



Project Report

Report of the 12th Session of the CLIVAR Working Group on Ocean Model Development

10-11 April 2014 Kiel, Germany

July 2014

WCRP Informal/Series Report No. 12/2014
ICPO Informal Report 195/14

CLIVAR is a component of the World Climate Research Programme (WCRP). WCRP is sponsored by the World Meteorological Organisation, the International Council for Science and the Intergovernmental Oceanographic Commission of UNESCO. The scientific planning and development of CLIVAR is under the guidance of the JSC Scientific Steering Group for CLIVAR assisted by the CLIVAR International Project Office. The Joint Scientific Committee (JSC) is the main body of WMO-ICSU-IOC formulating overall WCRP scientific concepts.

Bibliographic Citation
INTERNATIONAL CLIVAR PROJECT OFFICE, 2014:
WGOMD,. International CLIVAR
Publication Series No 195. (not peer reviewed).

Table of Contents

WGOMD12 ACTION ITEMS	4
1. Introduction	9
3. Repository for Evaluating Ocean Simulations (REOS)	10
4. Coordinated Ocean-ice Reference Experiment - Phase II (CORE-II) Update 11	
4.1 CORE-II Protocol.....	12
4.2 CORE in CMIP	13
5. CMIP ocean model data	13
6. Southern Ocean MIP	14
7. GSOP/GODAE Ocean Reanalyses Intercomparison Project (ORA-IP)	14
8. Community ocean Vertical Mixing (CVMix) Project	15
9. CLIVAR Update	15
10. Future Activities	17
11. WGOMD Business	17
11.1 Next Meeting	17
References	19
Appendix A - 12th Session of WGOMD Agenda	20
Appendix B - 12th Session of WGOMD Participants	22

WGOMD12 ACTION ITEMS

Outcomes and Recommendations of the WGOMD Workshop on High Resolution Ocean Climate Modeling

1	Produce a CLIVAR Exchanges Special Issue on High Resolution Ocean Climate Modeling	A. Pirani, A. M. Treguier, and Scientific Organizing Committee (SOC)	Submissions June 13 Final Version July 15
2	Workshop summary / review paper on High Resolution Ocean Climate Modeling in CLIVAR Exchanges	A. M. Treguier and SOC	Submissions June 13 Final Version July 15
3	Recommendations from workshop for observational needs, including how to better exploit existing observations	A. M. Treguier	ongoing
4	Recommendations from workshop for a new version of the CORE framework that can be used in high resolution simulations, i.e., a high-resolution forcing data set, plus other CORE-type experiments	A. M. Treguier	ongoing

REOS

5	Workshop recommendations on metrics for Metrics Panel	S. Marsland	May 2014
6	Update REOS website, including a new high resolution component and experience from CORE-II analyses	A. Pirani	ongoing
7	In order to make more use of this web site within CLIVAR, we recommend that it be incorporated into a broader pan-CLIVAR repository of sanctioned datasets, methods, projects, etc. Doing so will facilitate coordination across the observation-based and model panels. It will also leverage input from a broader group of CLIVAR scientists than available just within the WGOMD	A. Pirani, All	After Pan-CLIVAR
8	Exchanges Special Issue on REOS - reports on latest published transport estimates, prepared jointly by modeler and observational communities. Possibly a precursor to a BAMS-type summary report.	A. Pirani, A. M. Treguier, M. Balmaseda	2015

