Abstract View

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Geosat Data Assimilation with Application to the Eastern North Atlantic

Detlef Stammer

Institut f¨ur Meereskunde, D¨usternbrooker, Kiel, Germany

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ABSTRACT

An attempt is made to determine the three-dimensional ocean circulation from satellite altimeter measurements by assimilating Geosat sea surface height data into an eddy-resolving quasigeostrophic (QG) model of the eastern North Atlantic Ocean. Results are tested against independent information from hydrographic field observations and moored current meter data collected during the Geosat ERM. The comparison supports the concept of inferring aspects of the three-dimensional flow field from sea surface height observations by combining altimetric measurements with the dynamics of ocean circulation models.

A Holland-type QG model with open boundaries is set up on a 2000 km × 2000 km domain of the eastern North Atlantic between 25° and 45°N, 32° and 8°W. By using a simple nudging technique, about two years of Geosat altimeter data are assimilated into the model every five days as space–time objective analyses on the model grid. The error information resulting from the analysis is used during the assimilation procedure to account for data uncertainties. Results show an intense eddy field, which in the surface layer interacts with a meandering Azores Front. Compared to Geosat, the model leads to smoothed fields that follow the observations.

Model simulations are significantly correlated with hydrographic data from March 1988 and June 1989, both close to the surface and in the subsurface. Good agreement is also found between the model velocity fields and moored current meter data in the top two model layers. The agreement is visually weak in the bottom layer, although a coherence analysis reveals an agreement between the model simulation and current meter data over the full water column at periods exceeding 80 days.

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Headquarters: 45 Beacon Street Boston, MA 02108-3693
DC Office: 1120 G Street, NW, Suite 800 Washington DC, 20005-3826
amsinfo@ametsoc.org Phone: 617-227-2425 Fax: 617-742-8718
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