CLIVAR
Ocean Model Development Panel
Update

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Co-Chairs

WGNE-36 Meeting, November, 2021

Topics of Panel Interest

OMIP: Ocean & Sea-Ice Only Simulations vs. Observations

SWOT AdAC: High-resolution model intercomparison in anticipation of launch

Coupled Model vs. OMIP: Fluxes vs. ABL, Eddy Killing Feedbacks

Mixed Layer Intercomparisons: MLD as emergent constraint, multi-model MLDs

Coupled Model Initialization: In collaboration with WGNE, DAO

Recent Meetings: Virtual Panel (May, Oct), WGNE small groups, ESMO reps.

Future Directions in High-resolution Ocean Modelling Workshop

(Kiel GEOMAR hosting, Sept)

OMIP: Ocean & Sea-Ice Only Sims vs. Obs.

A Tradition of the Panel Work from the WGOMD Days

CORE (“Normal Year”)

CORE-II (1948-2009, OMIP1)

JRA55-do

(1958 to present, OMIP2)
+selected “typical” years

OMIP-Future

OMDP plans to extract forcing from high-res. coupled sims to produce, SSPs for OMIPs.

Geosci. Model Dev., 13, 3643–3708, 2020
https://doi.org/10.5194/gmd-13-3643-2020

Geoscientific Model Development
Open Access
EGU

Evaluation of global ocean–sea-ice model simulations based on the experimental protocols of the Ocean Model Intercomparison Project phase 2 (OMIP-2)

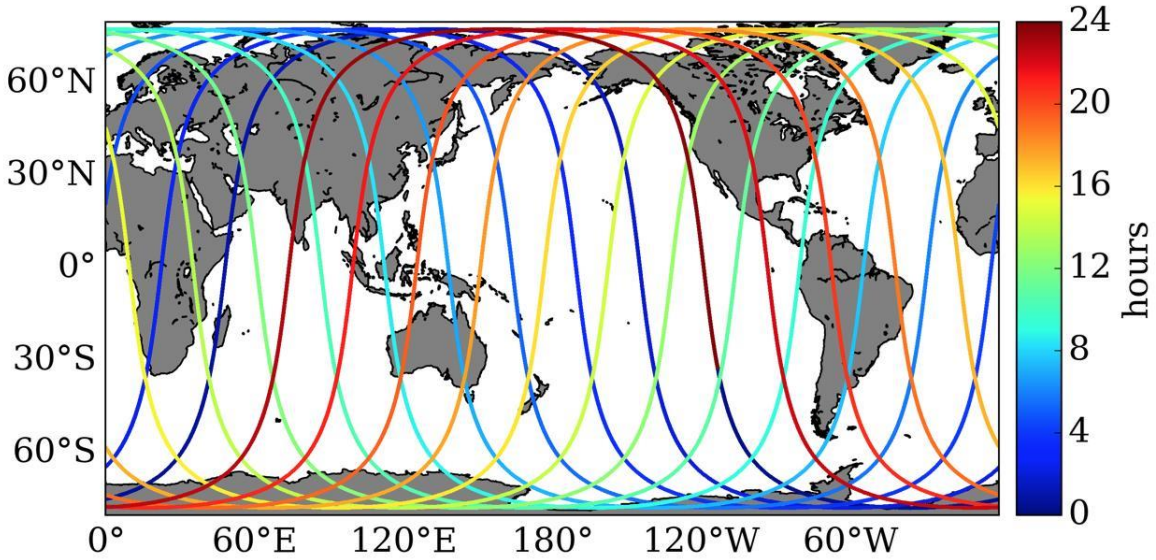
Hiroyuki Tsujino[1], L. Shogo Urakawa[1], Stephen M. Griffies[2,3], Gokhan Danabasoglu[4], Alistair J. Adcroft[3,2], Arthur E. Amaral[5], Thomas Arsouze[5], Mats Bentsen[6], Raffaele Bernardello[5], Claus W. Böning[7], Alexandra Bozec[8], Eric P. Chassignet[8], Sergey Danilov[9], Raphael Dussin[2], Eleftheria Exarchou[5], Pier Giuseppe Fogli[10], Baylor Fox-Kemper[11], Chuncheng Guo[6], Mehmet Ilicak[12,6], Doroteaciro Iovino[10], Who M. Kim[4], Nikolay Koldunov[13,9], Vladimir Lapin[5], Yiwen Li[14,15], Pengfei Lin[14,15], Keith Lindsay[4], Hailong Liu[14,15], Matthew C. Long[4], Yoshiki Komuro[16], Simon J. Marsland[17], Simona Masina[10], Aleksi Nummelin[6], Jan Klaus Rieck[7], Yohan Ruprich-Robert[5], Markus Scheinert[7], Valentina Sicardi[5], Dmitry Sidorenko[9], Tatsuo Suzuki[16], Hiroaki Tatebe[16], Qiang Wang[9], Stephen G. Yeager[4], and Zipeng Yu[14,15]

SWOT AdAC: High-resolution model intercomparison in anticipation of launch

When Surface Water Ocean Topography altimeter launches next year, there will be a high-frequency phase…

At some **crossovers**, An *in situ* Cal-Val expt. will occur during phase.

