

Oceanographic Data Issues for Support of Navy Fleet Synthetic Training

Greg Jimenez
Commander Naval Meteorology and Oceanography Command East
9141 Third Ave
Norfolk, VA 23511-2394

I. INTRODUCTION

In order to gain efficiencies throughout the fleet training cycle and conserve fuel, the Navy is in the process of increasing its use of synthetic training technologies. Maximum training value and increased readiness result from the most realistic training possible, which must include a robust and realistic physical environment. Commander, Naval Meteorology and Oceanography Command (CNMOC) will be providing meteorological and oceanographic data and expertise to enhance Fleet Synthetic Training (FST) events. This paper describes the issues associated with inserting operational data into modeling and simulation training events.

II. BACKGROUND

The Navy Continuous Training Environment (NCTE) provides the capability to conduct training on demand through a persistent network connecting geographically dispersed training simulators and systems with geographically dispersed forces. The NCTE is a global enterprise network built and supported by the Navy Warfare Development Command (NWDC) using modeling and simulation to complement and enhance constrained live training time with virtual training events. These events are conducted in a synthetic battlespace employing tactical training ranges and infrastructure, joined in a common network.

Currently, oceanography utilized for synthetic training is based on a monthly climatological average. In contrast, meteorology utilized for synthetic training is current, real world weather. This presents numerous challenges associated with exercise execution and control. In addition to the lack of environmental consistency across training federates, introduction of the natural environment makes it difficult for the training audience to conduct planning. The potential negative environmental impact may require exercise planners and controllers to manually modify the environment to avoid actual or perceived loss of control of the exercise. Manual modifications translate into lost training time.

III. INITIATIVES

Many of the environmental challenges can be mitigated by using a fully integrated (coupled) air ocean synthetic environment provided by an authoritative source and providing subject matter expertise in an environmental white cell, responsible for assisting exercise controllers and responding to information requests from the training audience. CNMOC will begin supporting Navy FST events in 2010 by providing an authoritative environment to the NCTE and establishing an Environmental White Cell. In support of this goal, CNMOC and the Naval Research Laboratory located in Mississippi and Monterey are developing an environmental data archive consisting of a high fidelity, coupled (air-ocean) environment. Four primary FST exercise areas are scheduled for completion in 2009. Each environmental archive contains five years of data consisting of four months per year representing each season. The years covered are 2003 through 2007 and the months are April, August, September and December. The archive includes specific meteorological and oceanographic data and products required by simulators connected to the NCTE and Fleet meteorology and oceanography (METOC) professionals.

The oceanographic data archive includes 1/8 degree Global Navy Coastal Ocean Model (NCOM). Specific parameters within the archive are temperature, salinity, ocean currents, sea surface height and sound speed. Tides will be added in post-processing. The data reflects standard depth levels from surface to 5500 meters. WaveWatch III (WW3) will be used to provide 0.1 degree resolution significant wave height, direction and period. Temporal resolution for all data is 6 hours. Sample oceanographic model fields are represented in Fig 1.

Report Documentation Page				Form Approved OMB No. 0704-0188	
Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.					
1. REPORT DATE JUN 2010		2. REPORT TYPE N/A		3. DATES COVERED -	
4. TITLE AND SUBTITLE Oceanographic Data Issues for Support of Navy Fleet Synthetic Training				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Meteorology and Oceanography Command East 9141 Third Ave Norfolk, VA 23511-2394				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release, distribution unlimited					
13. SUPPLEMENTARY NOTES See also ADM202806. Proceedings of the Oceans 2009 MTS/IEEE Conference held in Biloxi, Mississippi on 26-29 October 2009. U.S. Government or Federal Purpose Rights License, The original document contains color images.					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT SAR	18. NUMBER OF PAGES 3	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			

Fleet Synthetic Training Sample Data Sets: US Coasts

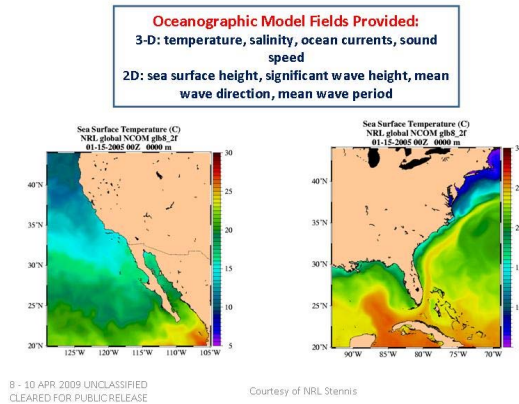


Fig. 1 Sample Oceanographic Model Fields

The meteorological data archive includes 27 kilometer resolution Coupled Ocean/Atmosphere Mesoscale Prediction System (COAMPS). This data covers the same time frame as the oceanographic data, providing a “coupled air-ocean atmosphere”.

