Summary of
the Mini-Workshop #4:
AMOC Mechanisms and Predictability

(led by Task Team #3)

Invited talks

- Tom Delworth:

  Review of Proposed Mechanisms for Decadal to Multidecadal AMOC and Atlantic Variability

- Grant Branstator:

  Initial Value Predictability of Upper Layer Temperature and AMOC

NEAR-TERM RESEARCH PROIRITIES (NTPs)

Task Team #3: AMOC mechanisms and predictability (p.18-19 of the AMOC 2012 Report)

5. Further effort needs to be directed toward understanding AMOC variability mechanisms and the model dependencies of these variability mechanisms. To address this issue, a detailed comparison study for the AMOC mechanisms should be coordinated among modeling groups. A focused effort is also needed to develop a synthesis of existing observations, including synthesis of proxy data, to discriminate various model-based proposed mechanisms against the observational data.

6. In coordination with the near-term prediction experiments being conducted by modeling centers for the IPCC AR5, an inter-comparison study should be performed to investigate the robustness of AMOC predictions among simulations using various models. These efforts should seek collaboration with the U.S. CLIVAR Decadal Predictability Working Group as well as the International CLIVAR Working Group on Ocean Model Development and Global Synthesis and Observational Panel.

NTP #5:

Primarily calling for coordinated activities:

- Focused comparison study for AMOC mechanisms among modeling groups …… e.g., role of Nordic Sea overflows, eddy parameterizations, ……
- New observations or synthesis of existing observations / proxy data to discriminate among various model-based proposed mechanisms
- Identify standard set of metrics to document and assess simulated AMOC variability and mechanisms

Efforts / Frameworks:

- New focused experiments
- CORE-II project, involving forced ocean – ice coupled simulations (CLIVAR WGOMD)
- CMIP5, involving coupled simulations

•Focused comparison study for AMOC mechanisms among modeling groups
…… e.g., role of Nordic Sea overflows, eddy parameterizations, ……

Action Item 1:

Formulate an email discussion group to develop coordinated modeling experiments with common perturbations applied to various models, spanning hierarchy of models (e.g. simple models with adjoint to full OGCM). (Lead: Gokhan Danabasoglu)

- Identify the participating PIs. (Send email to Gokhan if intereted.)
- Define the experiment protocols considering internal variability (e.g. advection/propagation of anomalies) as well as the externally forced change (e.g. aerosol forcing). (Many suggestions! Ex: anomalously high/low NAO forcing, southern ocean SAM forcing…)
- Communicate with the THOR project for their similar effort

….

- Do the coordinated experiments! (funding/resources?)

- New observations or synthesis of existing observations / proxy data to discriminate among various model-based proposed mechanisms

Action Item 2:

Support/join the effort to have a fingerprint workshop with the paleo-climate community led by the Task Team #2.

- Communicate with the paleo community through the CLIVAR/ PAGES working group. (Task Team #2 Chairs)
- Report back the similar effort in the THOR project from their meeting in September. (Young-Oh Kwon/Claude Frankignoul)

- Identify standard set of metrics to document and assess simulated *AMOC* variability and mechanisms

Action Item 3:

The coordinated experiment group for the mechanism study will lead the effort to define the metrics in a consistent way to the experiment protocols. (Lead: Gokhan Danabasoglu)

- Common definition, location, variables.
- Make the metrics available to the greater community through the US CLIVAR webpage (e.g. for CMIP-5 inter-comparison).
- Provide the recommendation for the metrics to the WGOMD CORE-II project group.

Other discussions related to the NTP #5

- Act as a curator for the AMOC-related results and publication using the webpage. (Please send the list of your (and others') AMOC-related publication list to Mike Peterson.)

- Review article on the AMOC mechanism?

  ➔ Wait for the results from the coordinated experiments, so that we can actually test/verify the proposed mechanisms.

NTP #6:

Analysis and inter-comparison of decadal prediction (DP) simulations regarding their AMOCs in CMIP5.

Call for efforts in:

- Best initialization practices and bias correction,
- Standard metrics (including for AMOC predictability studies)

Several groups are already working on these

CLIVAR WGCM, CLIVAR WGSIP, U.S. CLIVAR DPWG, and CLIVAR WGOMD

Suggested activity for the AMOC Science Team:

Participate in the case verification of the early 2010 sudden AMOC decrease from the decadal prediction simulations.

Suggestion for the new NTPs / additional ideas

- How can we constrain the simulated AMOC? Need to maintain and add additional sustained observing system.

- Need to support AMOC/AMO focused synthesis of the paleo proxy data.

- Funding/resource: bottom-up vs. top-down

Mini-Workshop #4: AMOC Mechanisms and Predictability

==========

Topic 1: Review of proposed mechanisms for decadal to multidecadal AMOC and Atlantic variability

Speaker: Tom Delworth

Guiding questions:

1. What are some of the proposed mechanisms for AMOC variability? Hopefully this list will involve some grouping with respect to their critical elements such as Nordic Sea overflows, Labrador Sea heat flux, Arctic freshwater flow, subtropical gyre expansion, impacts from low latitudes, etc.
2. Do some of the above variability elements play similar or different roles among the proposed mechanisms?
3. Can we tell if some mechanisms are more plausible than others based on model physics, robustness, and available observations?
4. What is needed from observations and models to help identify robust aspects of AMOC variability?

Mini-Workshop #4: AMOC Mechanisms and Predictability

==========

Topic 2: Initial value predictability of upper layer temperature and AMOC

Speaker: Grant Branstator

Guiding questions:

5. What is the current state of initial value predictability in climate models on decadal time scales?
6. What are the measures of predictability? Are some atmospheric and oceanic fields more predictable than others?
7. What is the predictability of AMOC on decadal time scales?
8. What are the prospects for determining predictability from observations? What are the prospects for AMOC in particular, and what observations are most crucial?