



CLIVAR

CLIMATE VARIABILITY AND PREDICTABILITY

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WCRP Cross-Cuts

SSG-18

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CLIVAR Working Group on Ocean Model Development

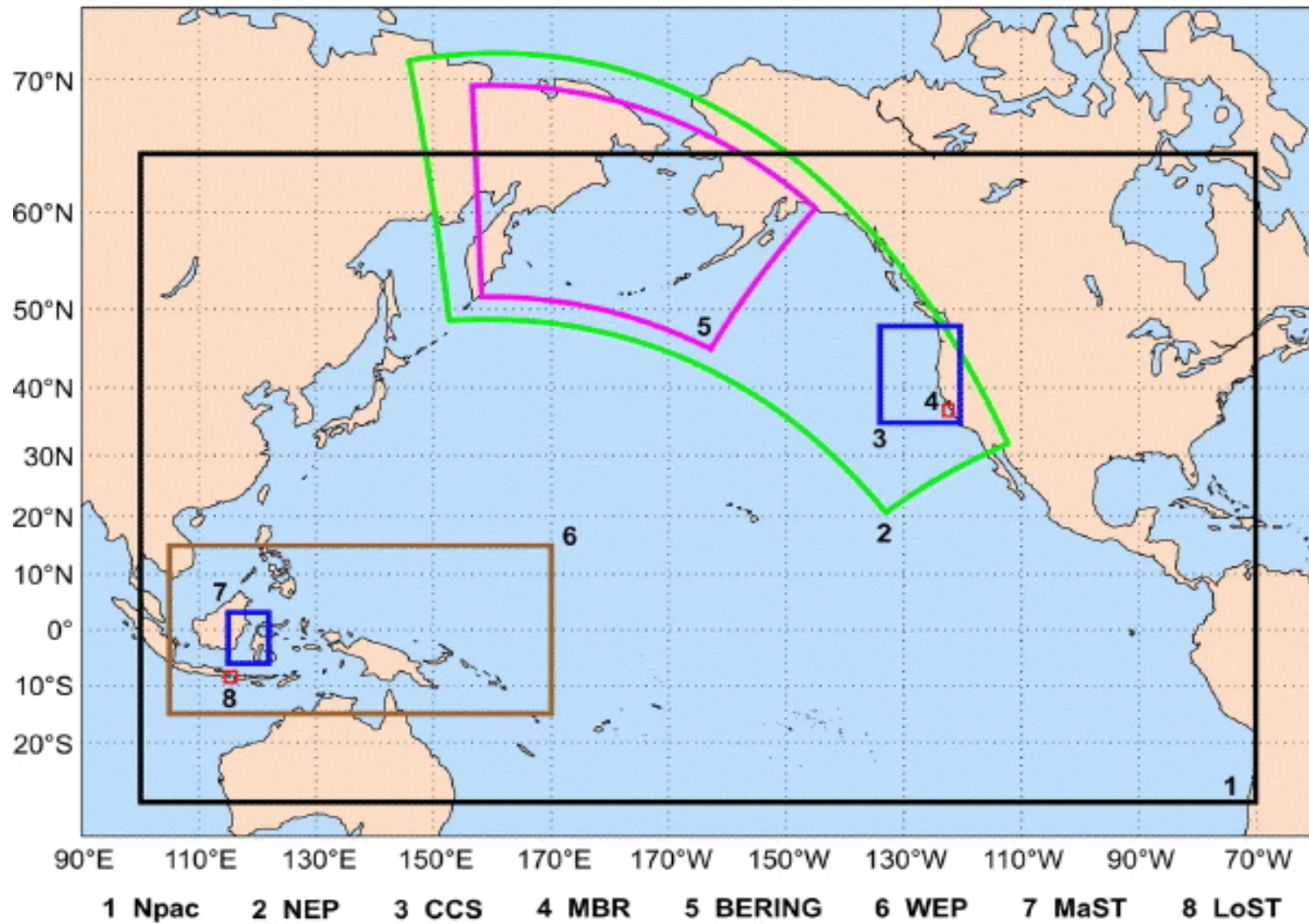
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The ICPO contact for the CLIVAR Working Group on Ocean Model Development is [Anna Pirani](#)

