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Multi and Single Model Ensemble Forecasting in the Gulf of Mexico

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The Navy Coastal Ocean Model (NCOM) has been configured for the Gulf of Mexico and used to investigate forecast error via ensemble forecasting methods. The models assimilate observations via the Navy Coupled Ocean Data Assimilation (NCODA) system. The model has $\sim$3 km horizontal grid resolution, 46 levels in the vertical, boundary forcing from a global ocean model also based on NCOM, surface forcing from the Navy's Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS), as well as tidal forcing and river runoff. A deterministic control run provides the forecast error which is used (via an ensemble transform) to perturb the ensemble members. The atmospheric forcing is also perturbed via a space-time deformation technique. 32 ensemble members are generated and each produces a 72 hours forecast. These are the so called single model ensembles. Other Navy forecast systems that include the Gulf of Mexico (global and regional) that differ primarily in horizontal and vertical resolution and boundary conditions (surface and lateral) are used to calculate the so called multi (or super) ensemble.
For both cases statistics calculated across the ensemble members are shown and discussed. Limits of predictability are described and discussed, especially with respect to the Loop Current Eddy Shedding episode of early July 2010 (Eddy Franklin). Overall system performance is quantified and discussed, with emphasis on (but not limited to) the Deep Water Horizon oil spill timeframe. Longer term predictability (30 day) is also investigated and discussed.