Phenomena, Observations and Synthesis Panel (POS)

Developing a framework for CLIVAR

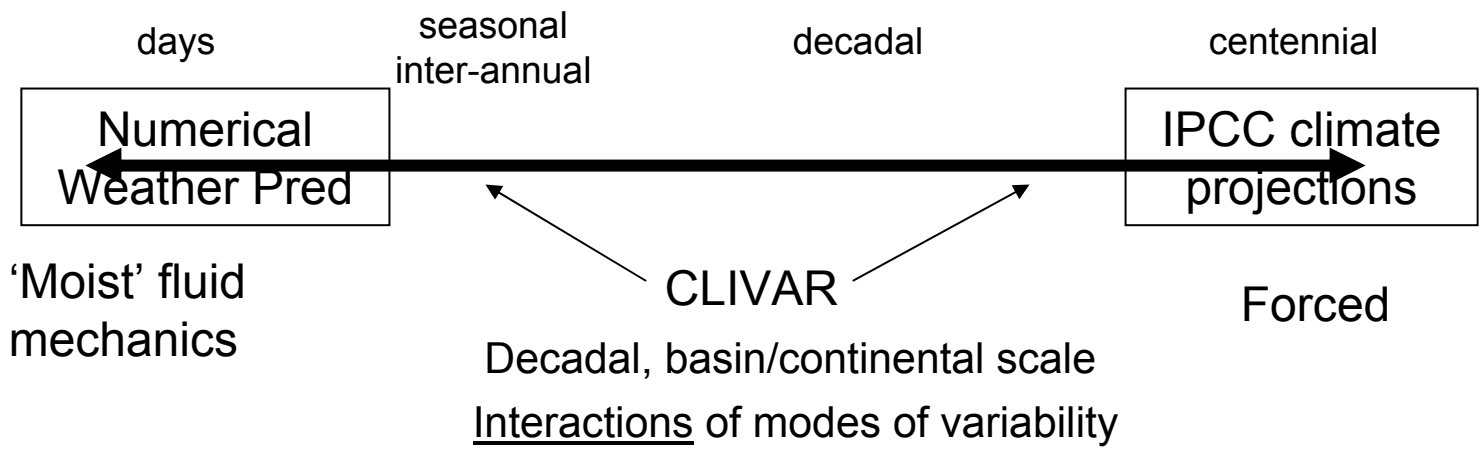
TOGA → led to seasonal-to-interannual prediction systems

WOCE → observed state of ocean and set up global ocean observing systems

CLIVAR → should set up experimental decadal predictability systems

Pre-requisite is decadal predictability of slow components of climate system i.e. the ocean

Predictability 'end-members'



Much effort has been placed in setting up prediction systems pushing out from NWP

It would be highly productive to attempt to also 'push down' from IPCC-class coupled models

Two huge investments make such an effort timely:

1. Construction of IPCC-class coupled climate models

2. Existence of global ocean observing/synthesis systems

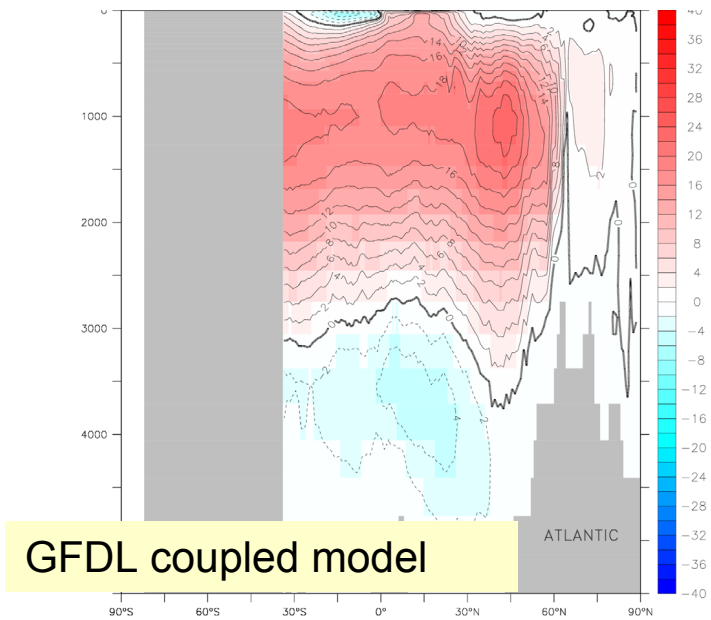
POS panel objectives identified at last year's summit can be usefully drawn in to the following three thrusts:

