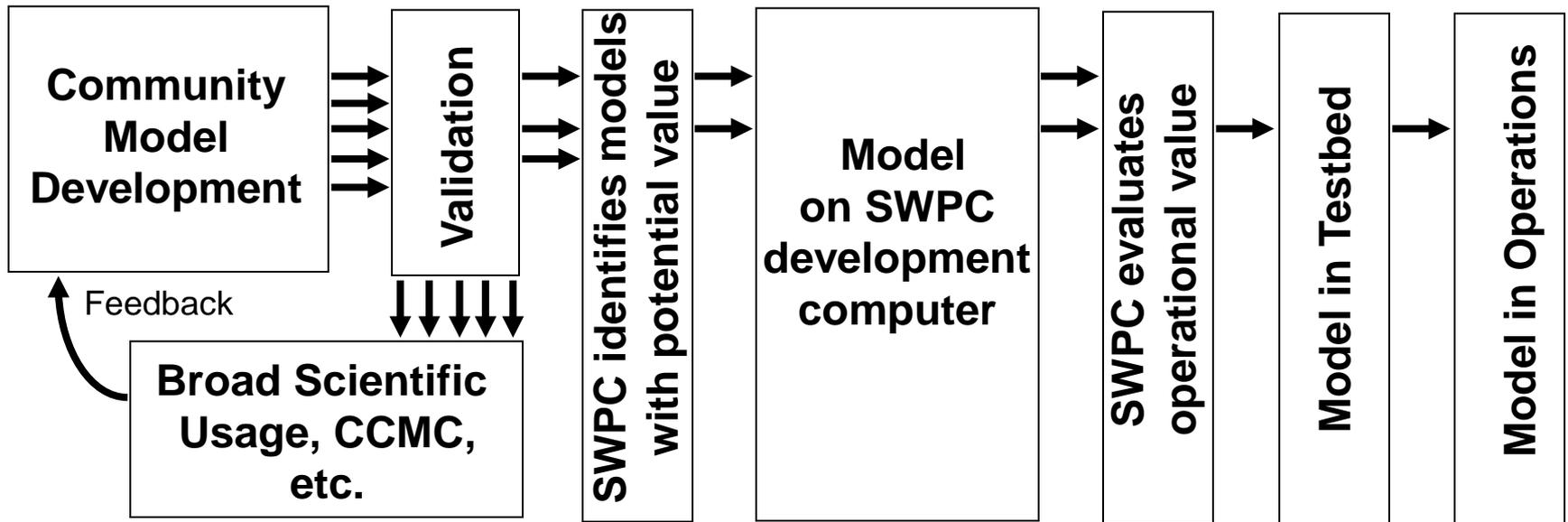
CISM - Knowledge Transfer Plan

Program Elements:	AFRL Partnership	CCMC Partnership	SEC Partnership	Short Course	Case-by-Case Interactions
<i>Objectives:</i>					
<i>Facilitate model transfers to operational environment.</i>	<p>Assess and prioritize USAF needs and potential model impact.</p> <p>Collaborate in model development toward operational needs.</p> <p>Identify appropriate areas for direct model transitions to USAF agencies.</p>	<p>Support transitions to operations through CCMC independent metrics evaluations, real-time test runs, and installation support.</p>	<p>Evaluate and prioritize models for operational impact.</p> <p>Transition and validate models for SEC operational environment.</p> <p>Support development of forecast products from CISM models.</p>	<p>Clarify operational needs of space weather product end-users.</p>	<p>Identify appropriate areas for direct model transitions, e.g. to AFWA, AFSPC.</p> <p>Support direct model transitions in high impact areas.</p>
<i>Provide models & visualization tools to research community.</i>	<p>Provide models for AFRL research and for collaborative development of specialized models.</p>	<p>Provide model runs-on-request and visualizations for research (and operational) community.</p> <p>Obtain feedback on model use and validations by CCMC and community.</p>			<p>Provide CISM_DX to the community.</p>
<i>Train and interact with government agencies, aerospace industry and others who cope with space weather.</i>	<p>Explore AFRL as a USAF conduit for transmitting user needs and model capabilities.</p>	<p>Provide model runs for retrospective analyses of operational anomalies and to evaluate model capabilities.</p>	<p>Use extensive SEC interactions with government & industry customers to assess diverse operational needs and prioritize CISM-based forecast products.</p>	<p>Interact directly with diverse end-users on modeling needs and future developments.</p> <p>Train in modeling capabilities, tools, and plans; and in available space weather resources.</p> <p>Provide CISM_DX and training with hands-on computer labs.</p> <p>Train in using specific forecast models.</p>	

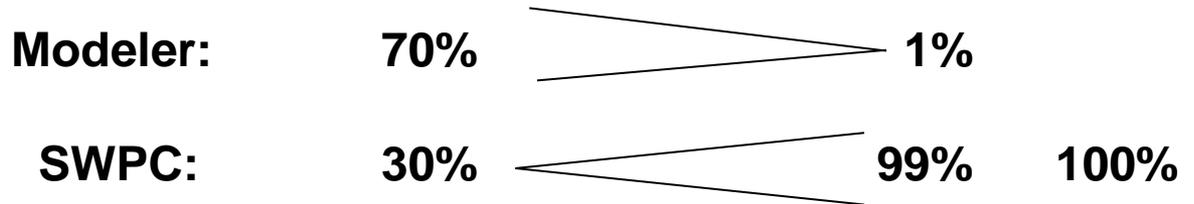
Space Weather Model Development



Operational Model Flow



Implementation Effort:

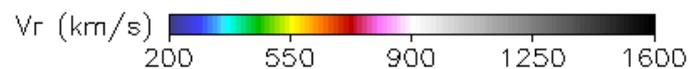
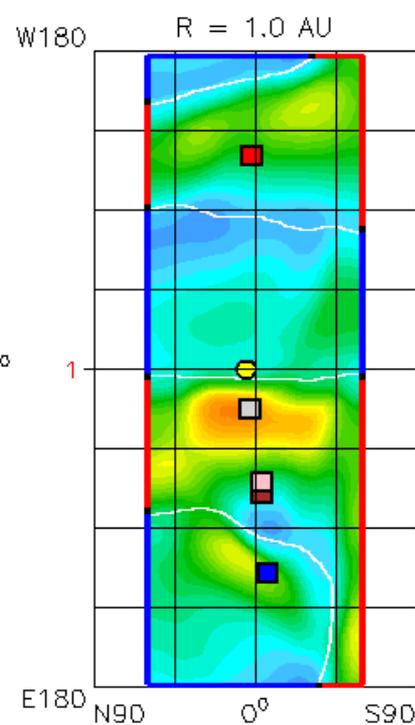
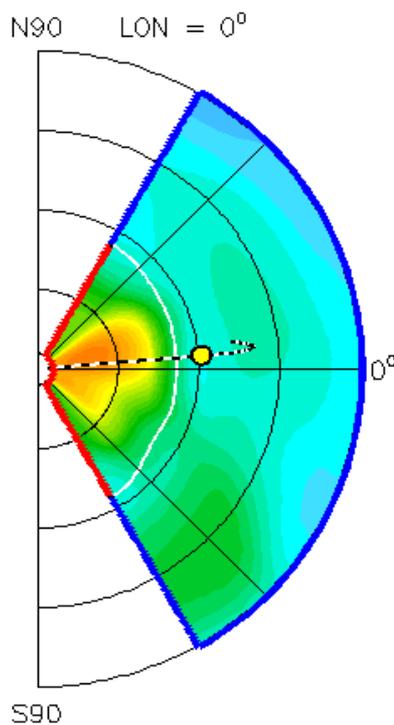
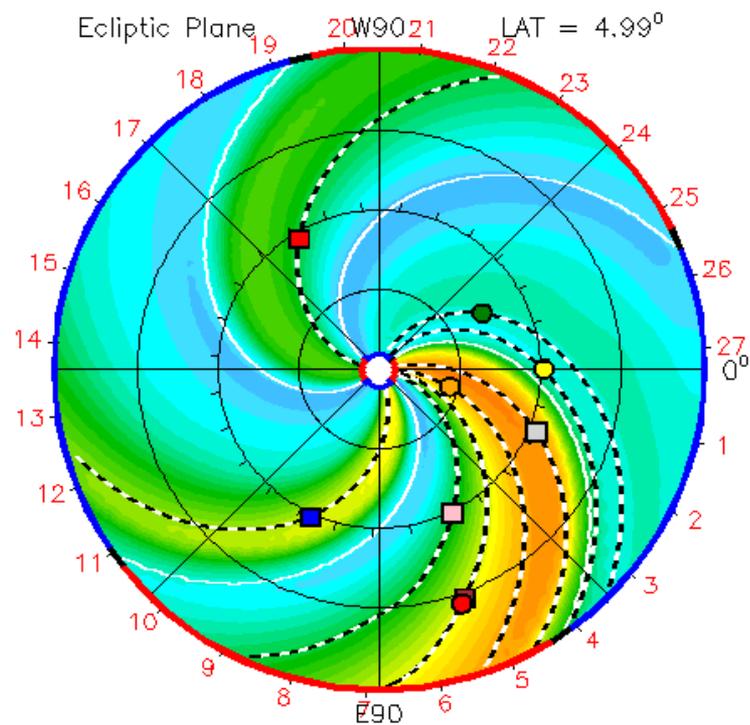


WSA-ENLIL Model: Solar Wind Speed

2012-07-22T00:00

2012-07-22T00 +0.00 day

- Earth
- Mars
- Mercury
- Venus
- Kepler
- MSL
- Spitzer
- Stereo_A
- Stereo_B



Current sheath



3D IMF line





Guido Scarabottolo, NY Times

“Much as America’s scientific leadership and policy of open inquiry did wonders for U.S. prestige during the cold war, making most of the [nuclear] detection system data available to the global public would show friends, allies and adversaries alike that the United States is willing to use even its most advanced defense assets for the betterment of humanity.

American taxpayers support a truly remarkable monitoring system whose information could significantly improve our health, security and well-being. We should use this hidden treasure to make the world a better and safer place.”

Opinion Guest Column, *New York Times*

The Earth’s Secrets, Hidden in the Skies

By DANIEL N. BAKER

Published: May 27, 2010

Summary and Recommendations

Through programs such as CISM and LWS, I (and much of the community really) have extensive R2O experience:

- Bringing in the science community to support NOAA Space Weather Prediction Center (SWPC) was crucially important (e.g., CISM);
- Much of our present national space weather program is built “on the back” of science missions (e.g., from NASA).

On the other hand, I have spent much of my career trying to use (and make available to others) key operational data sets (DOE, USAF, NASA, etc.)—this is the O2R part:

- Quit letting operational agencies hide their valuable data!
- Make it national policy to openly share unclassified data sets.
- Use this golden “SWAP” opportunity to make O2R a full reality.

**We need a truly operational national space weather program:
Let's make it happen!**