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C.D. Rowley, L.F. Smedstad, C.N. Barron, M. Wei, R.S. Linzell, M. Yaremchuk, J.C. May, J.M. Dastugue, P.J. Sakalaukus, P.J. Spence, T.L. Townsend, J.J. Osborne V, G.G. Panteleev, N. VandeVoorde, and B. Maloy

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14. ABSTRACT
Develop ocean and air-sea coupled ensemble generation, ensemble data assimilation, and probabilistic prediction capabilities using the Coupled Ocean Atmosphere Mesoscale Prediction System (COAMPS®1), Navy Coastal Ocean Model (NCOM), and Hybrid Coordinate Ocean Model (HYCOM).

15. SUBJECT TERMS
COAMPS, NCOM, HYCOM, prediction capabilities

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(228) 688-5809

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Author(s): C.D. Rowley,[1] L.F. Smedstad,[1] C.N. Barron,[1] M. Wei,[1] R.S. Linzell,[2] M. Yaremchuk,[1] J.C. May,[1] J.M. Dastugue,[1] P.J. Sakalaukus,[1] P.J. Spence,[2] T.L. Townsend,[1] J.J. Osborne V,[3] G.G. Panteleev,[1] N. VandeVoorde,[2] and B. Maloy[4]
Affiliation(s): [1]Naval Research Laboratory, Stennis Space Center, MS; [2]Vencore, Stennis Space Center, MS; [3]ASEE Postdoctoral Fellow, Stennis Space Center, MS; [4]Jacobs Engineering, Stennis Space Center, MS
CTA: CWO

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Research Objectives: Develop ocean and air-sea coupled ensemble generation, ensemble data assimilation, and probabilistic prediction capabilities using the Coupled Ocean Atmosphere Mesoscale Prediction System (COAMPS®[1]), Navy Coastal Ocean Model (NCOM), and Hybrid Coordinate Ocean Model (HYCOM).

Methodology: Operational capability for regional ocean ensemble forecasts is being extended to global ocean and regional and global coupled air-ocean-ice-wave extended-range forecast systems. Work consisted of global coupled system ensemble initialization and metrics development; support for NRL modeling and data handling; testing of systems for operational use with new types of input data; NCOM/NCODA system development to support NAVOCEANO operational modeling; assimilation tests comparing adjoint-free and standard 4dVar; and a series of assimilation runs with an NCODA-driven CICE model to compare the standard NCODA formulation. Sea surface temperature analyses were performed to assess the impact of new data sources at the air sea interface. Testing and comparison of Glider Observation Strategies (GOST) system on Cray XC40 with newer Global Heterogenous Observation Systems (GHOST) system was performed to move to the GHOST system for support of new platforms and the Smart Glider Teams project.

Results: Progress on further testing global ensemble initialization using perturbed observations in the ocean and integration of NCODA to perform the observation preparation with the Local Ensemble Transform Kalman Filter; adapting ocean profile observation matchup software for coupled ensemble metrics; addition of new data types; assessment of new sources of observational data for assimilation; initial installation of NRL Ocean Surface Flux (NFLUX) observation quality control and assimilation software; and support for transitioned systems. We have developed and transferred to NAVOCEANO NCODA observation quality control software for processing sea surface temperature observations from Himawari8 and AMSR2. Model sea surface forecasts in multiple regions are used to diagnose combinations of factors for evaluating new sources of remotely sensed data, including these two platforms. Figure 1 shows an example of the results using SST observations from different platforms. Nested high-resolution was supported for the Smart Glider Teams project during the PEACH field program (Fig. 2). The NCOM/NCODA 3DVar and 4DVar systems were tested for providing adaptive sampling guidance for glider teams during the 1.5-month PEACH field exercise, during which glider data was assimilated into the high resolution domains.

DoD Impact/Significance: Higher resolutions and larger ensembles are needed to ensure forecast reliability and accurate risk assessment in areas such as antisubmarine warfare, nuclear-chem-bio hazard prediction and monitoring, and search and rescue. Development of extended-range coupled forecasts depends on probabilistic forecasting, due to the inherent limitations of deterministic forecasts and on new coupled-assimilation techniques to improve initial conditions.

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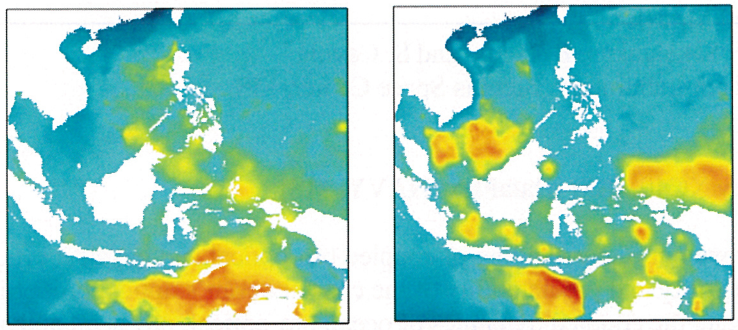
[1]COAMPS® is a registered trademark of the Naval Research Laboratory.

Himawari-8
SST
22 Nov-
10 Dec 2016



AMSR-2
SST
22 Nov-
10 Dec
2016

Figure 1. Space METOC: Sea Surface Temperature (SST) analyses in the South China Sea using remotely sensed observations using the Himawari-8 and AMSR-2 instruments.

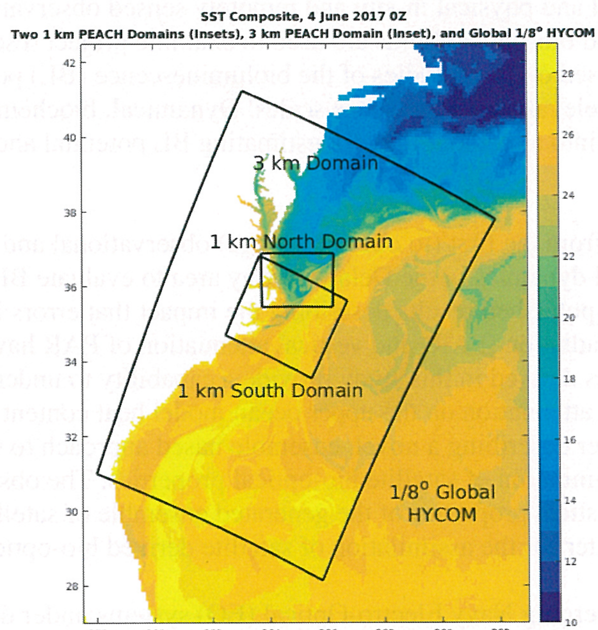


Figure 2. Model Set up for PEACH: Processes driving exchange at Cape Hatteras.

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Prepared by

Portia A. Shingler

and

Beth A. Howell

Center for Computational Science

Information Technology Division

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