On Combining Satellite Altimetry Data With Models in Improving the Simulation of Ocean Circulation

Lee-Lueng Fu (Jet Propulsion Laboratory, California Institute of Technology, MS 300-323, 4800 Oak Grove Drive, Pasadena, CA 91109, U.S.A.; Tel: 818-354 8167; Fax: 818-393-6720; E-Mail: llf@pacific.jpl.nasa.gov)

The sea-surface elevation relative to the geoid is a dynamic boundary condition for the three-dimensional oceanic pressure field. This boundary condition has been determined over the global oceans every 10 days by a precision radar altimeter aboard the TOPEX/POSEIDON (T/P) satellite since October, 1992. This is the most accurate altimeter data stream to date for the study of the dynamics of large-scale ocean circulation. The data provide a unique test-bed for global ocean models and have set the stage for operational ocean applications. Comparisons of the observations with model simulations will be reviewed. Many of the observed features of the global ocean circulation are well simulated by state-of-the-art models, including variabilities at seasonal-to-interannual time scales that are key to the understanding of climate change. However, the model simulations often underestimate the magnitude of the variabilities. To improve the model estimate of the state of the ocean, T/P observations were assimilated into the models. The information provided by the observed sea surface elevation was propagated into other dynamic and thermodynamic variables of the model. The simulation of the entire water column was improved by incorporating the surface information into the model calculation. However, both data and model have errors. Data assimilation must be performed according to the relative weights of data evaluated against model prediction in order to assimilate only the information that is compatible with the model's capability. Results will be presented that demonstrate the power of assimilation of T/P data in improving model estimate of the ocean state in terms of current velocity and water temperature at the surface as well as at depths. The resultant model simulation then provides an improved estimate of the ocean circulation as well as its transport of heat, a key process by which the ocean influences climate. The role of satellite altimetry in monitoring the global ocean and improving the prediction of climatic events will be discussed.

Other submittal information

1. Preferred topic areas:

Remote sensing in geophysical models - ocean and ice dynamics

Applications of remote sensing- ocean surface and subsurface properties

2. Oral presentation is preferred.