CORE-II Protocol

9	Create netCDF files with multi-model diagnostics, including multi-model means for, e.g., AMOC indices, strait transports, and ocean heat uptake (with an eye on future CORE studies). Distribute for comparison with CMIP/ocean-state/data-assimilation products via CORE website	All to A. Pirani	August 2014
10	Collect monthly-mean model output files from all CORE-II participants for the last cycle of the simulations at NCAR	G. Danabasoglu, S. Yeager	June 2014
11	CORE overview paper for <i>Ocean Modelling</i> special issue to introduce the CORE project, the data, and CORE diagnostics.	S. Griffies et al.	Summer 2015
12	Extended CORE forcing to present day, with radiation and run off as climatology - CORE-interim	G. Danabasoglu, S. Yeager, S. Griffies	August 2014
13	Recommend a test simulation of CORE-II models with alternate forcings: L&Y, Compo, new DRAKKAR	G. Danabasoglu, A. M. Treguier	Fall 2014
14	Develop CORE BGC protocol, based on updating OCMIP protocol (does not include sea-ice) tailored to decadal to multi-decadal timescales	A. Oschlies, E. Curchitser	Spring 2015
15	Change wording of CORE protocol to 'must' use L&Y bulk formula, except over sea-ice	S. Griffies	July 2014
16	Provide an acknowledgment text for use in papers using CORE-II framework, data, model output, etc. on the CORE-II website and request that future papers cite this	G. Danabasoglu, S. Griffies, A. Pirani	August 2014
17	Entertain the idea of writing a synthesis / analysis paper on high resolution CORE-type simulations	A. M. Treguier	Longer term consideration

CORE in CMIP

18	Circulate CMIP Panel email about CMIP6 protocol and collate comments for WGMOD response.	A. Pirani	July 2014
19	WGOMD to evaluate next steps in CORE, postpone contribution as a MIP	G. Danabasoglu	July 2014

CMIP ocean model data

20	WGOMD to request information regarding ocean-related output data usage from ESGF achieve for CMIP5: list of papers and output fields used on webpage	A. Pirani	July 2014
21	Ocean temperature in CMIP - no strong preference if keep as Kelvin, or change to Celsius	G. Danabasoglu	April 2014
22	Develop BGC output request for CMIP based on CORE BGC protocol	A. Oschlies, E. Curchitser	Spring 2015

SO MIP

23	Request from SOP preliminary protocols for performing coordinated Antarctic freshwater perturbations experiments and Southern Ocean wind stress perturbation experiments; encourage any interested party to proceed as a smaller group.	P. Spence, M. England, S. Griffies	July 2014
----	---	------------------------------------	-----------

ORA-IP

24	Start an organized effort for comparison of solutions from CORE-II experiments and those of various reanalysis products. Initial focus is on the Atlantic Meridional Overturning Circulation (AMOC), Atlantic meridional heat transport, and mixed layer depths.	G. Danabasoglu, M. Valdivieso, M. Balmaseda, S. Masina	Fall 2014
----	--	--	-----------

CVMix

25	Publicize CVMix at various meetings, e.g., WMAC, CLIVAR, etc. for support.	G. Danabasoglu	July 2014
----	--	----------------	-----------

CLIVAR/ Panel v WGOMD

26	Enhance communication and coordination between WGOMD and Basin panels via regular exchange with Basin panel modeling representatives on synthesis of priorities, needs, recommendations	A. Pirani, G. Danabasoglu, S. Marsland	Fall 2014
27	Recommend that Research Foci activity communication is facilitated via a dedicated Research Foci notice board.	A. Pirani, ICPO	July 2014
28	WGOMD to become the CLIVAR Ocean Model Development Panel, revisit ToRs.	G. Danabasoglu, A. Pirani, S. Marsland, H. Drange, S. Griffies, CLIVAR SSG	Fall Executive SSG meeting

WGOMD Business

29	2015 Turkey - WGOMD-ICTP Summer School, explore holding a mini-science workshop and the WGOMD panel meeting	G. Danabasoglu, S. Marsland, A. Pirani, R. Farneti	Fall 2015
----	---	--	-----------

1. Introduction

The 12th Session of the CLIVAR Working Group on Ocean Model Development (WGMOD) was held in Kiel, Germany on 10-11 April 2014 at GEOMAR, hosted by Dr. C. Böning. The agenda is in Appendix A and the List of Participants in Appendix B.

The meeting followed the WGOMD Workshop on High Resolution Ocean Climate Modeling. After a discussion of the main outcomes and recommendations of the workshop, the WGOMD meeting focused on reports on the status of the CORE-II analysis efforts, the CORE-II protocol, the WGOMD and CORE in the context of the CMIP process, future development of the Repository for Evaluating Ocean Simulations (REOS) and on the evolution of WGOMD as part of the changing structure and activities of the CLIVAR Project.



