Geophysical Research Abstracts, Vol. 7, 03154, 2005
SRef-ID: 1607-7962/gra/EGU05-A-03154

Sensitivity studies in the 1/4° global ocean/sea-ice DRAKKAR model

T. Penduff(1), B. Barnier(1), J.-M. Molines(1), A.-M. Treguier(2) and G. Madec(3)

(1) Laboratoire des Ecoulements Geophysiques et Industriels, Grenoble, France [Thierry.Penduff@hmg.inpg.fr, Bernard.Barnier@hmg.inpg.fr, Jean-Marc.Molines@hmg.inpg.fr/(+33)476825271], (2) Laboratoire de Physique des Oceans, Brest, France [Anne.Marie.Treguier@hmg.inpg.fr/(+33)298224496], (3) Laboratoire d'Oceanographie Dynamique et de Climatologie, Paris, France [Gurvan.Madec@hmg.inpg.fr/(+33)144273805].

Regardless of their forcing or implementation details, most ocean models at eddy-admitting resolution (about 1/4°) produce common dynamical discrepancies: western boundary currents (Gulf Stream, Brazil Current) most often overshoot poleward, deep western boundary currents tend to leave continental slopes, open-ocean major current systems are often shifted, subpolar gyres are usually too weak, eddy-driven topographically-locked structures like the Zapiola anticyclone are absent, etc. These widespread biases are thus often found where strong, non-linear currents interact with topographic slopes, suggesting the potential benefit for numerical simulations of improving momentum advection schemes and better representing topography.

As a preliminary to 50-year interannual integrations, the Drakkar project has performed several 10-year sensitivity tests with a newly-implemented 1/4° global numerical model based on NEMO, i.e. the OPA9 z-level ocean model coupled to the LIM multi-layered sea-ice component. The present study details how (and hypotheses why) many standard biases mentioned above are clearly reduced by first improving the consistency of the momentum advection scheme, and then by the use of partial steps instead of full steps. Comparison with other model solutions shows that critical numerical changes can drastically improve mean model solutions, i.e. more than increased resolution.