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Toward closing the globally averaged sea level budget on Seasonal to interannual time scales

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One of the primary causes of uncertainty in projections of future sea level rise due to global warming is inaccurate knowledge of the contributions to sea level rise. Thermal expansion and the input of freshwater from melting of land-bound ice are expected to be the principle causes of modern-day sea level rise on time scales longer than seasonal. However, independent observations of these two components remain elusive and to date, estimates of the components remain too small to fully explain the rate of historical sea level rise observed by tide gauges and satellites on any time scale longer than one year.

In light of recently discovered biases in the in situ observing network, estimates of the thermosteric (or thermal expansion) component of sea level rise are currently being re-visited. Correction of these biases are expected to reduce interannual to decadal variability in the historical estimates of thermosteric sea level rise and long-term trends may be effected as well. A new estimate of thermosteric sea level, corrected for all known biases in the in situ observing network, will be presented for the period from 1993 through mid-2007. The new estimate suggests a rate of only 1.2 to 1.3 mm/yr of sea level rise from thermal expansion over this period, with very little warming observed between 2003 and the present.

Since mid-2003, two new observing systems have begun to provide independent mea-

surements of the steric and mass components of sea level rise. The Argo array of profiling floats now provides nearly global observations of temperature and salinity in the upper ocean, and the Gravity Recovery and Climate Experiment (GRACE) satellites provide monthly estimates of the ocean's total mass. The global mean sea level budget will be assessed for the period between mid-2003 and mid-2007 by comparing these independent observations of the steric and mass components of sea level with observations of total sea level based on the Jason satellite altimeter. Although seasonal and interannual fluctuations are in excellent agreement over this period, a significant discrepancy in the 4-year trends remains.