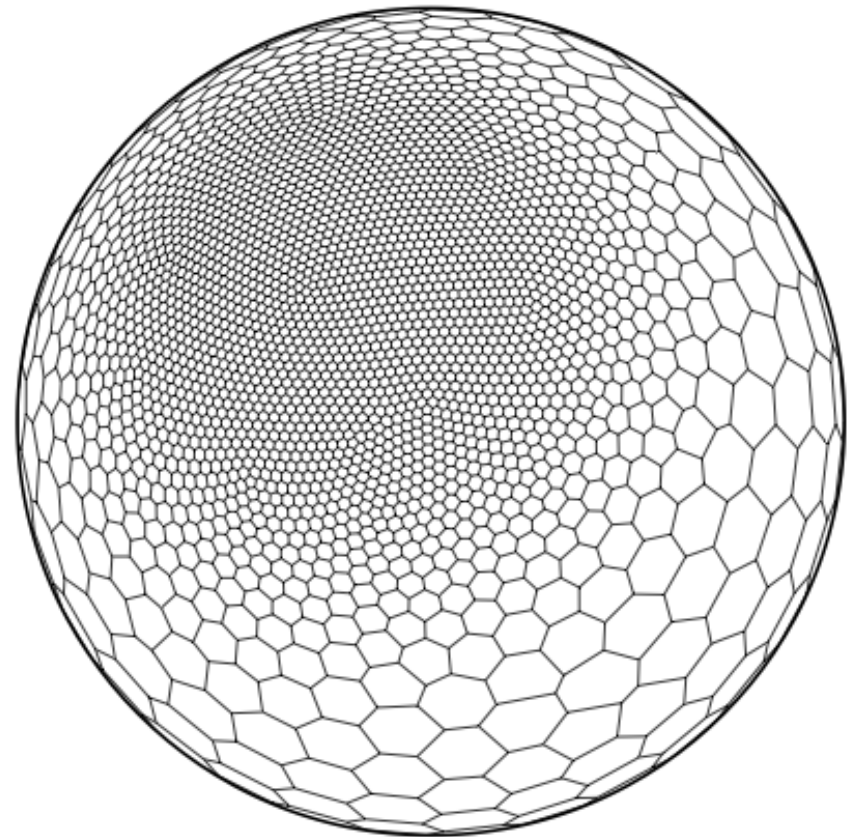
MODEL DEVELOPMENT: Nested Modeling



Curchitser et al.

MODEL DEVELOPMENT: Model for Prediction Across Scales - Ocean (MPAS-O)

- Unstructured grid approach to climate system modeling.
- Supports both quasi-uniform and variable resolution meshes, using quadrilaterals, triangles.
- Potential to explore regional-scale features within the global climate system.
- A partnership between NCAR (MMM; atmosphere) and LANL COSIM.
- The ocean part is led by Todd Ringler at LANL.



MODEL SIMULATIONS AND ANALYSIS

Report of the 14th Session of the CLIVAR/WCRP WGCM
Action Items and Recommendations:

#17: Recommend that WGOMD compare CORE-II* results to CMIP coupled simulations.

WGOMD: Paper analyzing CMIP5 ocean output WGOMD requested, possibly comparing to CORE-forced experiments.

* ocean - sea-ice simulations forced with 1948-2007 inter-annually varying atmospheric data sets (Large and Yeager 2009)



