Ocean Model Intercomparison Project (OMIP)

Co-Chairs

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Physical Processes (CLIVAR Ocean Model Development panel, OMDP, & Collaborators

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Chemical and Biogeochemical Processes

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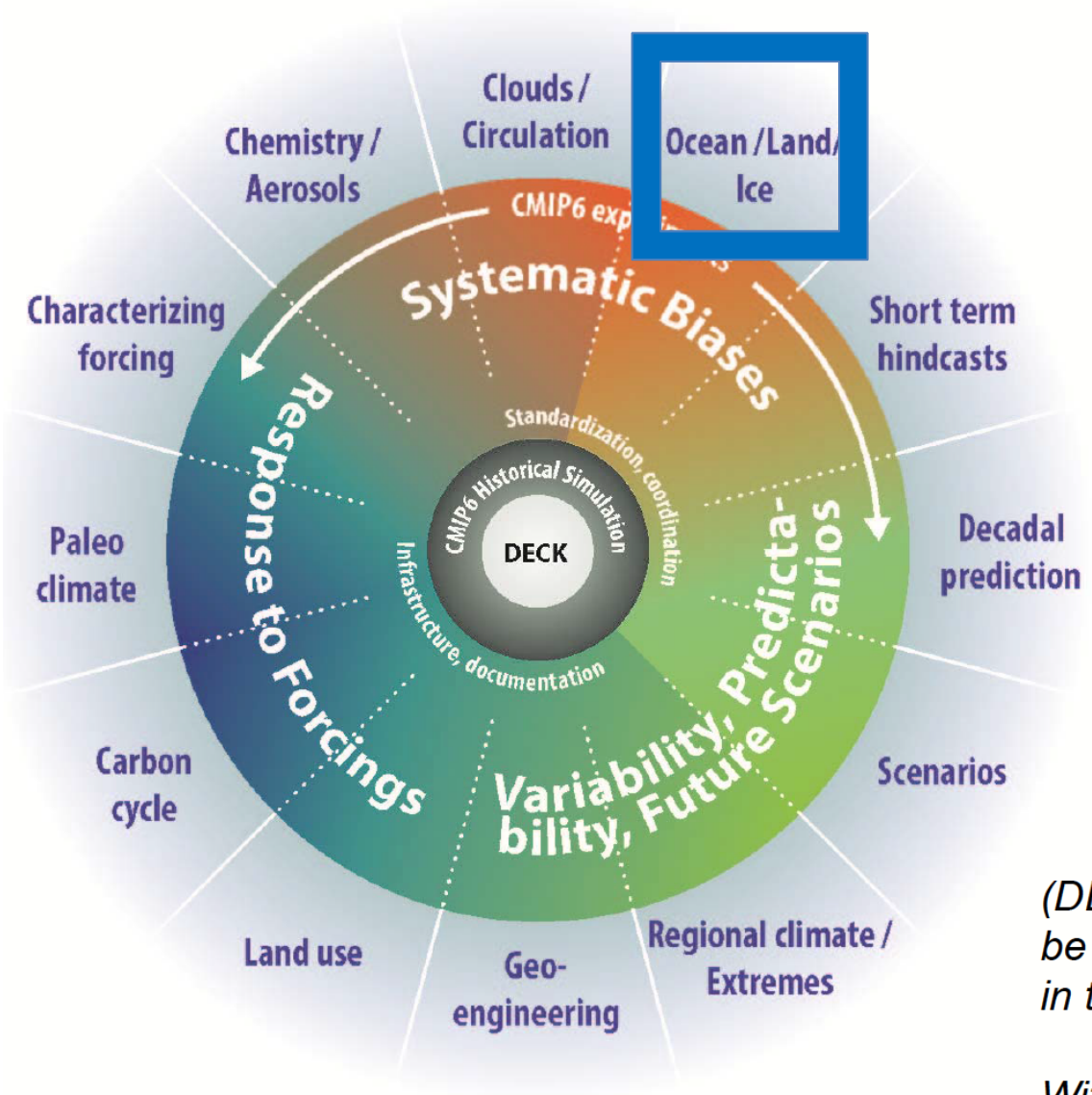
OMIP includes the previously separate Ocean Carbon Model Intercomparison Project (OCMIP). This merging of ocean physical, chemical, and biogeochemical efforts into a single project allows for efficient communication across these communities participating in CMIP6.

