Forecast Ecosystem Conditions in Gulf of Mexico OCS Habitats Using Coupled Modeling and Climate Scenarios

Quarterly Report (Y2Q1 – Oct 1-Dec 31, 2017)
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This quarterly report is filed per requirements of BOEM-NRL IAA # M16PG00027 with respect to our research project focused on climate-scale ocean model simulations for the Gulf of Mexico. The focus of this study is to forecast, through year 2050, marine ecosystem conditions in the Gulf of Mexico (GoM) using RCP climate scenarios prescribed by the NCAR CESM Large Ensemble (LE) atmospheric forcing.

1. WORK ACCOMPLISHED

Two long term (circa 1993-2015) climatologically forced ocean simulations were completed to evaluate the robustness of the HYCOM and NCOM models in a "nature" configuration (no data assimilation). The motivation for these simulations is twofold: 1) to assess the robustness of the models (i.e. numerical) using minimal data constraints, and 2) to assess whether HYCOM or NCOM is better suited for the planned projection runs through 2050. With exception of the native vertical structure of each model (HYCOM: hybrid σ/z/ρ, NCOM σ/z), the configuration (1/25° horizontal resolution) and the forcing for both models is the same.

Low frequency (daily climatology) boundary forcing (from Global HYCOM) and surface forcing (from NOGAPS/NAVGEM) inputs were constructed and repeatedly used as input every year to assess model drift and natural variability. HYCOM proved to be more robust than NCOM, but after several parameter adjustments to both models, mainly to the heat flux parameterization in NCOM, both models ran stably to completion. The final configuration, quasi-equal for both models, required restoration of Sea Surface Salinity and Sea Surface Temperature, both fields from the GDEM V4 monthly climatology. Before a final decision is made on the choice of model, a few short sensitive runs will be conducted with CESM LE data.

Further discussions about CESM LE atmospheric forcing production for the projections simulations took place in December. A Road Map, a Gantt Chart, and a Project Website are being implemented to establish the schedule and milestones for year 2 and the project in general.

2. PROBLEMS

A catastrophic 'local workstation' data loss caused delays in processing model outputs for the climatological run assessments. The model output, residing on HPC mass storage, is being reprocessed to produce synthesis figures.

3. PLANNED ACTIONS FOR NEXT QUARTER

The full assessment of the NCOM and HYCOM climatological runs will be completed and published to an internal project website (to be available only by password). Various project related subjects will also be available, including forcing functions and data sources.

4. BUDGET

Y1 funds: $80,000; Y2 funds: $80,000 (both received)

Expenditures to date, including direct and indirect costs: ~$30,000.00

NRL-CU contract amount - executed: $21,000.00