

# **An Examination of a Multi-Scale Three-Dimensional Variational Data Assimilation Scheme (MS-3DVAR) in the Kuroshio Extension with Simulated and Real Observations**

Philip A. Muscarella<sup>a</sup>, Matthew Carrier<sup>b</sup>, and Hans E. Ngodock<sup>b</sup>

<sup>a</sup>*ASEE Post doc, Naval Research Lab, Stennis Space Center, USA,*  
[philip.muscarella.ctr@nrlssc.navy.mil](mailto:philip.muscarella.ctr@nrlssc.navy.mil), <sup>b</sup>*Naval Research Lab, Stennis Space Center, USA*

A MS-3DVAR method for use with the Naval Coastal Ocean Model (NCOM) is being examined in the region of the Kurshio extension. The advantage of a multi-scale approach to data assimilation is the ability to resolve the multiple spatial scales present in regional ocean models. This method relies on the specification of large and small horizontal correlation length scales and their associated background error variances. Using empirical orthogonal functions (EOF) the variances associated with pre-specified length scales can be determined. An additional benefit of the MS-3DVAR technique is the ability to assimilate coarse and dense collections of observations. The forecast errors for the MS-3DVAR scheme are lower than for a traditional 3DVAR system with similar scales. This is shown using simulated and real ocean observations.