



The Global Water Cycle 2003-2008: Implications for Long-Period Sea Level Change

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Water is exchanged globally among the ice sheets, continents, and ocean. On seasonal time-scales, we know that the largest exchange is between the oceans and the continents. The magnitude of exchange on longer-periods has not been well quantified, although it is generally believed that melting of ice sheets and continental glaciers will lead to a secular trend in sea level change. The contribution of terrestrial water storage to global mean sea level is becoming better constrained as not been well estimated, until the launch of the Gravity Recovery and Climate Experiment (GRACE) in 2002. Now, with data from August 2002 until late 2008, we can fully measure the fluxes of water among the major reservoirs – the oceans, the ice sheets, and the continents - on interannual periods. Results over the continents implicitly include the contributions from alpine glaciers, and explicitly include contributions from the Greenland and Antarctic ice sheets. We find that for the current length of the GRACE record, the trend in land contributions to mean sea level change is near zero, but that there are significant interannual fluctuations in the continental/ocean water mass exchange. We find that the ocean mass trend over recent years is almost completely explained by melting of Greenland and Antarctica ice sheets.