OMDP is curating a collection of 10km-1km resolution models with cloud access & analysis at these sites.



Coupled Model vs. OMIP:
Fluxes vs. ABL, Eddy Killing Feedbacks

In comparison to CMIP, **OMIP has many advantages** in the **precision** to which numerics & parameterizations can be evaluated across the multi-model ensemble.

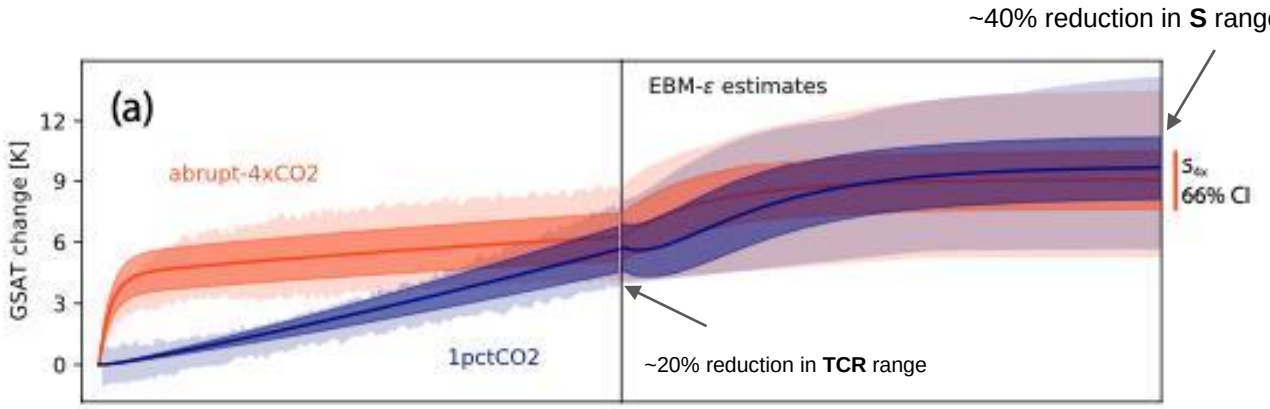
However, specified forcing through **relaxation or imposed fluxes** is **missing key feedbacks**, and is inherently unphysical.

At the **submesoscales (10km - 100m)**, these effects become pronounced leading to O(1) deficiencies in **EKE/EPE production and dissipation**.

New approaches to **couple to an ABL** are being explored to better understand if this is possible in a multi-institution framework.

Mixed Layer: MLD as emergent constraint, multi-model MLD OMIP-2 intercomparison

SROCC & AR6--import: upper ocean stratification and mixed layer depth



"Using these correlations and observations from the Argo float network, we revise the ensemble mean and narrow the 66% range of equilibrium climate sensitivity (ECS) for the particular CMIP6 model collection from 4.51 (3.13–5.71) °C, to 4.66 (3.88–5.43) °C, amounting to a 40% reduction in the span of the uncertainty range."

Emulate CMIP6 model oceans with 2-layer ocean emulator.
Understand emulator parameters as they depend on
Mixed layer depth, an observable emergent constraint

$$C_S \frac{d\Delta T}{dt} = F - \lambda \Delta T - \varepsilon\gamma(\Delta T - \Delta T_D),$$
$$C_D \frac{d\Delta T_D}{dt} = \gamma(\Delta T - \Delta T_D);$$

Can't measure parameters!!

Hall & Fox-Kemper, Submitted to *GRL*, 2021

Coupled Model Initialization: with WGNE, DAO

The **long timescales of the ocean** (~100 year upper ocean spinup, ~1000 deep/abyssal ocean spinup) have long challenged **comparing models post-initialization drift**.

OMIP-2 uses **no less than 6 JRA55-do cycles (330 years)**. Biogeochemistry in the 4th to 6th cycles. **Analysis on cycle 6**.

How to combine understanding for **shorter duration coupled** applications (medium-range weather, data assimilation) is ongoing.

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