Overview of CCSP Goals 1 and 3

Ants Leetmaa

Geophysical Fluid Dynamics Laboratory

DOC/NOAA/OAR

Princeton, New Jersey 08540

CCSP Goals 1 and 3

CCSP Goal 1: Improve knowledge of the Earth's past and present climate and environment, including its natural variability, and improve understanding of the causes of observed variability and change (*natural variability, climate predictions and predictabity, extremes, observing and documenting climate*)

CCSP Goal 3: Reduce uncertainty in projections of how the Earth's climate and related systems may change in the future. (*how will climate change, feedbacks, ocean-atmosphere coupling, abrupt changes, changes in extremes, development of high end models*)

CCSP GOAL 1: Initial topics for S&A Reports

Topics	Significance
Temperature trends in the lower atmosphere – steps for understanding and reconciling differences (*talk*)	Inconsistencies in the temperature profiles of different data sets reduce confidence in understanding of how and why climate has changed.
Past climate variability and change in the Arctic and at high latitudes (*poster*)	High latitudes are especially sensitive and may provide early indications of climate change; new paleoclimate data will provide long-term context for recent observed temperature increases
Reanalyses of historical climate data for key atmospheric features. Implications for attribution of causes of observed change (*talk*)	Understanding the magnitude of past climate variations is key to increased confidence in the understanding of how and why climate has changed and why it may change in the future

CCSP Goal 3: Initial Topics for S&A Reports

Topics

Climate models and their uses and limitations, including sensitivity, feedbacks, and uncertainty analysis (*talk*)

Climate projections for research and assessment based on emissions scenarios developed through CCTP (*poster*)

Climate extremes including documentation of current extremes. Prospects for improving projections *(talk*)

Risks of abrupt changes in global climate (*poster*)

Significance

Clarifying the uses and limitations of climate models at different spatial and temporal scales will contribute to appropriate application of these results

Production of these projections will help develop modeling capacity and will provide important inputs to comparative analysis of response options

Extreme events have important implication for natural resources, property, infrastructure, and public safety.

Abrupt changes have occurred in the past and thus it is important to evaluate what we know about the potential for abrupt change in the future

International Assessments

Intergovernmental Panel on Climate Change (IPCC) provides regular assessments of policy relevant scientific, technical, and socioeconomic information relevant for understanding the risk of climate change. Next assessment report in 2007. Today:

- IPCC Working Group 1 (the Scientific Basis for Climate Change) (*talk*)
- US Modeling Contributions to IPCC (*talk*)

What are the Critical S&A Issues for Decision Makers? What are (my) Emerging Issues?

Given the uncertainties, why should one trust the results from the climate models?

Model **and data** intercomparisons for the climate of the 20th Century (and earlier) are critical tests for understanding and models.

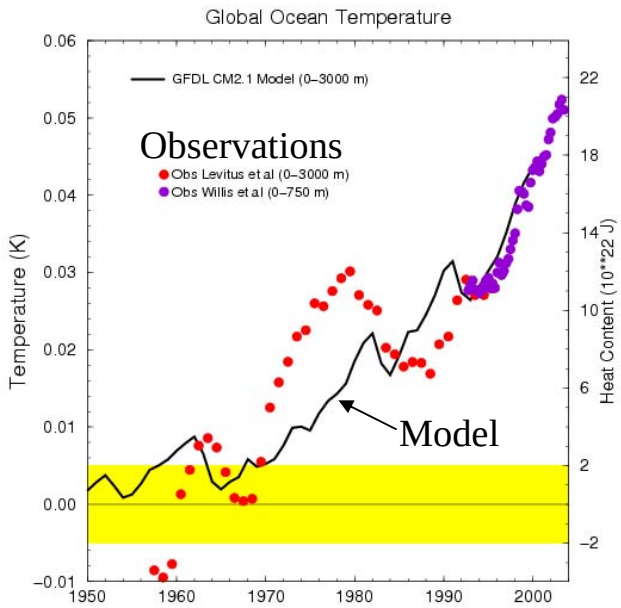
•What are key upcoming issues related to the observed record, to ocean heat content changes?