1. Ocean observations/synthesis and predictability
   Meeting at MIT in Feb.06 sponsored by NASA
2. Decadal predictability and variability of coupled system
   Meeting at GFDL in June.06 sponsored by NOAA
3. Weather and climate extremes
   Proposed working group on Drought (Schubert)

Note – these are closely related to one-another:

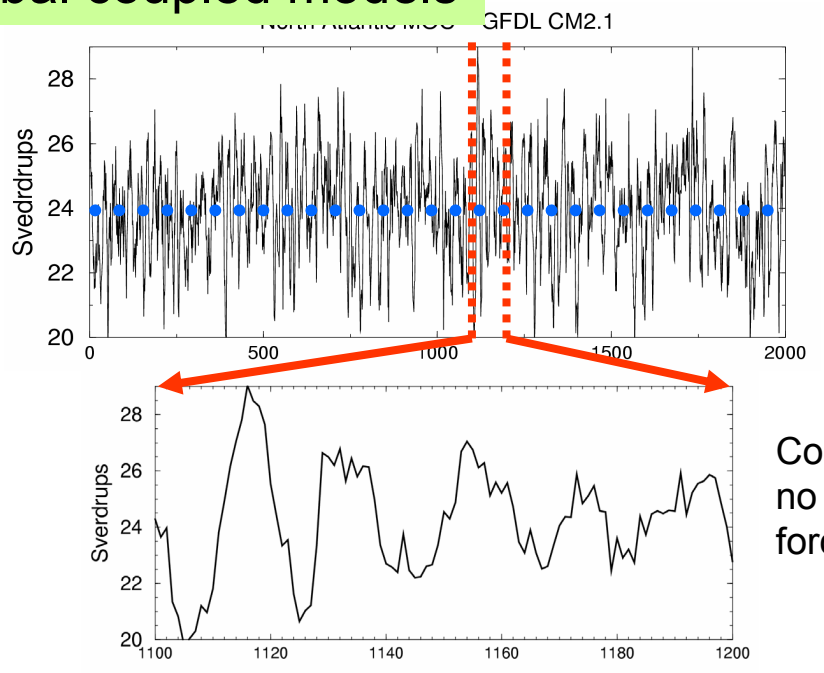
1. enables 2: 2 provides the context for 3.

