ESPC Operational Implementation and Validation

E. Joseph Metzger
Naval Research Laboratory, Code 7323
Stennis Space Center, MS 39529-5004
phone: (228) 688-4762 fax: (228) 688-4759 email: joe.metzger@nrlssc.navy.mil

Award Number: N0001413WX20374
http://www7320.nrlssc.navy.mil/GLBhycom1-12/skill.html

LONG-TERM GOALS

A fully coupled global atmosphere/ocean/ice/wave/land prediction system providing daily predictions out to 10 days and weekly predictions out to 30 days.

OBJECTIVES

Task: Design the infrastructure for operational implementation of the coupled system.

The main objective of this task is designing the infrastructure for operational implementation of the fully coupled global system. This design includes scoping the system to fit within the constraints of the operational centers. These constraints include both computational and manpower resources. Determination of the run cycle will take into account the three main forecasts (10 day deterministic, 30 day deterministic and 30 day probabilistic) with data assimilation for the different components to be considered. Data streams, inputs and post-processing also will be considered.

APPROACH

Working with the operational centers and researchers, an implementation plan will be constructed along with a transition plan. This will cover the run cycle for short term deterministic forecast, long term deterministic forecast and long term probabilistic predictions. The coordination with the operational centers will ensure that sufficient computational resources are available, that proper input data streams will be available and that manpower resources will be committed as appropriate. The resolution of the system components, forecast lengths and run cycles will be adjusted in coordination with the operational centers to fit within expected available computational resources.

WORK COMPLETED

A document defining a first-look at the operational implementation design for the Earth System Prediction Capability (ESPC) has been written, completing this milestone.

RESULTS

A document has been written that defines the first-look at the operational implementation design for ESPC, with the Initial Operational Capability (IOC) targeted for 2018. The document begins with a projection of the computational resources expected to be available at the Navy DoD Supercomputing Resource Center (DSRC), the facility at which the coupled system forecasts will run. It then describes the individual model components and their existing operational implementation. These include: atmosphere – NAVy Global Environmental Model (NAVGEM), ocean – HYbrid Coordinate Ocean Model (HYCOM), sea ice – Community Ice CodE (CICE), waves – WAVEWATCH III™ (WW3), land/surface – NAVGEM-Land Surface Model (LSM), and aerosol – Navy Aerosol Analysis and Prediction System (NAAPS). In addition, descriptions of the data assimilation schemes are provided: NRL Atmospheric Variational Data Assimilation System – Accelerated Representer (NAVDAS-AR) and the Navy Coupled Ocean Data Assimilation (NCODA). The computational requirements of each existing system are provided along with estimates at their target resolution for the IOC.

The future ESPC coupled system is then defined along with the input and output data streams, including the volume of data/output that must be transferred back and forth between Fleet Numerical Meteorology and Oceanography Center (FNMOC) and the Naval Oceanographic Office (NAVOCEANO). A description of how the system will cycle is then provided. Lastly, potential issues are identified and these include 1) the timely and efficient transfer of voluminous model output between the centers and 2) implementation of distributed job control across the centers. This latter issue will have to be worked in earnest as the coupled systems become more mature.

IMPACT/APPLICATIONS

ESPC forecasts will provide environmental information to meet Navy and DoD operations and planning needs throughout the globe from under the sea to the upper atmosphere, and from the tropics to the poles.

RELATED PROJECTS

Dependence on outside 6.2 work: ONR-funded MJO DRI; ONR-funded ITOP; ONR-funded Tropical Cyclone; ONR-funded Unified Physical Parameterization DRI; ONR-funded Seasonal Prediction DRI; NOPP-funded HYCOM; NOPP-funded waves work; NRL-funded high resolution ice coupling; NRL-funded MJO 6.2; NRL-funded Fresh Water Fluxes 6.2; NRL-funded Wave conservation 6.2.

Dependence on outside 6.4 work: The NUOPC interoperability layer under ESMF is a critical piece on which this development initially built upon. Large Scale Atmospheric modeling (under 6.4 NAVGEM) is providing extensions and validation to NAVGEM. Large Scale Ocean Modeling is providing extensions and validation to HYCOM. Small Scale Ocean Modeling is providing extensions and validation to WaveWatch III. Ocean Data Assimilation is providing vertical synthetic covariance and data assimilation for HYCOM and new data streams from altimeter satellites. Atmospheric Data Assimilation is providing extensions and validation to NAVGEM assimilation. Satellite Ice is providing new data streams for assimilation in CICE.

PUBLICATIONS

Metzger, E.J., B.C. Ruston, J.D. Dykes, T.R. Whitcomb, A.J. Wallcraft, L.F. Smedstad, S. Chen and J. Chen, 2013: Operational implementation design for the Earth System Prediction Capability (ESPC): A first-look. *NRL Memo. Rpt.,* NRL/MR/7320--13-9498, 20 pages, (submitted).