• Are the recent trends unusual or can they be explained by natural processes

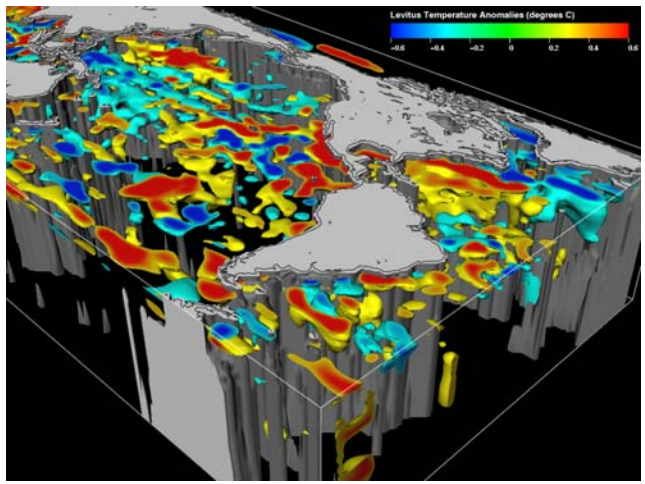
Has there been a detectable impact of global warming on natural variability and extremes?

Are Ocean Heat Content Changes a Verification of the Greenhouse Simulations?

Is this proof of the net radiative imbalance caused by anthropogenic effects?



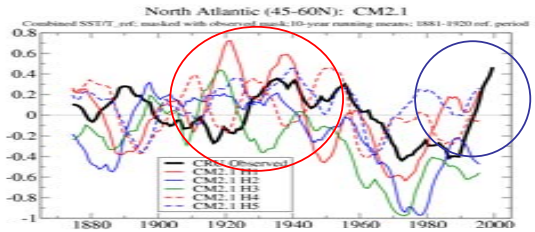
Typical 5-year data distribution of ocean profile data



How Much of the Observed Record is Related to Natural Effects?

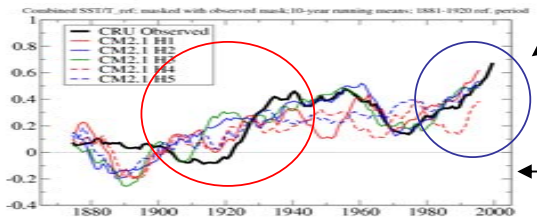
Note: not all areas of globe warm during the 20th C even for the model runs

North Atlantic (45-60N)



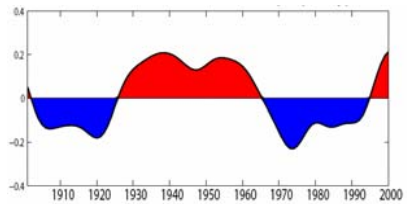
Global warming or natural decadal variability

Subtropical North Atlantic



Atlantic hurricane development region

Atlantic Multi-Decadal Oscillation (AMO)