WGOMD and Guests at the 12th Session, held at GEOMAR, Kiel, Germany

2. Outcomes and Recommendations of WGOMD Workshop on High Resolution Ocean Climate Modeling

WGOMD organized the Workshop on High Resolution Ocean Climate Modeling, held on 7-9 April, also hosted by GEOMAR in Kiel, Germany. The introductory session was led by a series of invited talks on mesoscale eddies and climate; air-sea interactions and western boundary currents; resolution dependence of climate biases; variability and sensitivity in coupled models; and thoughts on eddy resolving ocean models. This was followed by a session on current on-going work and state-of-the-art simulations by all the climate modeling groups present at the workshop, then sessions on ocean physical processes, their parameterizations, air-sea interactions, technical challenges of high resolution climate modelling, downscaling, and metrics and evaluation. The program and all presentations are available on the workshop website at <http://www.clivar.org/wgomd/highres>

A CLIVAR Exchanges Special Issue is being compiled for production in July 2014 that will include an introductory article from the workshop scientific organizing committee, as well as contributions from the workshop speakers, many of whom will prepare joint, or session-wide articles.

Action Items

- 1. Produce a CLIVAR Exchanges Special Issue on High Resolution Ocean Climate Modeling*
- 2. Workshop summary / review paper on High Resolution Ocean Climate Modeling in CLIVAR Exchanges*
- 3. Recommendations from workshop for observational needs, including how to better exploit existing observations*
- 4. Recommendations from workshop for a new version of the CORE framework that can be used in high resolution simulations, i.e., a high-resolution forcing data set, plus other CORE-type experiments*

3. Repository for Evaluating Ocean Simulations (REOS)

The REOS is a WGOMD web site aimed at facilitating the research community's access to:

- basic datasets and analyses/syntheses products;
- metrics for evaluating variability and processes including input by the CLIVAR basin panels;
- guidance on ocean model validation;
- tools available for the community for ocean model data analysis;
- a comprehensive bibliography of papers, linked to the online articles where possible.

In order to make more use of this web site within CLIVAR, we recommend that it be incorporated into a broader pan-CLIVAR repository of sanctioned datasets, methods, projects, etc. Doing so will facilitate coordination across the observation-based and model panels. It will also leverage input from a broader group of CLIVAR scientists than available just within the WGOMD.

Action Items

5. *Workshop recommendations on metrics for Metrics Panel*
6. *Update REOS website, including a new high resolution component and experience from CORE-II analyses*
7. *In order to make more use of this web site within CLIVAR, we recommend that it be incorporated into a broader pan-CLIVAR repository of sanctioned datasets, methods, projects, etc. Doing so will facilitate coordination across the observation-based and model panels. It will also leverage input from a broader group of CLIVAR scientists than available just within the WGOMD*
8. *Exchanges Special Issue on REOS - reports on latest published transport estimates, prepared jointly by modeler and observational communities. Possibly a precursor to a BAMS-type summary report.*

4. Coordinated Ocean-ice Reference Experiment - Phase II (CORE-II) Update

The following CORE-II analysis papers, representing contributions to the *Ocean Modelling* Special Issue on CORE-II, were reported on:

- G. Danabasoglu: North Atlantic variability; Pacific Ocean
- S. Griffies: Global and regional sea level; Indian Ocean
- R. Farneti (remote) and S. Marsland: Southern Ocean circulation and ventilation
- M. Bentsen: Arctic Ocean and sea-ice
- R. Farneti (remote) and A. M. Treguier: South Atlantic Ocean
- G. Nurser: Overturning in temperature and salinity space

We are very pleased to note that two manuscripts, documenting the mean states in the North Atlantic (Danabasoglu et al. 2014) and the global and regional sea level (Griffies et al. 2014) in the participating CORE-II simulations have been already published in the special issue.

Issues of storage, use (e.g., credit), and distribution of the output data sets from the CORE-II simulations were discussed, with multiple requests coming in to use the simulation data and more detailed analyses planned or already underway. Monthly mean output from the last cycle of all models could be stored at NCAR, together with multi-model diagnostics for comparison with other studies.