DECK: Diagnosis, Evaluation, & Characterization of Klima



Note: *The themes in the outer circle of the figure might be slightly revised at the end of the MIP endorsement process*

DECK (entry card for CMIP)

i. AMIP simulation (~1979-2014)
ii. Pre-industrial control simulation
iii. 1%/yr CO_2 increase
iv. Abrupt 4xCO_2 run

CMIP6 Historical Simulation (entry card for CMIP6)

v. Historical simulation using CMIP6 forcings (1850-2014)

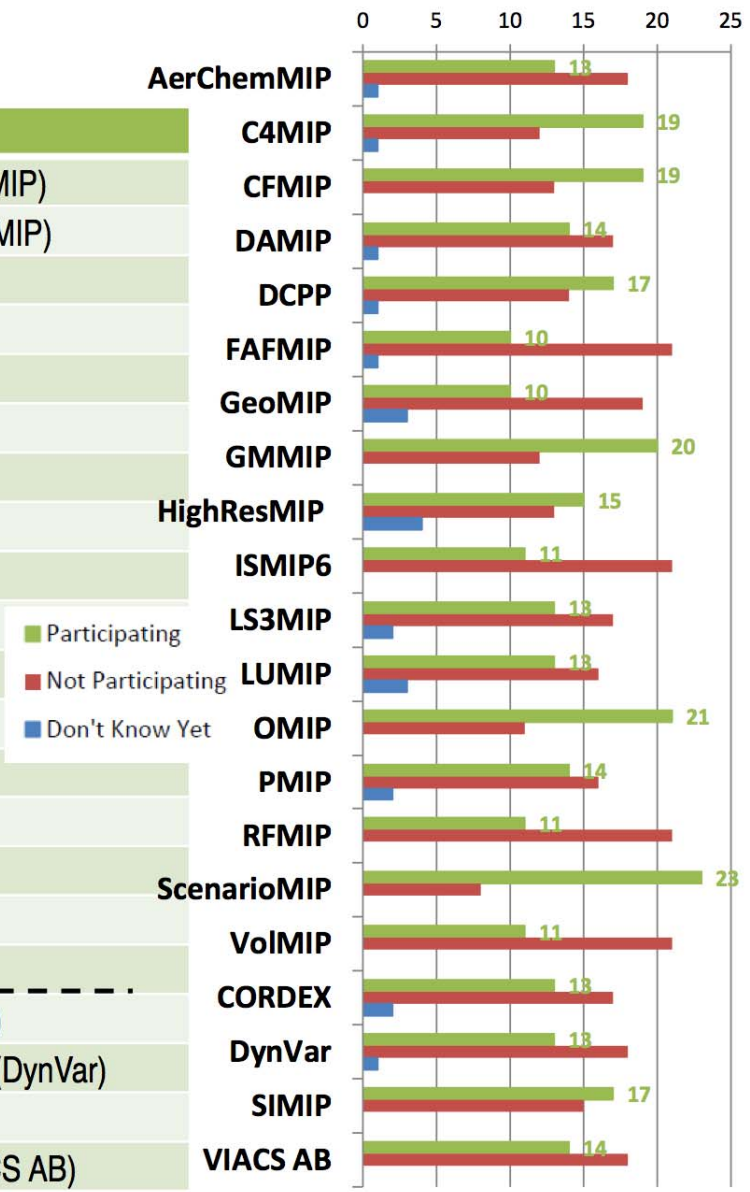
(DECK & CMIP6 Historical Simulation to be run for each model configuration used in the subsequent CMIP6-Endorsed MIPs)

With proto-DECK experiments (LMIP,OMIP etc.) in CMIP6 Tier1

Endorsed MIPs for CMIP6 (October 2015)

CMIP6-Endorsed MIPs and Model Groups' Commitments to Participate in each MIP

	Long Name of MIP (Short Name of MIP)
1	Aerosols and Chemistry Model Intercomparison Project (AerChemMIP)
2	Coupled Climate Carbon Cycle Model Intercomparison Project (C4MIP)
3	Cloud Feedback Model Intercomparison Project (CFMIP)
4	Detection and Attribution Model Intercomparison Project (DAMIP)
5	Decadal Climate Prediction Project (DCPP)
6	Flux-Anomaly-Forced Model Intercomparison Project (FAFMIP)
7	Geoengineering Model Intercomparison Project (GeoMIP)
8	Global Monsoons Model Intercomparison Project (GMMIP)
9	High Resolution Model Intercomparison Project (HighResMIP)
10	Ice Sheet Model Intercomparison Project for CMIP6 (ISMIP6)
11	Land Surface, Snow and Soil Moisture MIP (LS3MIP)
12	Land-Use Model Intercomparison Project (LUMIP)
13	Ocean Model Intercomparison Project (OMIP)
14	Paleoclimate Modelling Intercomparison Project (PMIP)
15	Radiative Forcing Model Intercomparison Project (RFMIP)
16	Scenario Model Intercomparison Project (ScenarioMIP)
17	Volcanic Forcings Model Intercomparison Project (VolMIP)
18	Coordinated Regional Climate Downscaling Experiment (CORDEX)
19	Dynamics and Variability of the Stratosphere-Troposphere System (DynVar)
20	Sea-Ice Model Intercomparison Project (SIMIP)
21	Vulnerability, Impacts & Adaptation and Climate Services AB (VIACS AB)



The CMIP6 design will be described in a Geoscientific Model Development (GMD) special issue with submissions of an overview paper and the CMIP6-Endorsed MIP contributions with a deadline of 31 March 2016.

