AN ESTIMATE OF GLOBAL OCEAN CIRCULATION COMBINING TOPEX/POSEIDON ALTIMETER DATA AND AN OCEAN GENERAL CIRCULATION MODEL

Ichiro FUKUMORI, Lee-Lueng FU, Ramanujam RAGHUNATH, Yi CHAO, and Avijit GANGOPADHYAY

Jet Propulsion Laboratory, California Institute of Technology,
Mail Stop 300-323,4800 Oak Grove Drive, Pasadena, CA 91109 U.S.A.

Preliminary results of an analysis of global ocean circulation based on TOPEX/POSEIDON observations will be presented, Temporal variations of the circulation are estimated by assimilating altimetric sea level measurements with a wind- and thermodynamically-driven three-dimensional nonlinear primitive equation model. The numerical model is based on the GFDL Modular Ocean Model and covers the world ocean from 80°S to 80°N with realistic coastlines and bottom topography. The estimation procedure is an approximate K alman filter and smoother that employs a time-asymptotic limit and a dimensional reduction of the state error covariance matrix. The synthesis results in a dynamic interpolation of the altimetric measurements and a correction to the prognostic model's physical evolution. The estimate allows inferences to be made of the three-dimensional circulation; Large-scale, basin-wide sea level variations are resolved along with associated barotropic and baroclinic changes in the circulation. Fast barotropic sea level variations are found at mid to high latitudes while low latitude sea level changes are due primarily to baroclinic evolution of the ocean. Formal error estimates are obtained and used to measure consistencies of the solution with the data. The circulation estimates will also be compared and validated against independent in situ observations. Dynamics of the model estimates and their relation to atmospheric forcing will be explored,