On the issue of authorship of future studies using CORE-II simulations, it was concluded that, since all relevant preceding CORE-II papers would be cited, it would be sufficient to provide a common acknowledgment text. Papers on future studies will be requested to cite this in their acknowledgements. A summary CORE-II overview

paper was proposed for the *Ocean Modelling* Special Issue to introduce the issue as well provide information on how to access CORE-II data and diagnostics. This paper will be submitted to *Ocean Modelling* sometime first half of 2015, after the bulk of the present CORE-II projects are published or in press, and when the CORE-II model results have been organized at the NCAR archive.

4.1 CORE-II Protocol

A series of deviations (mostly minor) from the CORE-II protocol have been reported. These deviations include use of different bulk formulations; introduction of a seasonal cycle for Antarctic runoff; and modifications of the winds. Details of these deviations will be included as an appendix in the North Atlantic Variability paper (Danabasoglu *et al.*, in preparation).

The CORE-II protocol allows the use of surface salinity restoring. The participating groups employ a wide range of restoring time scales in their simulations, ranging from 50 days to 4 years (over 50m thickness) to maintain stable simulations and obtain solutions in agreement with observations. In comparison to the impacts of such restoring, the deviations from the CORE-II protocol appear to be minor. However, more analysis is needed to understand the full impacts of the various modifications on the ocean simulations. Furthermore, some of the changes could be the basis for a modified and improved CORE-II protocol.

An ocean biogeochemistry (BGC) and passive tracer protocol for CORE is being developed following the OCMIP-2 protocol by Orr *et al.* (1999a, b). See also the OCMIP-2 website: <http://ocmip5.ipsl.jussieu.fr/OCMIP/phase2/simulations/>.

Action Items

9. *Create netCDF files with multi-model diagnostics, including multi-model means for, e.g., AMOC indices, strait transports, and ocean heat uptake (with an eye on future CORE studies). Distribute for comparison with CMIP/ocean-state/data-assimilation products via CORE website*
10. *Collect monthly-mean model output files from all CORE-II participants for the last cycle of the simulations at NCAR*
11. *CORE overview paper for Ocean Modelling special issue to introduce the project, the data, and CORE diagnostics.*
12. *Extended CORE forcing to present day, with radiation and run off as climatology - CORE-interim*
13. *Recommend a test simulation of CORE-II models with alternate forcings: L&Y, Compo, new DRAKKAR*
14. *Develop CORE BGC protocol, based on updating OCMIP protocol (does not include sea-ice) tailored to decadal to multi-decadal timescales*
15. *Change wording of CORE protocol to 'must' use L&Y bulk formula, except over sea-ice*
16. *Provide an acknowledgment text for use in papers using CORE-II framework, data, model output, etc. on the CORE-II website and request that future papers cite this*
17. *Entertain the idea of writing a synthesis / analysis paper on high resolution CORE-type simulations*

4.2 CORE in CMIP

An initial design for CMIP6 has recently been published (Meehl et al., EOS, 2014, see <http://onlinelibrary.wiley.com/doi/10.1002/2014EO090001/abstract>) and is now open for comments from the community until 15 September 2014. The CMIP6 design includes a small set of experiments to be routinely performed by modeling groups whenever they develop a new model version. The output from these so-called ongoing CMIP Diagnostic, Evaluation and Characterization of Klima (DECK) experiments will be distributed for community use via the ESGF infrastructure. Other Model Intercomparison Projects (MIPs) will build on the CMIP DECK experiments and augment them to address a broad range of scientific questions. Additionally proposed MIP experiments together with the CMIP DECK experiments will constitute the suite of simulations for the next phase of CMIP.

Feedback on this initial CMIP6 proposal is being solicited this year from modeling groups and model analysts, to be sent to the CMIP Panel by 15 September 2014. The WGCM and the CMIP Panel will then revise the proposed experiment design, with the intention to finalize it in October 2014.

The WGOMD discussed the possible inclusion of the CORE-II experiments as a MIP within the CMIP framework in detail. While we recognize that such inclusion will further increase the prominence of our CORE-II efforts and enforce the standardization of output data, there are some additional work and responsibilities that come with being a MIP. These include updates and improvements of the CORE-II protocol; continuing updates, corrections, and maintenance of the forcing data sets; and management of broader efforts, all requiring dedicated and not insignificant resources. After thoughtful deliberations, the WGOMD decided to i) to explore and seek funding opportunities to support the CORE-II efforts more reliably and ii) postpone participation in CMIP as a CORE-II MIP because we will have additional opportunities to do so in the near future.