**WCRP Coupled Model
Intercomparison Project - Phase 5
- CMIP5 -**

Physical Ocean Fields in CMIP5

Stephen Griffies¹ and Gokhan
Danabasoglu²

1 NOAA Geophysical Fluid Dynamics Lab, USA
2 NCAR, USA

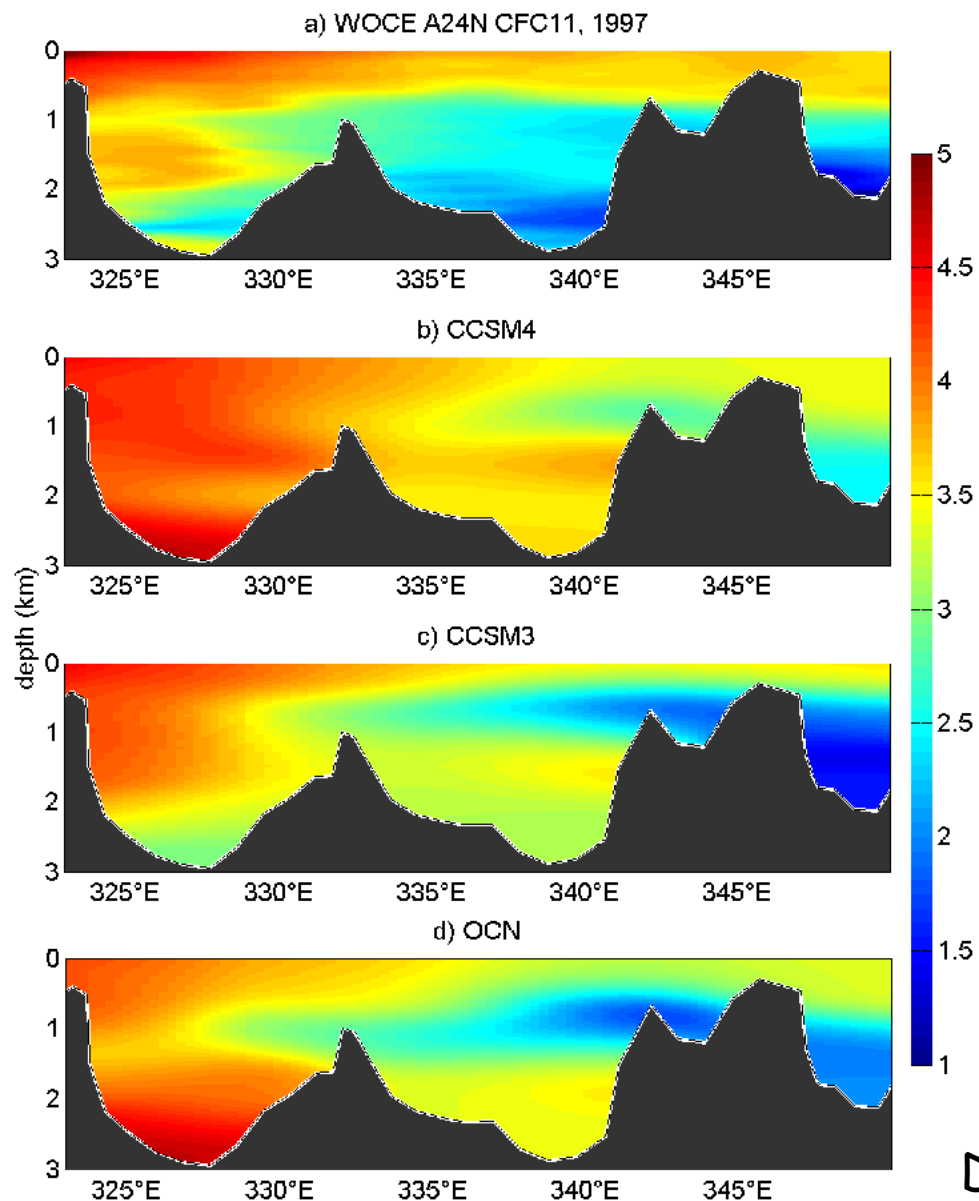
Pages 32-34

MODEL SIMULATIONS AND ANALYSIS

From a physical (oceanography) process perspective, CMIP3 archive suffered from the following shortcomings:

- There was insufficient output to construct global budgets of ocean mass, heat, and salt, with incomplete information regarding the surface boundary fluxes. Furthermore, those boundary fluxes archived were generally *not* on the ocean model native grid.
- There were few (if any) fields of use for studying the impact of subgrid scale parameterizations, with such information of leading order importance for understanding ocean model behavior.
- Vector fields were remapped to a spherical grid from the non-spherical native grids of most contributing models. Remapping occurred despite the absence of a generally applied algorithm to handle complex land-sea boundaries, thus resulting in incomplete and/or untrustworthy vector fields.
- Fields important for understanding ventilation of abyssal, intermediate, and thermocline waters (relevant for ocean heat or Carbon uptake) were missing - e.g., ideal age, CFCs.

