CEDAR Strategic Planning for the Next Decade

Jeff Thayer, CSSC Chair
Aerospace Engineering Sciences
University of Colorado

CEDAR 2009, June 29- July 3, Santa Fe, NM
Motivation for a CEDAR Strategic Plan

CEDAR program has maintained its prominence and longevity by planning, implementing, reviewing, self-assessing, and phasing with a grass-roots community spirit.

- CEDAR Phase III document is 12 years old
- Research landscape is rapidly evolving
- Initiatives are pushing the research and resource envelop of CEDAR
- CEDAR needs to be better poised to contribute to high-priority, agency-wide research programs
- CEDAR has icon status as the preeminent aeronomic body and is the right group to push concept forward
Hour Glass Concept

Problem Statement or Question

Data

Information

Knowledge

Wisdom

Understand Relationships

Understand Concepts

Fundamental Principles

Reductionist View

Connectedness

Holistic View

Overarching Goal

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Limited amount of SAND
Reformulate Problem Statement and Approach

Add more SAND

SAND = Ideas
CEDAR Program

CEDAR Phase III

Polar Aeronomy
Coupling with Lower Altitudes
Solar-Terrestrial Interactions
Long-Term Variations

Understand the Whole Earth System
"Earthcasting"

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CEDAR: The SAND Phase

This strategy applies a whole atmosphere-space system approach to ITM research building from the wisdom gained through the concerted effort of the CEDAR community.

“Man must rise above the Earth – to the top of the atmosphere and beyond – for only thus will he fully understand the world in which he lives.” Socrates
A Way Forward

What Processes Make our Planet Habitable, Sustainable and Variable?

Analytic Approach

System Approach

CEDAR Phase III

Integrative Aeronomy – Is an approach to study the interactive role of the physics and chemistry of the mesosphere, thermosphere, and ionosphere with the entire planetary atmosphere-space system.

Integrative Aeronomy

Understand the Whole Earth System “Earthcasting”
It Takes a Village to Develop the Strategic Plan

The proposed approach is to create a new dimension of CEDAR by establishing community subcommittees tasked to develop themes and concepts centered around fundamental processes:

- Forcing, Response and Feedback
- Plasma-Neutral Interactions
- Cross-Scale Coupling
- Preconditioning

Subcommittee members and their themes would serve as focused efforts within subsequent CEDAR meetings.
Benefits of the Strategic Plan

- **Unifies** the Aeronomic field

- **Demands** stronger collaboration with other research areas, such as lower atmosphere and magnetosphere

- **Explores** transformational research

- **Defines** resource needs

- **Responds** to the new research landscape

- **Provides** a platform from which new initiatives can build
The ionosphere / thermosphere / mesosphere community is at a cross roads in how this discipline will evolve over the coming years. There are many changes taking place in the agencies and in the scientific approach to geoscience and geospace research. It is imperative that action be taken to ensure the CEDAR community is properly involved in this new evolution of science and to lead the direction for the CEDAR program. This workshop will invigorate discussion regarding the CEDAR strategic plan and include participation and discussion by a broader ITM group that is spearheading action in other programs.
Strategy for a New Dimension (SAND) of CEDAR

Overarching Problem Statement:
What are the geospace impacts on Earth’s habitability and sustainability of technology-reliant societies?

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Themes

- Climate Change with the geospace system (mutual interaction)
  - Space climate
  - Geospace effects on climate
- Complexity in the geospace system
  - Nonlinear, complex system (e.g. space weather, extreme events)
- Follow the energy
  - Propagation, Transformation, Manifestation
SAND Fundamental Processes

- **Forcing, Response and Feedback**
  - Processes responsible for the primary forcing, primary response on geospace and the subsequent feedback within geospace and to the atmosphere-space system

- **Plasma-Neutral Interactions**
  - Processes related to the exchange of energy, mass and momentum between the plasma and the neutral gas of geospace (i.e. plasma drag, plasma chemistry, charge distributions, electrodynamics, plasma instabilities, neutral acceleration, neutral energization)

- **Cross-Scale Coupling**
  - Processes of one spatial/temporal scale couple to other spatial / temporal scales (i.e., gravity wave – tidal wave interactions, wave-mean flow interactions, small scale Joule and particle heating to global thermal distribution, mean flow to instability processes)

- **Preconditioning**
  - Processes that modify the state of the system leading to a different response (QBO cycle, solar cycle, solar rotation, day/night cycle, geomagnetic cycles) or either processes only occur when certain conditions are met (ESF, strat warming…)

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Approach

- Identify Leads for each fundamental process topic
  - To lead and represent that effort, to meet with other leads to address overlap, to organize activities for next year’s meeting, and to begin the process of generating CEDAR report

- Common items to address by leads
  - Establish focus groups and schedule
  - Determine how the specific processes fit within the themes and main question
  - How might this new dimension broaden the scientific method
  - How would this effort be put forward to other science communities and public

- All leads will meet regularly (telecon) to make overall progress
  - Work with the CSSC chair and committee on next year’s meeting and in the production of a CEDAR report

- Must not digress
  - Note the approach does not digress to a particular instrument, location or altitude – must keep eye on themes and fundamental processes which will dictate resources such as instrumentation development and their distribution

CSSC 2008, Oct 28-29, NSF
2009-2010 CEDAR Science Steering Committee (CSSC) Members

Jeff Thayer (Chair)
University of Colorado
jeffrey.thayer@colorado.edu

John Foster (Chair Elect)
Millstone Hill / MIT
jfoster@haystack.mit.edu

Mark Conde
University of Alaska, Fairbanks
Mark.conde@gi.alaska.edu

Larisa Goncharenko
Millstone Hill / MIT
lpg@haystack.mit.edu

Joseph Huba
Naval Research Laboratory
huba@ppd.nrl.navy.mil

Tim Fuller-Rowell
University of Colorado
tim.fuller-rowell@noaa.gov

John Noto
Scientific Solutions
noto@sci-sol.com

Meers Oppenheim
Boston University
meers@bu.edu

Anthony van Eyken
SRI International
anthony.vaneyken@sri.com

Lara Waldrop
Univ. of Illinois Urbana-Champaign
lwaldrop@uiuc.edu

Mike Ruohoniemi
GEM Representative
Virginia Tech
mikeruo@vt.edu

Susan Skone
International Representative
University of Calgary
shskone@ucalgary.ca

Elizabeth Bass
Student Representative
Boston University
enb@bu.edu

Marco Milla
Student Representative
Univ. Illinois Urbana-Champaign
mmilla@uiuc.edu

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