Decadal predictability studies using global coupled models



GFDL coupled model

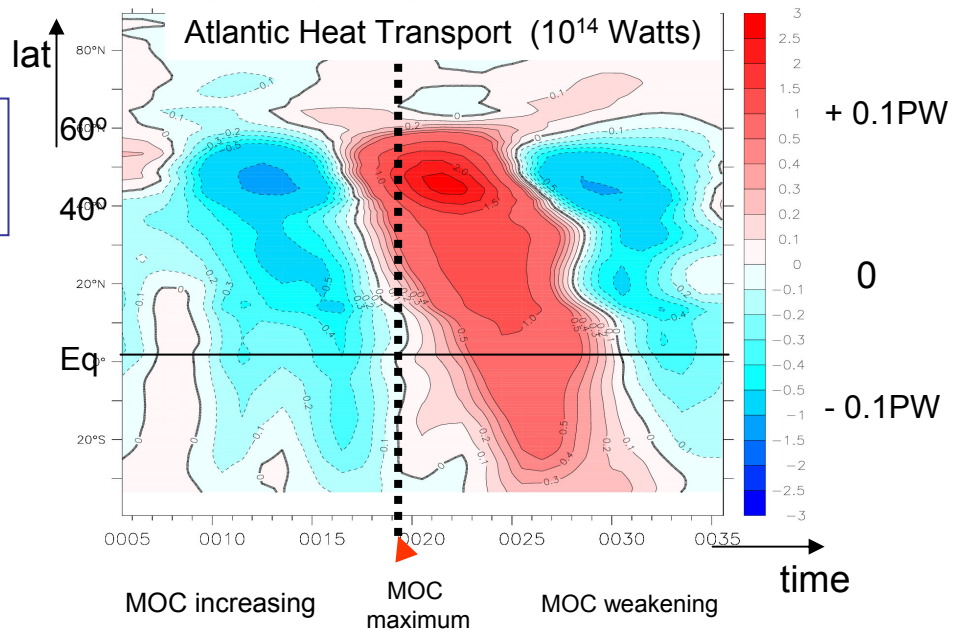
Atlantic MOC – GFDL CM2.1 Model



Control: no anthro forcing

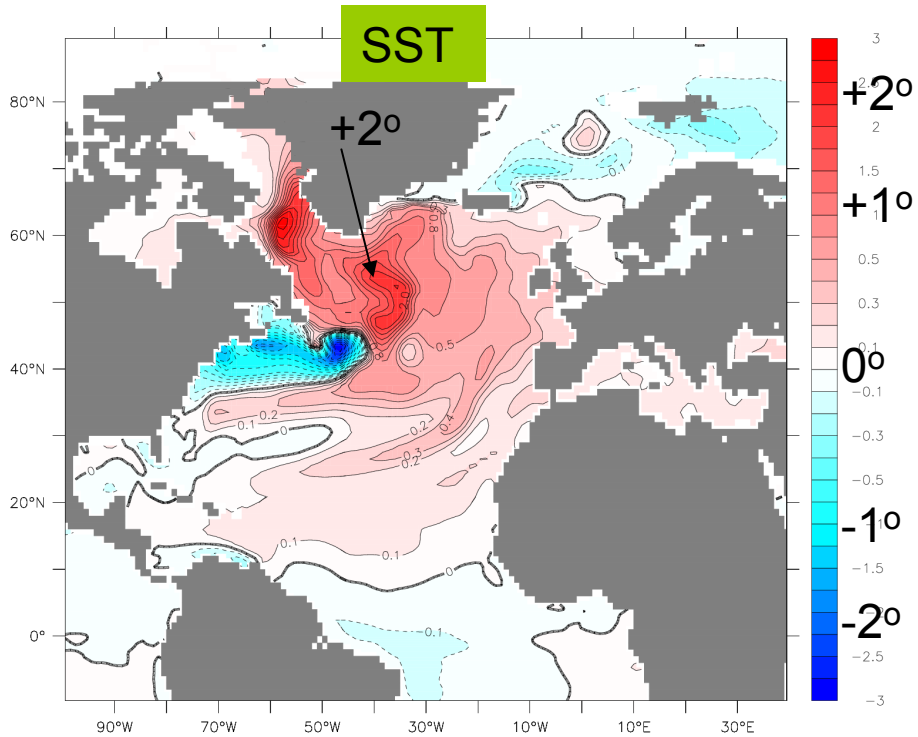
NOAA-sponsored workshop on Atlantic decadal predictability; June 06

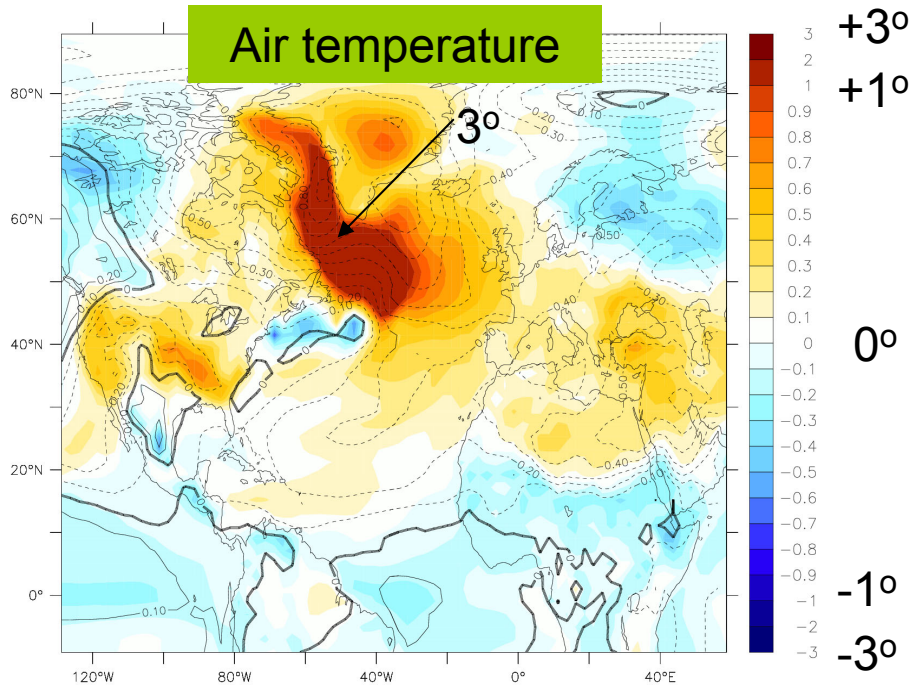
Workshop focused on Atlantic, but models are global.

