Geophysical Research Abstracts,
Vol. 11, EGU2009-5919-1, 2009
EGU General Assembly 2009

Simultaneous resolution of an eddying general circulation and reasonably accurate tides in a global 32-layer 1/12 degree ocean model

B.K. Arbic (1), E.J. Metzger (2), and A.J. Wallcraft (3)
(1) (barbic@fsu.edu), (2) metzger@nrlssc.navy.mil, (3) alan.wallcraft@nrlssc.navy.mil

In recent years the global baroclinic tide field has been modeled at high horizontal resolution. At the same time, several groups have modeled the global oceanic general circulation at horizontal and vertical resolutions sufficiently high to allow for an energetic mesoscale eddy field. Here we present a global simulation of HYCOM, the HYbrid Coordinate Ocean Model, that simultaneously resolves the eddying general circulation, barotropic tides, and baroclinic tides. The simulation has 32 layers in the vertical direction, 1/12.5 degree horizontal resolution, and has been run for 5 years using realistic tidal, wind, and buoyancy forcing at a computational cost of approximately one million CPU hours. A parameterized topographic wave drag is inserted into the model and tuned so that the surface tidal elevations are of comparable accuracy to optimally tuned forward tide models used in previous studies. We capture about 90% of the open-ocean sea-surface height variance of the eight largest tidal constituents, as recorded by a standard set of pelagic tide gauges. In order to minimize the impact of the topographic wave drag on non-tidal motions, the model utilizes a running 25-hour average to roughly separate tidal and non-tidal components of the bottom flow. In contrast to earlier high-resolution baroclinic tide studies, which utilized tidal forcing only, the run presented here has a horizontally non-uniform stratification, supported by the wind- and buoyancy forcing, and this affects the baroclinic tides in high latitudes to first order. Preliminary comparisons of the surface signature of internal tides to those seen in altimeter data around Hawaii indicate that the internal tides have reasonably correct magnitude and spatial structure, although the exact locations of peaks and troughs in the model differ from that seen in the altimeter. Images of eddies and internal tides co-existing in the model are shown, and a discussion of planned detailed analyses of this simulation beyond the preliminary results shown here will be given.