

Science Plan Production Schedule

- ✓ Jan 2012 SSC Meeting Initially scope, outline, draft mission statement & goals
- ✓ Spring SSC & Panel Telecons Refine mission / goals, draft subgoals
- ✓ July Summit Identify accomplishments; review & further develop subgoals
- ✓ Aug-Sep SSC Draft annotated outline
- ✓ Oct-Dec SSC & Panels Draft chapters
- ✓ Dec AGU Town Hall Mtg Present draft plan overview to community
- ✓ Jan 2013 SSC Meeting Consider first draft
- ✓ Feb-May SSC & Panels Complete editing of review-version
- ✓ June Community Open public review
- July SSC Review comments
- Aug-Nov SSC Final editing
- Dec SSC Publish and promote

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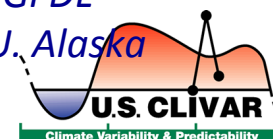
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Science Plan Chapters

Chapter 1. Introduction

Chapter 2. History and Achievements

Chapter 3. Fundamental Science Questions

Chapter 4. Goals

Chapter 5. Research Challenges

Chapter 6. Cross-cutting Strategies

Chapter 7. Management and Implementation Activities

Chapter 8. Program Cooperation and Coordination



Introduction

- Overall Plan Feedback
 - *Need for Executive Summary*
 - *Improved integration across chapters*
 - *Need for additional, compelling figures and illustrations*
 - *More complete inclusion of Indian, Southern and Arctic Oceans, and regional monsoons*
- Importance of the ocean in climate
 - *Change of section title to reflect panel recommendation*
 - *Introduction presents U.S. CLIVAR focus on the ocean's role*
 - *Addresses importance of air-sea interactions as well as ocean processes*
 - *Clarifies that consideration of land, cryosphere and stratosphere is through their interaction with changes in the ocean*
 - *Emphasizes collaboration across all Earth system research communities, including activities from observations to modeling to impacts assessment*
- Need for U.S. CLIVAR Program
- Science Plan: Purpose and scope, statement of mission, plan outline
 - *Panel recommendation to clearly identify audience(s) for the plan*
 - *Includes discussion of observations – e.g., as a crosscut strategy supporting all program goals to be addressed in Ch6*

History and Achievements

- Summarizes International CLIVAR origins, U.S. program formulation and initial implementation, and mid-term reorganization
 - Presents key achievements of first 15-years (paired down based on Panel feedback on need for conciseness)
 - Summary linking achievements to science questions and new goals
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- Separate Accomplishments Report providing details of key achievements
 - *Will be updated based on recommendations to better clarify achievements, their importance, and U.S. CLIVAR's role*
 - *Figures added per Panel feedback; additional figures for each accomplishment to be included*

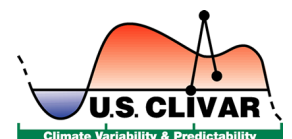


Fundamental Science Questions

- What processes are critical for climate variability and change in the ocean?
 - What are the connections and feedbacks between oceanic climate variability and other components of the Earth's climate system?
 - How predictable is the climate on different time and space scales?
 - What determines regional expressions of climate variability and change?
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- Panel-suggested clarifications:
 - *Eddies in Southern Ocean are important mechanism for poleward heat transport*
 - *Lack of ocean eddies are a (not necessarily the) major problem in climate models*

U.S. CLIVAR Goals

- 1) Understand the **role of the oceans** in climate variability on different time scales.
 - *Add discussion of importance of air-sea interactions*
- 2) Understand the **processes** that contribute to climate change and variability in the past, present, and future.
- 3) Better **quantify uncertainties** in the observations, simulations, predictions and projections of climate variability and change.
 - *Added observations and predictions*
- 4) Improve the **development and evaluation of climate simulations and predictions**.
 - *Discuss characterizing and interpreting (in addition to quantifying) uncertainty*
- 5) **Collaborate with research and operational communities** that develop and use climate information.
 - *Describe research communities that develop and use climate information, identifying the demand for this information.*



Research Challenges

Introduction: Strengthened paragraph to clarify that Research Challenges are not intended to include all of U.S. CLIVAR research. The research list is much broader, but we want to highlight these topics as important.

