Global Coupled Atmosphere/Ocean Models for Climate and Seasonal Forecast Applications

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A 3-dimensional global ocean circulation model, named iHYCOM, is under development at NOAA's Earth System Research Laboratory. The model is destined to become the oceanic counterpart of the finite-volume, flow- following, icosahedral atmospheric model FIM (http://fim.noaa.gov). FIM uses an icosahedral horizontal grid and a hybrid-isentropic vertical coordinate. FIM shares column physics with GFS.

Grid nesting is common in weather modeling, but grid discontinuities are usually kept away from the region of interest. To avoid joining disparate grids at the ocean-atmosphere interface, arguably the region of most interest in coupled modeling, we have recoded HYCOM for an icosahedral grid. The similarity of FIM and iHYCOM (3-D grid, prognostic variables) allows the two models to share dycore components and software engineering innovations developed for FIM.

Preliminary results from iHYCOM driven by atmospheric forcings from the Common Ocean-Ice Reference Experiments (CORE), and from iHYCOM coupled to FIM, will be discussed. Several performance measures indicate that running HYCOM on an icosahedral mesh is feasible. This paves the way for integrating FIM into a coupled ocean-atmosphere system without the need for an interpolating flux coupler. However, biases in the annual net surface heat flux in the coupled simulations, both global and regional, are large and need to be reduced.