MODEL SIMULATIONS AND ANALYSIS



CFC-11 concentration
(pmol kg^{-1}) along the
WOCE A24N section
for 1997

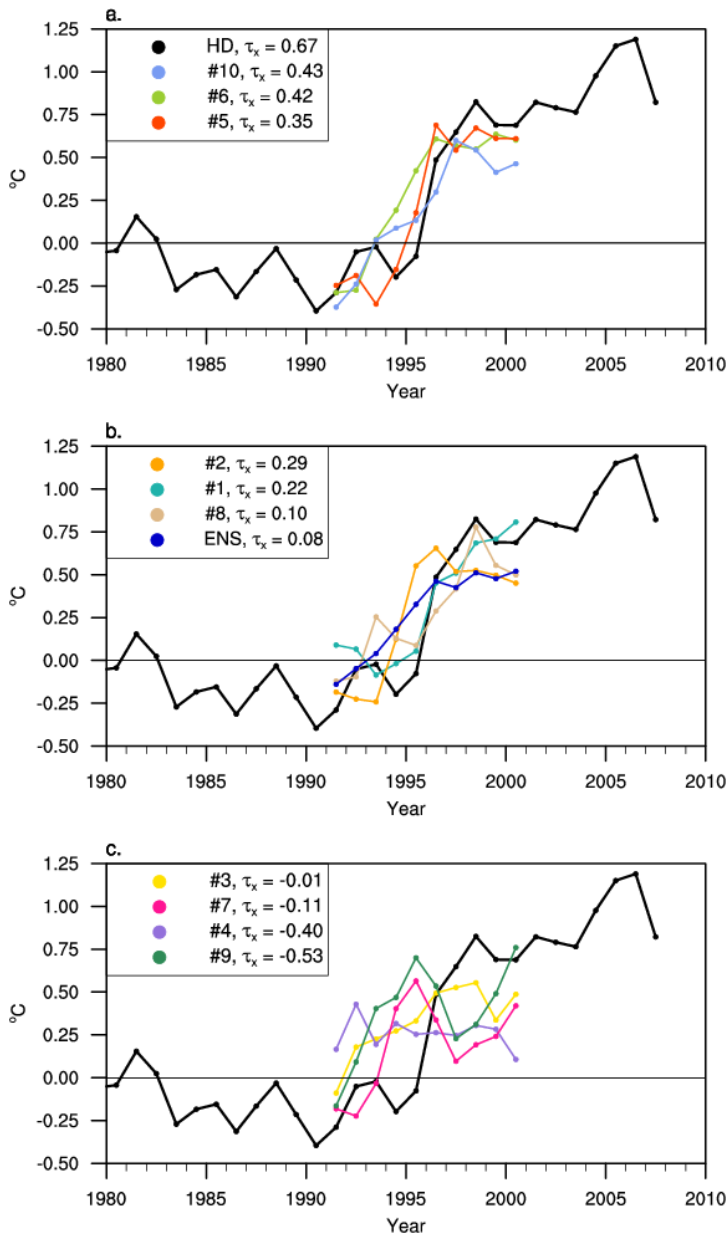
CMIP5 & CORE

Danabasoglu et al. (2011, J Climate)

MODEL SIMULATIONS AND ANALYSIS

- J. Deshayes et al.: Relation between changes in freshwater content and circulation in the North Atlantic (FCVAR project). **CMIP5**
- Danabasoglu et al. (2011, J. Climate): AMOC in CCSM4 and heat and freshwater budgets in the North Atlantic. **CMIP5**
- Yeager et al. (2011, J. Climate): A decadal prediction case study: Late 20th Century North Atlantic Ocean heat content. **CMIP5 & CORE**

MODEL SIMULATIONS AND ANALYSIS



Time series of the upper-ocean temperature anomalies in the North Atlantic Subpolar Gyre:

black - CORE-forced simulation

color - ensemble members of the decadal prediction simulations initialized on 1 January 1991

Yeager et al. (2011, J. Climate)

The 10th Session of the WGOMD Panel

11-13 January 2012, Venice, Italy

Hosted by CNR Institute for Marine Sciences (ISMAR)

MAIN FOCUS (2.5 days): CORE II simulations, their analysis, and documentation in peer-reviewed journals in time for CMIP5 usage.

- Level, isopycnal, and sigma coordinate models as well as participation of ECCO.
- Primary hypothesis is that models forced with the same inter-annually varying data will result in similar simulations.
- Studies will include mean state, variability, trends, various case studies, etc.
- Our intent is to look at CMIP5 20C simulations as well.
- Collaboration with GSOP.

INTERACTION WITH LOCAL SCIENTISTS (0.5 days)

Preliminary plans for the next WGOMD panel meeting:

- February 2013, Hobart, Australia.
Hosted by CSIRO
- Workshop on sea-level rise, ocean—ice-shelf interactions, and ice sheets (a proposal has been submitted to CSIRO for local funding considerations).

The WCRP/JCOMM Coordinated Ocean Wave Climate Projections (COWCLIP)

Mark Hemer, Xiaolan Wang, Ralf Weisse and the COWCLIP team

COWCLIP aims to generate wave climate projections and aid comprehensive assessments of their cascading uncertainty by:

- 1 Providing a systematic, community-based framework and infrastructure for wave climate projections forced from CMIP5 datasets,
- 2 Describing best practices for regional wave climate projections, and
- 3 Engaging the interests of the wind-wave community into the wider climate community and ultimately developing coupled wind-wave Atmosphere-Ocean global climate models in order to derive quantitative estimates of wind-wave driven feedbacks in the coupled climate system

30 researchers from 18 countries attended a workshop in Geneva in 2011, including B. Fox-Kemper, on behalf of the WGCM and CMIP communities with input from Meehl et al.

The other 21 presentations were distributed over four themes:

Global wave climate projections, Regional wave climate projections, Coupled wind-wave-climate modeling, Historical wave climate variability and change

Progress made: Key working groups identified, workshop presentations archived (www.jcomm.info/cowclip), key science questions identified (white papers below), protocol devised for a pilot phase of COWCLIP for AR5, challenges remain:

The 2011 Hawaii waves workshop, and 2nd COWCLIP workshop planned for early 2012, most likely in Europe, will aim to make further advance against these issues.

White paper: Hemer et al. 2011, BAMS: Hemer et al 2010, Cavalieri et al. 2012.

Hemer talks at WCRP OS Mon. 17:40 PM