The archive will be hosted at the Naval Oceanographic Office at Stennis Space Center and made available for distribution via the Naval METOC Data Services Framework (NMDSF). NMDSF uses METOC Community of Interest semantics to support machine-to-machine net-centric access to METOC data. CNMOC is addressing FST-specific data requirements, on two fronts. First, it is leveraging the Department of Defense Modeling and Simulation Coordination Office (MSCO) funded Environmental Data Cube Support System (EDCSS). The EDCSS provides full spectrum support to meet specific synthetic data needs of distributed simulations such as synthetic satellite imagery based on archived model data. EDCSS will retrieve data needed for training events from NMDSF, produce additional required synthetic products and then distribute same to NCTE and other training participants as required. EDCSS is being developed in close coordination with the capabilities of the Environment Scenario Generator (ESG), the operational system currently used to identify candidate environmental data for modeling and simulation. Second, CNMOC is currently working with the Air and Space Natural Environment (ASNE) Modeling and Simulation Executive Agent (MSEA) to leverage research and development funds in support of ocean data query functionality. Users can specify conditions and the query functionality will search the mineable environmental archive and identify dates that meet the desired conditions. FST support architecture is represented in Fig 2.

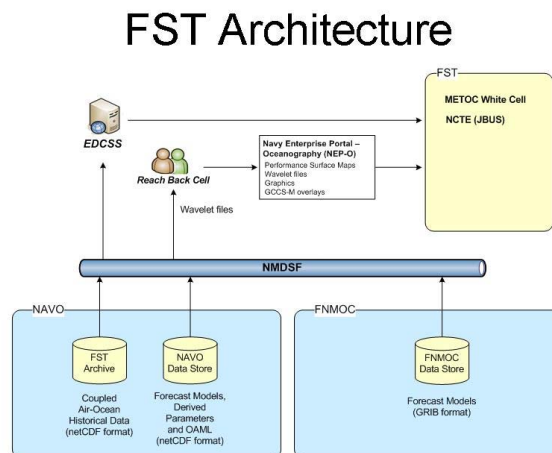


Fig. 2 FST Support Architecture

III. USE CASE

The following scenario will illustrate use of the environmental archive. Environmental capabilities will be briefed at the Initial Planning Conference, which takes place 9-12 months prior to the exercise. Later, during the Master Scenario Event List (MSEL) scripting and Main Planning Conference (MPC), a “target environment” that meets training objectives will be selected using ESG to access the CNMOC environmental archive. An EDCSS exercise package will be generated and reside on a production server. Utilizing the same synthetic environment, acoustic performance surface products created by the Anti-Submarine Warfare Reachback Cell (ASW RBC) at the Naval Oceanographic Office will be generated to graphically demonstrate the selected environment. The performance surface product is a high-fidelity numerical surface upon which actual acoustic performance can be modeled and can provide the training audience a clear indication of where and when competitive advantage exists.

The selected environment (parameters and implications), showing selected model outputs to demonstrate the “Big Picture” will be presented at the Final Planning Conference. If the training audience or exercise controllers require changes, the ASW RBC will make the necessary modifications.

The end result is a consistent, controlled environment utilized by the ASW RBC, training audience and exercise control for event planning and execution. Training participants will use the same types of data for both synthetic exercises and real world operations. The environmental white cell subject matter expert can support the training audience, mentors and exercise control with METOC expertise, including synthetic bathythermographs and ASW analysis/adjudication.

IV. SUMMARY

Consistency of METOC effects is the key to success. Although each federate in the training event may handle environmental effects differently, it is important that these effects are at least derived from the same environmental database. CNMOC will monitor use of the new synthetic environmental database for several synthetic training events and, in concert with Navy Warfare Development Command, modify spatial and temporal resolution and add new products and geographic areas as required.