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Circulation in the Gulf of Mexico from an eddy resolving Hybrid Coordinate Ocean Model

The surface and deep circulation in the Gulf of Mexico are explored with the HYbrid Coordinate Ocean Model (HYCOM). HYCOM uses isopycnal coordinates in the open, stratified ocean, sigma (terrain-following) in shallow water, and z-coordinates (pressure) in unstratified regions. This generalized vertical coordinate approach is dynamic in space and time via the layered continuity equation. The model domain includes the Atlantic ocean from 27°S to 70°N, thus ensuring dynamical interaction between the Caribbean Sea and Gulf of Mexico. The horizontal grid resolution is 1/12° (~7.5 km) and 26 layers are used in the vertical. Surface wind and thermal flux forcing are from the Navy Operational Global Atmospheric Prediction System (NOGAPS). A non-assimilative simulation is used to examine the general circulation features such as Loop Current Eddy Shedding, cyclonic cold-core eddies, and the impact that deep water features have on the shelf circulation (and vice-versa). A similarily configured simulation that assimilates sea surface height is used to compare the model results with frontal locations determined from MCSST and SST from buoys. The impact of horizontal grid resolution on eddy behavior and dynamics is examined with a 1/36° (~2.7 km) nested Gulf of Mexico model that takes boundary conditions from the 1/12° Atlantic model. Results from this simulation are used to examine the relationship between the cyclonic cold-core eddies and the Loop Current eddy shedding.