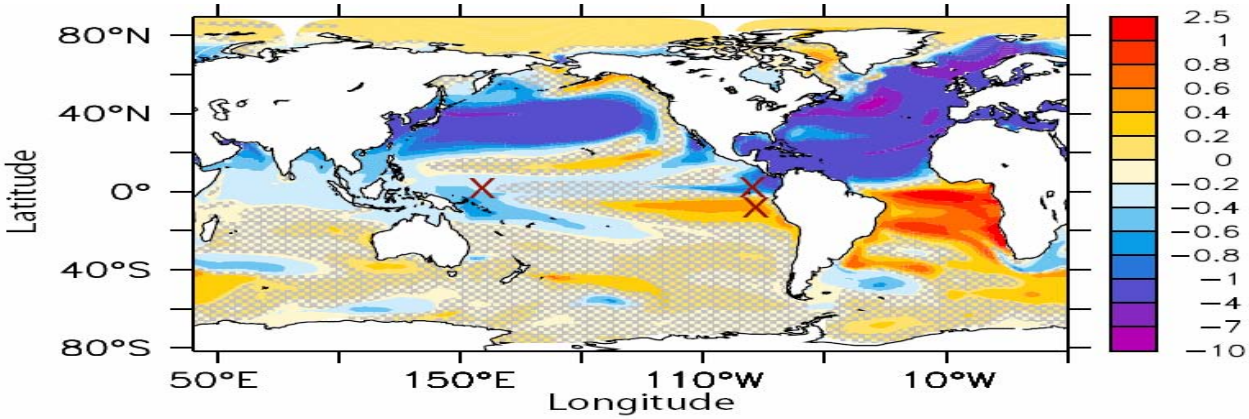


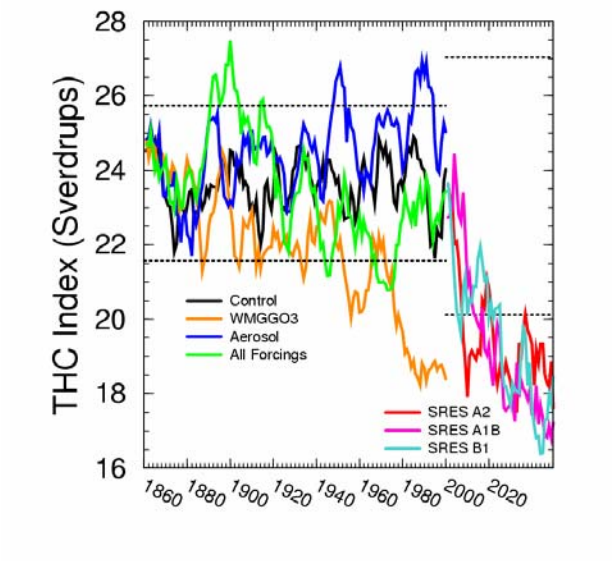
Observed - average North Atlantic detrended temperature

Simulations for most part capture 100 year trends but miss decadal variability. A major natural source for this in the Atlantic is the AMO.

What is the Potential for Abrupt Changes in the Near Future?

Global temperature changes resulting from an Atlantic THC shut down



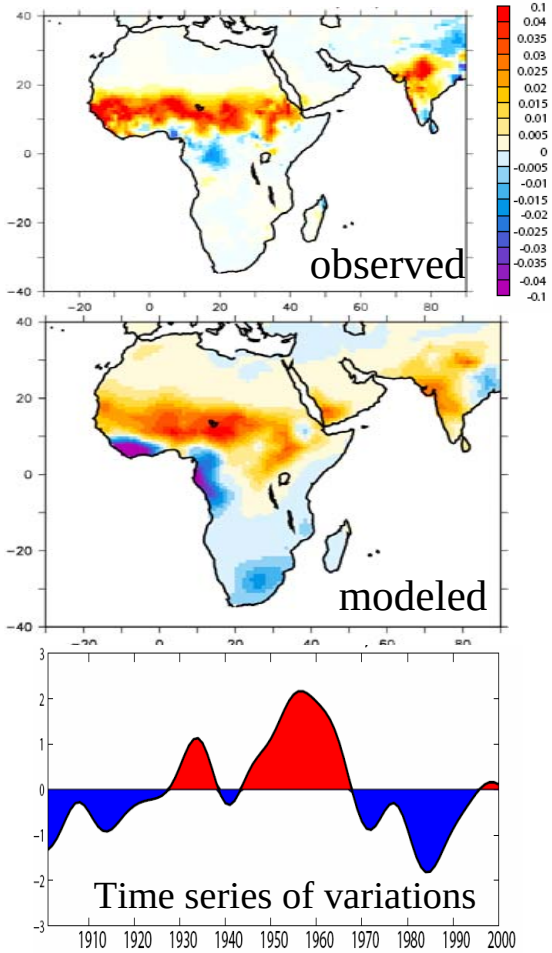


Models suggest a slow down of the Atlantic thermohaline circulation (THC) in the 21st C

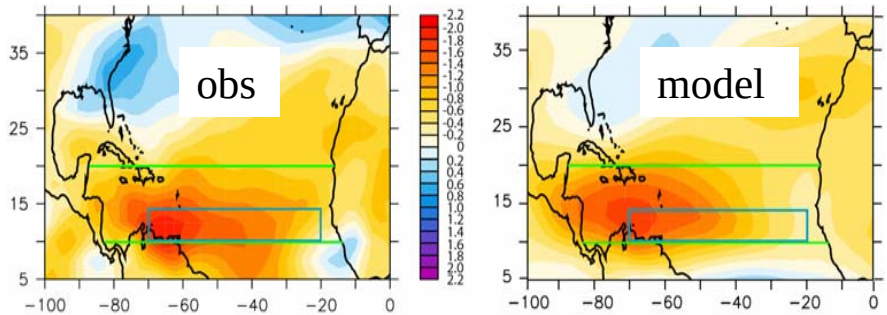
Note: the aerosol effects have delayed the onset of this

What are the Potential Impacts of THC Changes?