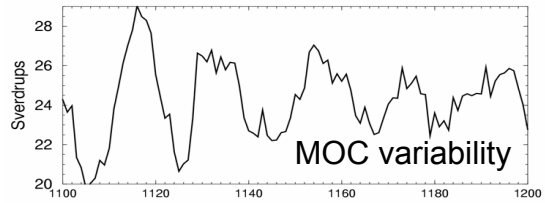


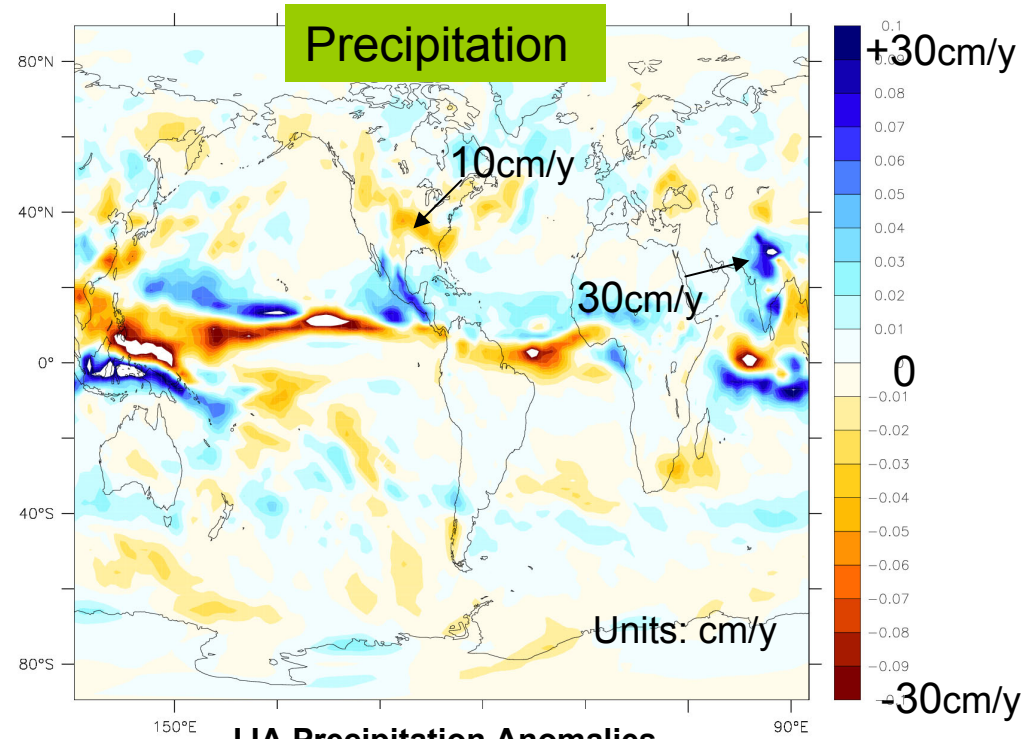
Courtesy of Tom Delworth

Anomalies associated with interdecadal MOC fluctuations

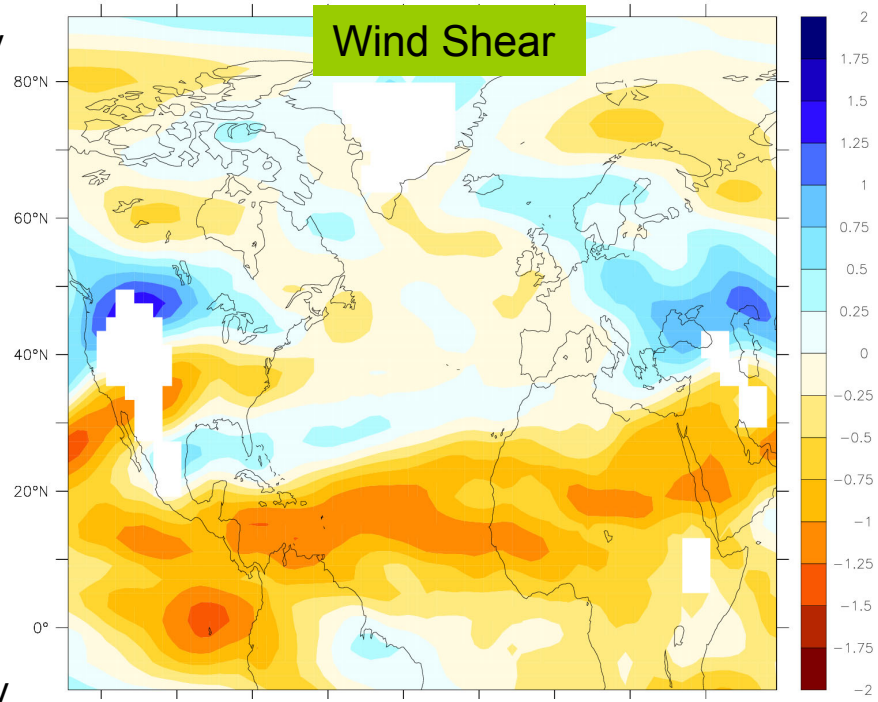








JJA Precipitation Anomalies
Maximum MOC



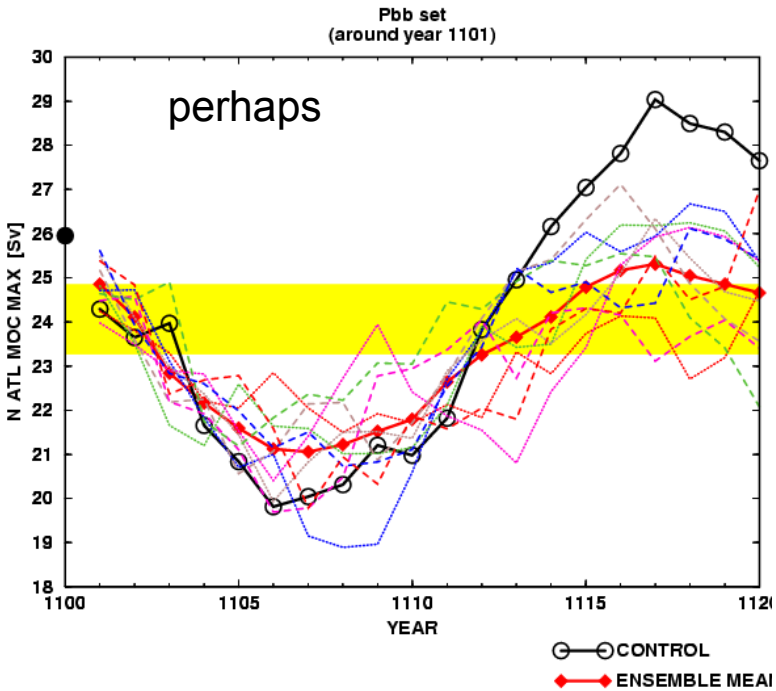
