Community Perspective: GeoSpace Observations and Analysis

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Select Strategic Planning Documents

- Decadal survey, 2013-2022  NRC, SSB
- Heliophysics Roadmap  2014-2033  NASA
- LWS Program 2015-2025  NASA
- GS Portfolio Review 2016  NSF, GEO
- NSF Dynamic Earth, 2015-2022  NSF, GEO
- Space Weather Strategy / Action Plan  2015  OSTP
- CEDAR New Dimension  2012  NSF
Decadal Strategy for Solar and Space Physics

Geospace Dynamics Constellation (GDC)

The primary focus of the GDC mission is to reveal how the atmosphere, ionosphere and magnetosphere are coupled together as a system and to understand how this system regulates the response of geospace to external energy input.

Quo Vadis Workshops

May 25-27, 2016  Boulder CO

Also
CEDAR / GEM / SHINE Workshops June 20-24, 2016

These workshops were organized to help shape the direction of research in geospace with an emphasis on crystallizing a research program at the NSF on space weather. The workshops focused on the scientific challenges and experimental infrastructure required for discovery research in the 21st century, with consideration for both basic and applied research driven by cutting edge observations of the Sun-Earth system.
Quo Vadis Workshops

Workshop Charge:

- What major gaps in scientific understanding or engineering capability limits our ability to describe Sun-Earth connections?
- Where is discovery science likely to occur?
- How can we predict the occurrence of, and reaction to, space weather?
- Can we create compelling science questions that unify the entire geospace community, have demonstrable societal relevance, and engage the public imagination?

Quo Vadis Workshops

Findings:

- Chromospheric and coronal magnetic field are the gate-keepers of space weather but the processes producing space weather are poorly understood.
- Propagation of solar disturbances through the interplanetary medium requires more robust characterization and tracking.
- Plasma and energy transport across geospace domains during space weather events occurs in several forms and on varying temporal and spatial scales that have yet to be resolved.
- The majority of space weather energy transferred to the near-space environment is absorbed by the neutral gas only to be redistributed through pathways that rely on inadequate knowledge of the thermosphere neutral gas and its interaction with the ionosphere plasma.
Quo Vadis Workshops

Dimensions of Geospace Sampling:

Spatial
- Distributed arrays of instruments (optical, magnetic, radar)
- Small satellite formations and constellations

Temporal
- Continued/autonomous operation
- Natural timescales of change in the system

MREFC:
- Whole atmosphere LIDAR
- Solar wind / magnetosphere radar
- COroonal Solar Magnetism Observatory

NASA ITM Missions

Mission Overview

Mission Summary
- Launch vehicle: Proton RL
- Spacecraft: LEOPRO, 2-3 axes stabilized to observatories
- Launch: June 2017
- Orbit: L1 90x90 degree inclination
- Science Downlink: 24 months Phase E
- Data Downlink: 5 times/day to Solis, Woom, Shepherds
TIMED-CEDAR Collaboration – The “Fifth” Instrument

- APL Hosted a series of TIMED-CEDAR Workshops (Meeting at Turf Valley Hotel in Jan 7&8, 1998)
  - Identify science objectives that can be uniquely addressed by the combined capabilities of the GB and S/C
  - Address near-term needs in GB capability to support S/C measurements
  - Coordinate GB campaigns with S/C modes

- NSF Established a call within CEDAR to support GB activities in preparation for TIMED observations
  - May 1998 1st CEDAR competition: 1 year duration

- NASA-NSF established a joint TIMED Program Announcement in 1999: 3-year duration

Challenges

- Do not consider ICON as an equatorial mission, the IT system does not operate in isolation

- GOLD is a trailblazer in developing strategic capability from hosted commercial spacecraft to make global-scale atmosphere-ionosphere-magnetosphere imaging measurement

- Engage and challenge young minds to approach problems differently and offer them opportunity to explore these new approaches.

- Develop a unifying strategic plan for observatories, models, and theory across agencies and industries to advance geospace research.

- Contribute your findings, time, and energy to help your program managers and your community remain vibrant
Space Weather: The unifying theme

What is under the space weather umbrella?

Effects on power systems? Yes
Effects on communications? Yes
Effects on Navigation? Yes
Human survival in space? Yes
Space debris monitoring? Yes
Asteroid impact? Seems reasonable.
Discovery! Yes.

Can we, as a community, agree to an N-prong definition of space weather that is actionable and responsible? SWAP

Solar-terrestrial interactions

What is missing? A unifying strategic plan for ITM observatories, models, and theory. An ITM community focus on scientific priorities.

Can we create compelling science questions that unify the entire geospace community, have demonstrable societal relevance, and engage the public imagination?