Geophysical Research Abstracts
Vol. 13, EGU2011-5508, 2011
EGU General Assembly 2011

Sea-level fingerprint of continental water and ice mass change from GRACE

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The Gravity Recovery and Climate Experiment satellites (GRACE) provide, for the first time, a method to directly measure mass exchange between the land and oceans over time. The dominant components of this exchange are due to continental ice loss/gain and land hydrology. Here, we determine the secular trend in these two components during the GRACE measurement era: 2003-2009. For each component, we model the distinct regional signatures or fingerprints of relative sea-level (RSL) change, obtaining maxima at low latitudes between $\pm 40^\circ$ N/S, but with particularly strong regional patterns. We estimate that the total ice and water mass loss from the continents is causing global mean sea-level to rise by 1.0 ± 0.4 mm/yr. Isolating the ice and hydrological signals, we find that the former is the sole net contributor to the global mean, while the latter dominates regional RSL changes in many coastal areas.