Action Items

18. Circulate CMIP Panel email about CMIP6 protocol and collate comments for WGMOD response.
19. WGOMD to evaluate next steps in CORE, postpone contribution as a MIP

5. CMIP ocean model data

In preparation for CMIP6, WGOMD is requested by WGCM and the CMIP Panel to prepare the requirements for ocean model field output. The preference from the ocean modeling community is for the provision of data on native grids. However native grid output is complex for extracting latitude-longitude section from the ESGF. Steps are needed to help broaden the usage of native grid output, providing mapping scripts and guidelines on how to handle complex land-sea boundaries. Some basic variables, e.g. temperature, salinity, 2-dimensional state variables could be stored on a common, 1 degree latitude-longitude grid, thus requiring less work to use these data by the user community. The WGOMD will provide a list of ocean model output variables, based on the WGOMD document provided for CMIP5. This list will prioritize the output fields. We will also provide a short list of candidate variables for remapping onto a

common regular latitude – longitude grid for easy analysis. A BGC output request, based on the CORE BGC protocol that is under development, will be provided.

Action Items

20. *WGOMD to request information regarding ocean-related output data usage from ESGF achieve for CMIP5: list of papers and output fields used on webpage*
21. *Ocean temperature in CMIP - no strong preference if keep as Kelvin, or change to Celsius*
22. *Develop BGC output request for CMIP based on CORE BGC protocol*

6. Southern Ocean MIP

P. Spence, M. England, and collaborators are planning to propose a couple of coordinated experiments involving i) Southern Ocean wind perturbations and ii) Antarctic freshwater perturbation experiments. Related protocols are expected to be proposed after a review of ongoing work. Regarding the latter set of experiments, a concern is the role of sub-surface salinity restoring which can act to negate / modify the impacts of glacial melt.

Action Item:

23. *Request from SOP preliminary protocols for performing coordinated Antarctic freshwater perturbations experiments and Southern Ocean wind stress perturbation experiments; encourage any interested party to proceed as a smaller group.*

7. GSOP/GODAE Ocean Reanalyses Intercomparison Project (ORA-IP)

The GSOP/GODAE Ocean Reanalyses Intercomparison Project (ORA-IP) is an assessment of over 20 ocean reanalysis products across the following variables: steric height, sea level, ocean heat content, 20°C isotherm depth, mixed layer depth, salinity, surface fluxes and transports, AMOC at 26°N and sea-ice. The first results from this intercomparison activity have been published in issue 64 of the CLIVAR Exchanges newsletter (<http://www.clivar.org/publications/exchanges>). Signal-to-noise ratios (ensemble mean signal vs ensemble spread) have been investigated to inform what ocean metrics might be well resolved in the context of climate monitoring, and identify regions that require improved observation and/or modeling. The ensemble has also been used in the context of specific scientific research questions - such as establishing historical relationships between the NAO and mixed layer depths in the North Atlantic and the robustness of the recently reported increase in deep ocean heat uptake during the 2000s. Full-length research articles are currently being invited for special issue of Climate Dynamics (nominal deadline is end of June 2014).

With the maturation of the CORE-II effort and the availability of various reanalysis products, the WGOMD will collaborate with GSOP to start some preliminary comparisons of solutions from CORE-II experiments and those provided by

reanalysis. The initial focus will be on Atlantic meridional overturning circulation (AMOC), Atlantic heat transport, and mixed layer depths, involving initially a small group of participants. The analysis of overturning in temperature and salinity space being performed on CORE-II by G. Nurser, J Zika and collaborators will be extended to the ORA-IP simulations.