JJA: Vertical Shear anomalies of zonal wind
(850mb-300mb) Maximum MOC

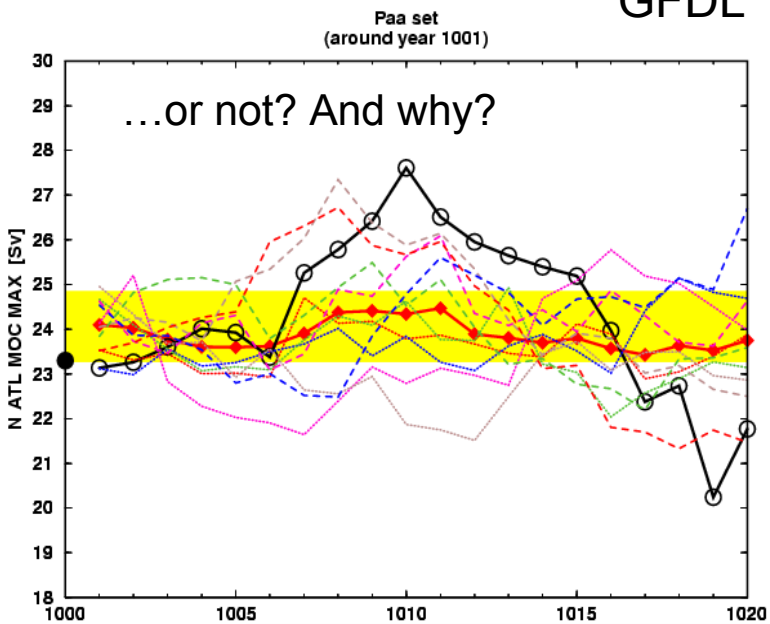
Decadal predictions provide context for severe weather:
drought, hurricanes

Need to de-convolve forced vs natural variability

Does, e.g., the MOC have any predictability?

