U.S. CLIVAR Program

Agency Guidance

U.S. CLIVAR Summit
August 15-18, 2005
Keystone, CO

U.S. CLIVAR Program

NOAA's Climate Mission Goal

Outcomes

- *A predictive understanding of the global climate system on time scales of weeks to decades with quantified uncertainties sufficient for making informed and reasoned decisions.*
- *Climate-sensitive sectors and the climate-literate public effectively incorporating NOAA's climate products into their plans and decisions.*

These outcomes require incremental, annual expansion of the observing system, focused research to understand key climate processes, improved modeling capabilities, and the development and delivery of climate information services.

http://www.spo.noaa.gov/noaastratplanning.htm

U.S. CLIVAR Program

NOAA's Climate Mission Goal

Performance Objectives

- Describe and understand the state of the climate system through integrated observations, analysis and data stewardship.
- Improve climate predictive capability from weeks to decades, with an increased range of applicability for management and policy decisions.
- Reduce uncertainty in climate projections through timely information on the forcing and feedbacks contributing to changes in the Earth's climate.
- Understand and predict the consequences of climate variability and change on marine ecosystems.
- Increase number and use of climate products and services to enhance public and private sector decision making.

U.S. CLIVAR Program

NOAA's Climate Mission Goal

Priorities that intersect CLIVAR

- Improving climate forecast skill
  - Role of global tropical heat sources on range of timescales and their teleconnections
  - Addressing tropical biases in coupled models
  - Predictability of major patterns of variability (ENSO, PDV, TAV, MOC, NAO, AMO and the American monsoon system)
  - SST predictability in a warming environment
  - Transitioning research understanding into improved operational observing and prediction systems

NOAA's Climate Mission Goal

Priorities that Intersect CLIVAR

- Detection and understanding of global trends
  - Estimating heat and salt budgets to quantify changes in radiative forcings and E-P on global and regional scales
  - Understanding and documenting carbon inventory changes
  - Understanding and documenting sea level rise
  - Development of appropriate observing systems
  - Diagnostics/modeling/analyses of climate of 20th Century
- Developing a climate nowcasting capability
- Understanding the mechanisms of abrupt change
- Developing U.S. drought information and prediction systems with links to hydrologic forecasting
- Climate variability and extreme events
- Applications - water resources, fisheries, air quality

U.S. CLIVAR Program

Intangibles

How to engage and provide value

- Sponsor coordinated simulation and forecasting studies to extend predictive capabilities (e.g,. ENSO, PDV, TAV, MOC, AMV, NAO, monsoons, abrupt change, etc.)
- Assist in development of distributed data bases for such studies to provide access to the broad user communities
- Coordinate and lead the development of strategic plans for the evaluation of the ocean observing system
- Aid in development of strategic plans for areas of focus of interest to NOAA and synthesis reports summarizing progress after research is accomplished
- Work with NOAA to develop appropriate milestones and performance metrics
- Link with other science communities (e.g., WCRP, IGBP, GCOS)
- Brief Congress and the Administration on CLIVAR science and applications

U.S. CLIVAR Program

NASA

Climate Variability and Change Roadmap for NASA

- How is the global ocean circulation varying on interannual decadal, and longer time scales?
- What changes are occurring in the mass of the Earth's ice cover?
- How can climate variations induce changes in the global ocean circulation?
- How is global sea level affected by natural variability and human-induced change in the Earth system?
- How can predictions of climate variability and change be improved?

(http://science.hq.nasa.gov/strategy/roadmaps/climate.html)

U.S. CLIVAR Program

NASA

- Priorities that intersect CLIVAR
  - End-to-end systems for climate prediction
  - Understanding the role of slowly varying components of the earth system (e.g. ocean and ice) in climate
  - Observing system development (esp. space-based technology)

U.S. CLIVAR Program

NASA

Priorities that intersect CLIVAR

- Implementation of modeling system improvements through Earth System Modeling Framework (ESMF)
- Global data assimilation (ECCO-GODAE)
- How do we best couple our understanding and models of the "fast" and "slow" components of climate system?

U.S. CLIVAR Program

NASA

Intangibles (how to engage and provide value)

- PPAI - Climate/Decision Support interface
- PSMI - Process Improvement into ESMF
- POS - Systematic measurements and development of climate data records, observing system priorities
- Map CLIVAR ambitions to agency goals, agendas, and priorities (can we carve CLIVAR into agency-friendly segments?)

U.S. CLIVAR Program

Overall Goals for Climate Research at NSF

- Advance discovery, knowledge and understanding in all areas of climate science
- Promote teaching, training, and learning in climate and related sciences
- Bring benefits to society though advancement in climate research

U.S. CLIVAR Program

Top five long-range (~5-10 years) climate research areas of interest that intersect with CLIVAR

- Theoretical studies (typically 1-3 investigators pursuing their own ideas based on first principles or unexplained observations)
- Empirical studies (typically 1-3 investigators conducting diagnostics of reanalysis products or historical data sets)
- Modeling Studies (small or large groups developing and running component and/or coupled models to identify, understand and predict modes of climate variability and change)
- Process Studies (small to large groups addressing through focused observations known deficiencies in climate models.
- Sustained observations (mostly in the ocean) (small groups working with other agencies and international partners to develop and implement new observing techniques to observe key components of the climate system).

U.S. CLIVAR Program

U.S. CLIVAR Program

Top high-priority scientific areas where NSF envisions strong US CLIVAR involvement over the next 1-5 years

- Process understanding
- New observing techniques
- Quantification of climate information uncertainties
- Diagnostics and model improvement and evaluation (Component and coupled models)
- Unified modeling approach: weather-interannual-decadal time scales
- High resolution climate models; "cloud resolving", "eddy resolving", Regional Climate Models, downscaling/upscaling, in general

U.S. CLIVAR Program

Intangibles:

What are practical actions and activities that U.S. CLIVAR and its panels should consider to improve its value to NSF and to the research community?

- Identify a (small) set of critically important questions and the facilities and research required to address them. These need not be new, as long as they are critically important to CCSP issues and limited not by ideas but by resources.
- U.S. CLIVAR should provide feedback on long-range scientific priorities
- Briefings to NSF Management to highlight CLIVAR achievements and new opportunities
- Always strive to represent the broader climate research community
- …

U.S. CLIVAR Program

Summary

- There is a need for activities that address short-term to long-term goals in climate research
- Note the wide breadth of research areas, e.g. predictability, prediction, need to develop understanding, as well as practical capabilities, strategic planning and establishing priorities