Action Item:

24. *Start an organized effort for comparison of solutions from CORE-II experiments and those of various reanalysis products. Initial focus is on the Atlantic Meridional Overturning Circulation (AMOC), Atlantic meridional heat transport, and mixed layer depths.*

8. Community ocean Vertical Mixing (CVMix) Project

The WGOMD endorses the CVMix project, a collaboration between NCAR, GFDL, and LANL. CVMix is a software package that aims to provide transparent, robust, flexible, well documented, shared Fortran source code for use in parameterizing vertical mixing processes in numerical ocean models. The project is focused on developing software for a consensus of first-order closures that return a vertical diffusivity, viscosity, and possibly a non-local transport, with each quantity dependent on the tracer or velocity being mixed. CVMix modules are written as kernels designed for use in a variety of Fortran ocean model codes such as MPAS-ocean, MOM, and POP. Code development occurs within a community of scientists and engineers who make use of CVMix modules for a variety of ocean codes. When mature, CVMix modules will be freely distributed to the open source community under GPLv2 using an open source methodology.

As of June 2014, the CVMix code includes a suite of mixing schemes, including the K-Profile Parameterization for the surface boundary layer, and rudiments of tide mixing schemes. Significant refinement and expansion to the code, including new parameterizations, will follow as testing within MPAS-O, MOM, and POP continues. It is anticipated that a beta release will be sometime during the second half of 2014.

Action Item:

25. *Publicize CVMix at various meetings, e.g., WMAC, CLIVAR, etc. for support.*

9. CLIVAR Update

The CLIVAR Climate and Oceans: Variability, Predictability and Change Project is the WCRP project on ocean-atmosphere interactions with objectives to improve the understanding of mechanisms for climate variability on intra-seasonal to centennial time-scales, improving predictions of climate variability and change, improving the atmosphere and ocean components of Earth-System Models, and extending the observed climate record.

In addition to the project's core activities that are being carried forward by its panels, CLIVAR has initiated a series of Research Foci. These are areas primed for progress in the next 5-10 years that will benefit significantly from enhanced CLIVAR coordination. Currently, the following Research Foci have been identified:

- Intraseasonal, Seasonal and Interannual Variability and Predictability of Monsoon Systems
- Decadal Variability and Predictability of Ocean and Climate Variability
- Science Underpinning the Prediction and Attribution of Extreme Events
- Marine Biophysical Interactions and Dynamics of Upwelling Systems
- Sea-Level Rise and Regional Impacts
- Consistency Between Planetary Heat Balance and Ocean Heat Storage
- ENSO in a Changing Climate

CLIVAR Research Foci topics are expected to evolve and expand in response to the research community's priorities and needs for internationally coordinated activities. CLIVAR's on-going and future activities, and their implementation will be discussed at the 2014 Pan-CLIVAR meeting that will be held in The Hague, The Netherlands on 16-18 July 2014, contributing towards the preparation of the CLIVAR Achievements Report and the new CLIVAR Science Plan and Implementation Strategy.

The role of WGOMD is expected to change in accordance to the evolution of CLIVAR. The CLIVAR SSG recommends that WGOMD becomes the CLIVAR Ocean Model Development Panel (OMDP) to serve an advisory role in support of the CLIVAR ocean basin panels, the development of the ocean observing system, and the relevant CLIVAR Research Foci. WGOMD is a CLIVAR global modeling group and plays a role within WCRP together with the WGSIP and WGCM global modeling groups, under the coordination of the WCRP Modeling Advisory Council. In consideration of our new roles as a new panel within CLIVAR and as a modeling liaison within CLIVAR and between CLIVAR and WCRP, the OMDP will revise its Terms of References (ToRs) to reflect these new responsibilities.

Tentatively, the WGOMD members will attend the following panel meetings (some joint) and Research Foci discussions:

Pan-CLIVAR interactions/meeting agenda items:

GSOP - forward/assimilation intercomparison, sub-surface indices, air sea fluxes, REOS

AIP - Tropical systematic errors, AMOC, overflows, SAMOC, decadal variability

All Basin panels: presentation on regional CORE-II analyses

SOP - SOP MIP

Research Foci engagement:

Upwelling - E. Curchitser, A. Oschlies, G. Danabasoglu

Decadal - G. Danabasoglu

Sea level - S. Griffies, S. Marsland, Y. Komuro

Heat uptake - A. M. Treguier, M. Winton, G. Nurser

Action Items:

26. *Enhance communication and coordination between WGOMD and Basin panels via regular exchange with Basin panel modeling representatives on synthesis of priorities, needs, recommendations*
27. *Recommend that Research Foci activity communication is facilitated via a dedicated Research Foci notice board.*
28. *WGOMD to become the CLIVAR Ocean Model Development Panel, revisit ToRs.*