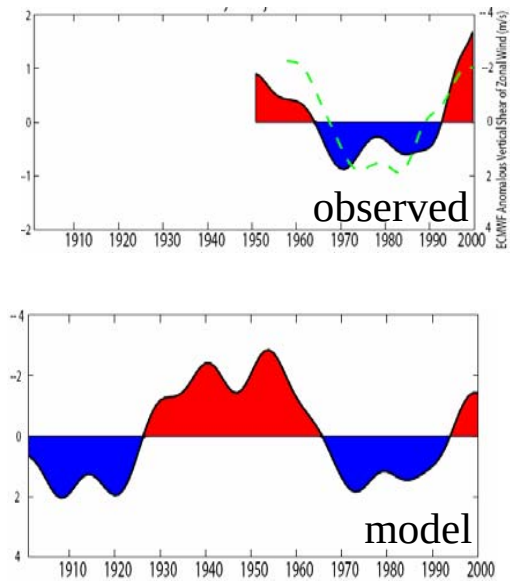
Rainfall Trends



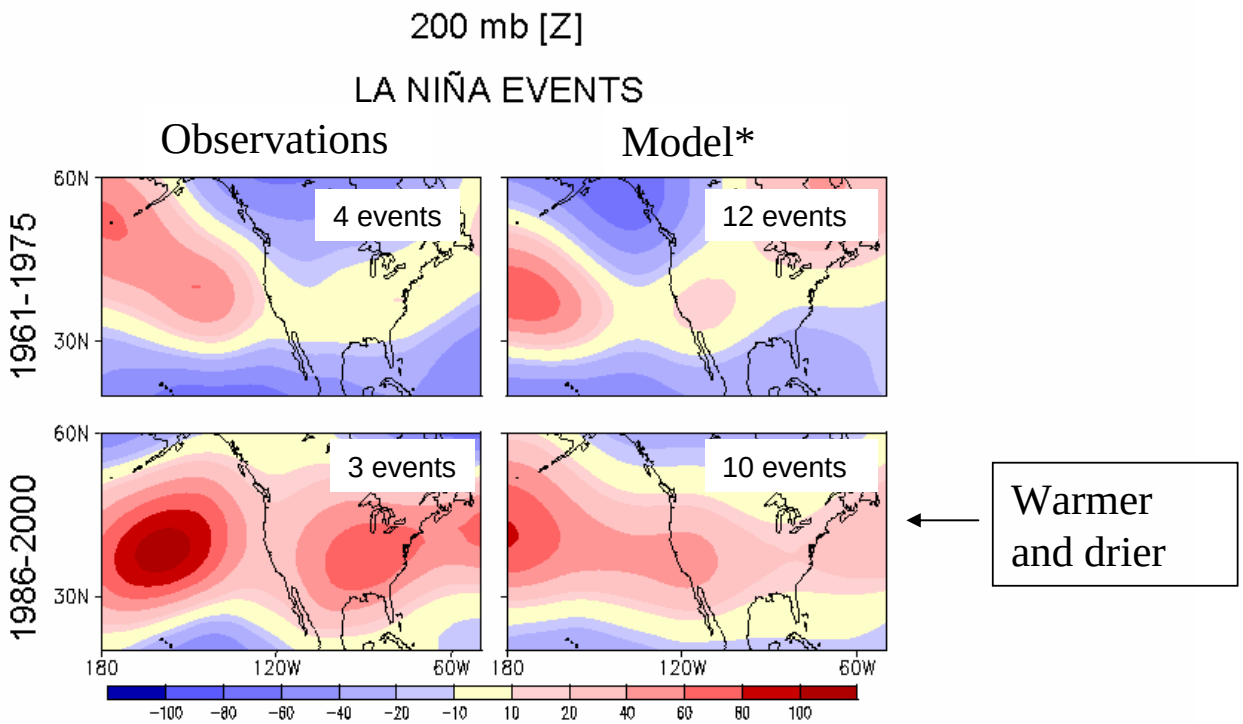
Decadal hurricane variability



Vertical shear August-September-October



Are the Impacts of Seasonal Climate Variability Changing Over North America?



Model – runs started in 1860 and forced with natural and anthropogenic changes to radiative forcings. Wintertime pattern. Same tendency occurs for El Nino events

The Charge

How can those assessments which are still being formulated be improved?

What are additional assessment needs?

What are the suggestions for improved coordination between CCSP, International, and other assessments?

How can the CCSP assessment process be improved?