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Coarsening of physics for biogeochemical model in NEMO

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Ocean mesoscale and submesoscale turbulence contribute to ocean tracer transport and to shaping ocean biogeochemical tracers distribution. Representing adequately tracer transport in ocean models therefore requires to increase model resolution so that the impact of ocean turbulence is adequately accounted for. But due to supercomputers power and storage limitations, global biogeochemical models are not yet run routinely at eddying resolution. Still, because the ”effective resolution” of eddying ocean models is much coarser than the physical model grid resolution, tracer transport can be reconstructed to a large extent by computing tracer transport and diffusion with a model grid resolution close to the effective resolution of the physical model. This observation has motivated the implementation of a new capability in NEMO ocean model (http://www.nemo-ocean.eu/) that allows to run the physical model and the tracer transport model at different grid resolutions. In a first time, we present results obtained with this new capability applied to a synthetic age tracer in a global eddying model configuration. In this model configuration, ocean dynamic is computed at $\frac{1}{4}^\circ$ resolution but tracer transport is computed at 3/4° resolution. The solution obtained is compared to 2 reference setup ,one at $\frac{1}{4}^\circ$ resolution for both physics and passive tracer models and one at 3/4° resolution for both physics and passive tracer model. We discuss possible options for defining the vertical diffusivity coefficient for the tracer transport model based on information from the high resolution grid. We describe the impact of this choice on the distribution and one the penetration of the age tracer. In a second time we present results obtained by coupling the physics with the biogeochemical model PISCES. We look at the impact of this methodology on some tracers distribution and dynamic. The method described here can found applications in ocean forecasting, such as the Copernicus Marine service operated by Mercator-Ocean, and in Earth System Models for climate applications.