10. Future Activities

The following are areas that were discussed for future WGOMD activities, beyond new activities as part of the CLIVAR Research Foci:

- CORE-III systematic Greenland ice melt experiment, forced by a realistic ice melt distribution
- AMOC MIP around Greenland in coupled models, comparing AMOC estimates with coupled climate model response
- Salinity restoring approaches
- High resolution CORE, development of high resolution CORE forcing dataset suitable for high resolution models, eg ERA-sat product (<T511 over satellite period, available in 2015)
- Climate response function CORE-type experiments
- CORE experiments with different wind products
- Partial coupling and other new forcing approaches for ocean only models
- Southern Ocean wind MIP, AABW cell intercomparison
- Exploring the feasibility and use of very high resolution 'truth' idealized experiments against which to compare models, parameterizations
- Community collaboration, CPT approach in parameterization development tests, CVMix extension
- Coordinated activities that target systematic biases

11. WGOMD Business

11.1 Next Meeting

An ICTP Summer School is being organized in collaboration with WGOMD on Ocean Climate Modeling: Physical and biogeochemical dynamics of semi-enclosed seas, tentatively scheduled for either June or September 2015 in Ankara, Turkey, hosted by the Middle East Technical University. The school will follow on the heels of the one held in India in 2013. This time the focus will be on modelling physical and biogeochemical dynamics of semi-enclosed seas and coastal areas. The activity will not only deal with the physics of the seas but also with marine biogeochemistry and ecosystem modeling, its interaction with the physical climate, and possible consequences on social and economical aspects. The activity is intended for students and young researchers. The students are expected to acquire both theoretical

understanding and the practical knowledge necessary for using ocean and biogeochemical models.

The 13th Session of the WGOMD (1st Session of OMDP) can be held in conjunction with the Summer School. We are also exploring the possibility of having a mini workshop in conjunction with the summer school. Potential topics for a workshop could include regional modeling; coastal modeling; links between coastal and open oceans and modeling.

Action Item:

29. 2015 Turkey - WGOMD-ICTP Summer School, explore holding a mini-science workshop and the WGOMD panel meeting

References

Danabasoglu, G., S. G. Yeager, D. Bailey, E. Behrens, M. Bentsen, D. Bi, A. Biastoch, C. Boning, A. Bozec, V. Canuto, C. Cassou, E. Chassignet, A. C. Coward, S. Danilov, N. Diansky, H. Drange, R. Farneti, E. Fernandez, P. G. Fogli, G. Forget, Y. Fujii, S. M. Griffies, A. Gusev, P. Heimbach, A. Howard, T. Jung, M. Kelley, W. G. Large, A. Leboissetier, J. Lu, G. Madec, S. J. Marsland, S. Masina, A. Navarra, A. J. G. Nurser, A. Pirani, D. Salas y Melia, B. L. Samuels, M. Scheinert, D. Sidorenko, A.-M. Treguier, H. Tsujino, P. Uotila, S. Valcke, A. Voldoire, and Q. Wang, 2014: North Atlantic simulations in Coordinated Ocean-ice Reference Experiments phase II (CORE-II). Part I: Mean states. *Ocean Modelling*, **73**, 76-107, doi:10.1016/j.ocemod.2013.10.005.

Danabasoglu *et al.*: North Atlantic simulations in Coordinated Ocean-ice Reference Experiments phase II (CORE-II). Part II: Variability. *Ocean Modelling*, in preparation.

Griffies, S. M., Yin, J., Durack, P. J., Goddard, P., Bates, S. C., Behrens, E., Bentsen, M., Bi, D., Biastoch, A., Boning, C., Bozec, A., Cassou, C., Chassignet, E., Danabasoglu, G., Danilov, S., Domingues, C., Drange, H., Farneti, R., Fernandez, E., Greatbatch, R. J., Holland, D. M., Ilicak, M., Lu, J., Marsland, S. J., Mishra, A., Lorbacher, K., Nurser, A. J. G., Salas y Melia, D., Palter, J. B., Samuels, B. L., Schroter, J., Schwarzkopf, F. U., Sidorenko, D., Treguier, A.-M., Tseng, Y.-H., Tsujino, H., Uotila, P., Valcke, S., Voldoire, A., Wang, Q., Winton, M., Zhang, X., 2014. An assessment of global and regional sea level in a suite of interannual CORE-II simulations. *Ocean Modelling* 78, 35–89.