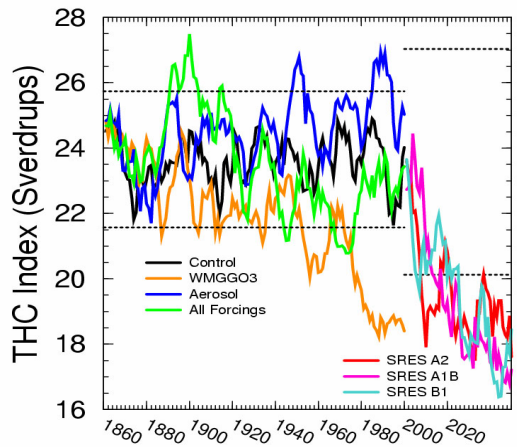
Keith Dixon
GFDL





GFDL workshop on predictability organized by Delworth, Leetma, Marshall and Rosati

2-page summary



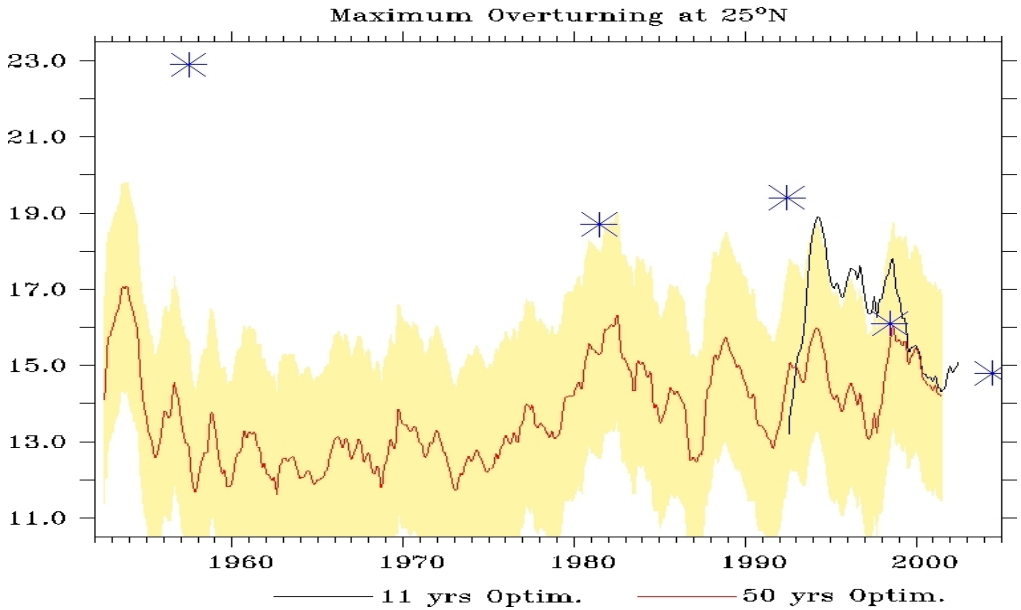
Early warning system for abrupt MOC changes?

Implementation plan is being written

POS-PPAI: joint discussions
Ideas for next steps

Ocean observations/synthesis and predictability

Strength of Atlantic MOC at 25N from ocean analysis compared to Bryden et al., 2005



Courtesy of Detlef Stammer and GECCO

Can assess the current state of the ocean, the status of the MOC, ice extent, sea-level etc etc, and provide initial conditions for decadal projections.

Requires combining the developing global ocean observing capability with ocean data assimilation systems.

Elements are in place, but a ‘push’ is needed to move beyond demonstration projects.

