



## **Use of isopycnic-coordinate ocean models in long-term global simulations**

Rainer Bleck and Shan Sun

NOAA Earth System Research Laboratory, Boulder, Colorado, United States (rainer.bleck@noaa.gov)

Attempts to align coordinate layers with neutral surfaces in ocean models to reduce numerically induced diapycnal mixing have led to the development of isopycnic and hybrid-isopycnic coordinate models such as MICOM and HYCOM. The principal challenge in solving the dynamic equations in sloping coordinate layers lies in the computation of the horizontal pressure gradient force, often referred to as the 2-term PGF problem. HYCOM addresses it by framing hydrostatic and PGF computations in terms of a globally referenced potential density. In 2008, Adcroft et al. suggested a novel approach based on the use of an unapproximated equation of state and computing the PGF in finite-volume form to overcome stability problems associated with 2-term finite-difference PGF formulations. Their approach in principle decouples the placement of coordinate layers (still guided by the desire to align them with neutral surfaces) from the dynamic calculations. Attempts to introduce this scheme into HYCOM have only been partially successful so far, the main drawback being the occasional generation of near-massless coordinate layers at mid-depth in multi-year simulations. In this talk we discuss the status of this work.