- 1) Decadal variability and predictability
- 2) Climate extremes
 - *Need to highlight the importance of extremes.*
 - *Identify connections between research communities on extremes.*
- 3) Polar climate
 - *Include importance of SO uptake of anomalous heat needs to be discussed. Put emphasis on mesoscale.*
- 4) Climate and carbon/biogeochemistry

More detail to be presented by Jay McCreary this morning



Cross-cutting Strategies

- 1) Identify necessary **sustained and new observations**
 - *Add assimilating data and initializing models to evaluating models in table.*
 - *Include designing new platforms and observational strategies.*
- 2) Carry out the critical **process studies** to improve climate models
- 3) Continue to foster **model development strategies**.
- 4) Assess best practices **for quantifying improvements in predictions and projections**
 - *Express the need to identify “useful” metrics for model verification.*
 - *Clarify what needs to be assimilated.*
- 5) Develop effective strategies for **communication of climate information**

Cross-cutting Strategies Intersection with Goals

Cross-cutting Strategies	<i>Sustained and new observations</i>	<i>Process studies</i>	<i>Model development strategies</i>	<i>Quantifying improvement in predictions and projections</i>	<i>Communication of climate information</i>
Goals					
<i>Understand the role of the oceans in climate variability on different timescales</i>	Document variations	Collect & provide data to evaluate and improve models	Improve climate models across processes and timescales	Understand limits of climate predictability	Prioritize observing network and predictability studies
<i>Understand the processes that contribute to climate change and variability in the past, present and future</i>	Document climate-critical processes	Investigate processes to help explain variations	Property conserving climate reanalyses	Quantify importance of model uncertainty in projections	Set priorities for observations and predictability studies
<i>Better quantify uncertainties in the simulations and projections of climate</i>	Evaluate model simulations	Validate model representation of relevant observed processes	Improve models	Quantify model, structural and scenario errors	Address needs for predictability and sensitivity studies
<i>Improve the development and evaluation of climate simulations</i>	Evaluate climate models	Provide data to develop and test model process representation	Reduce biases in climate models	Quantify importance of model physics errors	Determine key targets for model development
<i>Collaborate with research communities that develop and use climate information</i>	Provide multi-disciplinary datasets	Provide process understanding and opportunity for collaboration across disciplines	Strengthen communication between observational and model communities	Improve communication across disciplinary boundaries	Provide information on dominant climate phenomena and predictability

Cross-cutting Strategies Intersection with Goals

	POS Panel	PSMI Panel		PPAI Panel	
Cross-cutting Strategies	<i>Sustained and new observations</i>	<i>Process studies</i>	<i>Model development strategies</i>	<i>Quantifying improvement in predictions and projections</i>	<i>Communication of climate information</i>
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Panel discussions should consider cross-cutting activities to address goals.

Implementation Approaches

Panel and cross-panel feedback on and consideration of action items for:

- **Working Groups**
 - New WGs starting in 2015; no new WGs in 2014
- **Science Teams**
 - Additional Science Team recommendations for IAG consideration?
- **Climate Process Teams**
 - New CPTs possibly to be solicited in 2014
- **Science Meetings/Workshops**
 - IAG consideration in May & December
- **Agency-supported Research Calls** to implement coordinated observation and data projects; field campaign and process research; modeling, prediction and applications projects
- Opportunities for **Students, Postdocs, and Early-career Scientists**
 - Ideas to expand engagement



Program Coordination and Cooperation

Engagement of U.S. and International programs and infrastructure

- **USGCRP**

- Land surface hydrology and terrestrial ecosystem impacts research
- Carbon cycle, ocean biogeochemistry and marine ecosystem research
- Atmospheric aerosol-cloud interactions
- Polar and cryospheric research

- **WCRP**

- International CLIVAR (to be addressed in next talks)
- Global Energy and Water Exchanges (GEWEX)
- Climate and Cryosphere (CLIC)
- Stratospheric Processes and their Role in Climate (SPARC)

- **Enabling Infrastructure**

- Sustained observing systems
- Data centers
- Ship and aircraft *(added description of other agency platforms in addition to UNOLS)*
- Modeling centers and high-performance computing
- Operational and real-time information centers
- International and U.S. national climate change assessments *(added per panel recommendation)*