OMIP Overview and Scientific Goals

OMIP addresses the CMIP6 science question on investigating the origins and consequences of systematic model biases, by providing a framework for evaluating (including assessment of systematic biases), understanding, and improving ocean, sea-ice, tracer, and biogeochemical components of climate and earth system models contributing to CMIP6.

Among the WCRP Grand Challenges (GCs), OMIP primarily contributes to the regional sea-level rise and near-term (climate / decadal) prediction GCs.

Specifically, OMIP provides a framework:

- To investigate physical, chemical, and biogeochemical mechanisms that drive seasonal, inter-annual, and decadal variability;
- To attribute ocean-climate variations to boundary forced versus natural;
- To evaluate robustness of mechanisms across models and forcing data sets;
- To bridge observations and modeling by complementing ocean reanalysis from data assimilation;
- To provide consistent ocean and sea-ice states useful for initialization of climate (e.g., decadal) predictions.

OMIP

PART I

Diagnostic analysis of CMIP6 ocean components

- Physics
- Inert chemistry
- Biogeochemistry (BGC)

OMIP is independent of any particular CMIPX

PART II

Forced ocean – sea-ice hindcast simulations following the CORE-II protocol

TIER 1 (OMIP-A)

One 310-year simulation forced with the inter-annually varying CORE-II atmospheric datasets for the 1948-2009 period (5 repeat forcing cycles):

Path I: physics + chemistry

Path II: physics + chemistry + BGC

BGC fields are initialized from observations

TIER 2 (OMIP-B)

Same as Path II of Tier 1, except that BGC fields are initialized from spun-up fields

OMIP Part I:
Diagnostic analysis of CMIP6 ocean components

OMIP coordinates diagnostic analysis for all CMIP experiments that involve an ocean component. As part of this role, CLIVAR OMDP has produced two CMIP ocean model diagnostic papers that offer recommendations and scientific justifications for sampling ocean fields.

The OMIP diagnostic papers consist of three sections:

- Ocean physics
- Ocean inert chemistry
- Ocean biogeochemistry

CMIP Special Issue of Geoscientific Model Development

http://www.geosci-model-dev.net/special_issue590.html

S.M. Griffies et al, 2016: **OMIP contribution to CMIP6: experimental and diagnostic protocol for the physical component of the Ocean Model Intercomparison Project**, *accepted*.
J.C. Orr et al, 2016: **Biogeochemical protocols and diagnostics for the CMIP6 Ocean Model Intercomparison Project (OMIP),** *in review*.

OMIP Part II: Global Ocean and Sea-ice Simulations

OMIP Tier 1 Simulation

One 310-year ocean – sea-ice hindcast simulation for the 1948-2009 period.

Path I: modeling groups unable to run with biogeochemistry can participate in the physical / chemical portion. Potential (or Conservative) temperature, salinity (practical or Absolute) and ideal age are required. In addition, the inert chemical tracers are included with CFC11 as a required field and CFC12 and SF_6 are optional.

Path II: As in Path I, but with an online biogeochemistry model. Biogeochemistry is initialized from observed climatologies.

Forcing is based on the Coordinated Ocean-ice Reference Experiments interannually varying atmospheric data sets, i.e., CORE-II, and follows the OMDP CORE-II protocol. OCMIP2 protocol is followed for inert chemicals

OMIP Part II: Global Ocean and Sea-ice Simulation

OMIP Tier 2 Simulation

One 310-year ocean – sea-ice hindcast simulation for the 1948-2009 period

The same as OMIP-Tier 1/Path II except that the biogeochemistry fields are initialized with spun up fields, rather than observed climatologies.

Thus, this simulation is requested from the groups that have a biogeochemistry model and can run millennial-scale spin-up. The spin-up should be at least for 1000 years – ideally for 5000 years.

OMIP-Part II focuses on decadal to centennial changes particularly over the industrial era. In addition, it allows an evaluation of deep-ocean circulation via radiocarbon.

Forcing approaches are based on the CORE-II protocol for physics; OCMIP2 protocol for inert chemicals; and OCMIP3 protocol for biogeochemicals.

OMIP/Version 2: JRA-55 atmospheric/river state

A ``corrected'' version of the JRA-55 atmospheric reanalysis has been developed by JMA and NCAR collaboration (Tsujino et al, *in prep*). It will be released late 2016 for use in global ocean/sea-ice simulations. JRA-55 will replace the Large/Yeager (2009) atmospheric state used in OMIP/Version 1.

Feature	JRA-55	CORE-II
Space resolution	55 km	200 km
Time resolution for the meteorology fields	8 times per day	4 times per day
Years available	1958-2015 (will be frequently updated)	1948-2009 (not updated)