:decadal prediction can provide a focus

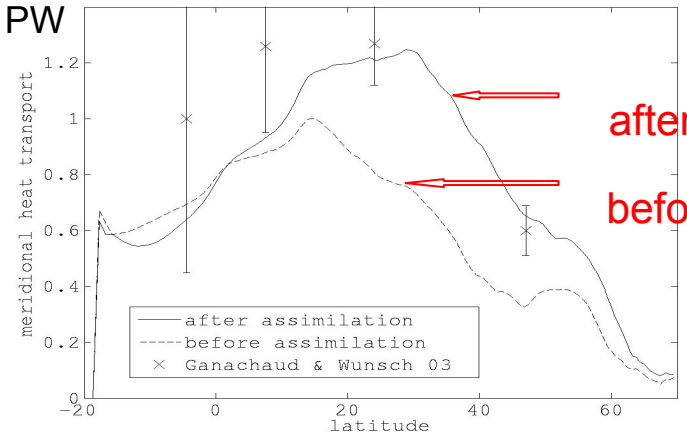
Ocean observing system is in continual threat of being significantly reduced in scope

:backbone is provided by ARGO arrays, satellite altimeters and satellite wind measuring systems.

Assimilation of ARGO profiles dramatically improves the ability of MIT ocean model to simulate the MOC and its heat transport.

ARGO profiles
May 2002-Apr 2003
(+climatology south of 30N & below 2000m)

Gael Forget et al (b), to be submitted



Meridional heat transport in the Atlantic

NOTE

There is a strong link between marine ecosystems and ocean climate. Sophisticated fisheries and ecosystem models exist and significant progress in the area of assessing potential changes can be made once these are coupled to ocean models.

<u>POS panel discussions</u>:

Sarah Gillie: status of ARGO
Jim Carton: ocean synthesis
Terry Joyce: CO2 hydrography

2-page summaries

<u>POS-PSMI joint discussions</u>

use of assimilative models to identify and fix systematic model errors

Salinity WG report: Jim Carton

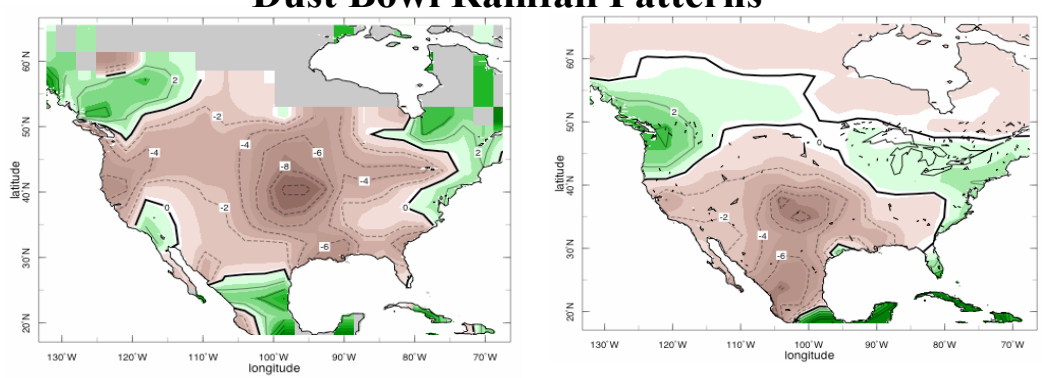
Weather extremes

Drought has emerged as a CLIVAR focus

A physical understanding of the causes of long-term drought is emerging.
Uncertainties remain about relative roles of:

- different ocean basins
- strength of the land-atmosphere feedbacks
- role of deep soil moisture
- nature of long term SST variability
- impact of global change
- fundamental issues about predictability of drought.

Dust Bowl Rainfall Patterns



observed modeled

NCAR climate model

Drought WG proposal: Schubert, Nigam → 2-page summary

Proposed working group will help focus observational and modeling studies

What can we do?

Set up and study prototype decadal predictability systems based on IPCC-class coupled models.

What does one need?

Coupled IPCC-class models

Global data sets and assimilation methods — particularly for the ocean

Computational resources - ensembles

Smart ideas
- on predictability of coupled system
- better understanding of the key components

Research program on basic dynamics and analysis related to the prediction problem

Links to the international community.

What would the products be?

Projection of sea-level rise, sea-ice extent, MOC, trends for weather extremes, separation of natural and forced variability, applications to global biogeochemical cycles, fisheries, carbon cycle…….

New – not being done now