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Symposium on Observations, Data Assimilation, and Probabilistic Prediction

On Wed Jan 16:

PACIFIC AND INDIAN OCEAN CIRCULATION DURING 1993-2000: ASSIMILATION OF TOPEX/POSEIDON DATA INTO A NEAR GLOBAL OGCM

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The time-varying state of ocean circulation is investigated through data assimilation. Sea level anomalies observed by the TOPEX/Poseidon altimeter, climatological mean temperature and salinity, and surface flux data are assimilated into a parallel version of the MIT ocean general circulation model (OGCM). The model is implemented over a near-global domain (80-deg S to 80-deg N) at fairly high spatial resolutions (1x0.3-deg grid in the tropics with 10m resolution in the upper 150 m). An approximate Kalman filter/smoother and the adjoint method are employed separately to capitalize on their respective merits and to explore their synergism (e.g., accuracy, computational requirements, error estimates). Both approaches model errors in external forcings. The assimilations significantly improve estimates of the oceanic state as evidenced through comparisons with independent observations (e.g., TOGA-TAO, satellite scatterometers, etc). The advanced assimilation schemes yield physically consistent state evolutions that can be used to diagnose processes underlying the seasonal-to-interannual variability of the estimated ocean circulation. Budgets of heat and salt over various regions are examined with a focus on identifying dominant processes associated with the development of the warming and cooling events in the Pacific and Indian Oceans. The analysis reveals strong geographic and temporal variabilities; In the tropics as a whole, vertical advection controls interannual changes of near-surface temperature while meridional advection dictates those of the total heat content. High frequency (~10s of days) advective anomalies dominate changes at mid-latitudes.