Meehl, G. A., R. Moss, K. E. Taylor, V. Eyring, R. J. Stouffer, S. Bony and B. Stevens, Climate Model Intercomparisons: Preparing for the Next Phase, *Eos Trans. AGU*, 95(9), 77, 2014.

Orr, J. C., R. Najjar, C. L. Sabine, and F. Joos, 1999: Abiotic-HOWTO. Internal OCMIP Report, LSCE/CEA Saclay, Gif-sur-Yvette, France, 25 pp.

Orr, J. C., J.-C. Dutay, R.G. Najjar, J. Bullister, and P. Brockmann, 1999: CFC-HOWTO. Internal OCMIP Report, LSCE/CEA Saclay, Gif-sur-Yvette, France, 12 pp.

Appendix A - 12th Session of WGOMD Agenda

Thursday 10th April

Morning (08:30-12:30)

1. Outcomes and recommendations of High Resolution workshop (A. M. Treguier, K. Bryan)
2. CORE-II papers status and updates
 - G. Danabasoglu: Atlantic variability + Pacific
 - S. Griffies: SSH and Indian Ocean
 - R. Farneti (remote) and S. Marsland: Southern Ocean papers
 - H. Drange: Arctic
 - R. Farneti (remote) and A. M. Treguier: South Atlantic
 - G. Nurser: Overturning in T & S space

Afternoon (13:30-18:00)

3. CORE-II protocol
 - a. Modifications introduced by some groups: discussion of reasons for these modifications.. (C. Böning, G. Nurser, and E. Chassignet)
 - b. CORE-II as a "MIP" in CMIP (G. Danabasoglu)
 - implications,
 - forcing data set updates and maintenance,
 - output data sets,
 - protocol,
 - etc.
 - c. Ocean data sets in CMIP: native grid, but a few on "standard" regular lon-lat grid. Units for temperature field: C or K ? What precision is sufficient for model output diagnostics: single or double? (G. Danabasoglu)
4. Discussion of wind and water protocol for Southern Ocean MIP, based on input from the Southern Ocean panel (S. Griffies)
5. CVMix as a prototype for a common code shared across ocean models (S. Griffies)

Friday 11th April

Morning (08:30-12:30)

6. CLIVAR and WGOMD (A. Pirani and G. Danabasoglu)

- Interactions with other CLIVAR panels (GSOP, basin panels, WCRP modeling WGs), research foci (sea level, decadal, heat uptake, upwelling) and preparing for pan-CLIVAR
- WGOMD: working group vs. panel
- SSG Action items

7. New COREs and future directions (leading and addressing CLIVAR science)

Afternoon (13:30-17:00)

8. Planning for next meeting, workshop, summer school
9. WGOMD business (membership)

Appendix B - 12th Session of WGOMD Participants

WGOMD members

G. Danabasoglu (co-chair), NCAR, USA
E. Curchister, Rutgers University, USA
M. Winton, GFDL, USA
S. Marsland, CSIRO/CAWCR, Australia
Y. Komuro, JAMSTEC, Japan
S. Masina, CMCC, Italy
G. Nurser, NOC, UK
A. Oschlies, GEOMAR, Germany
H. Johnson, U. Oxford, UK (remote)

A. Pirani, CLIVAR, Italy

Absent: D. Holland, Courant Institute, USA; H. Drange (co-Chair), University of Bergen, Norway; H. Johnson, U. Oxford, UK

Invited guests:

C. Böning, GEOMAR, Germany
A. M. Treguier, IFREMER, France
E. Chassignet, FSU, USA
M. Balmaseda, ECMWF, USA
S. Griffies, GFDL, USA
M. Bentsen, U. Bergen, Norway
S. Danilov, AWI, Germany
R. Farneti, ICTP, Italy (remote)
H. Tsujino, MRI JMA, Japan
F. Bryan, NCAR, USA
P. Spence, UNSW, Australia