



Measuring Variations in Mean Ocean Mass with GRACE

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The Gravity Recovery and Climate Experiment (GRACE) can measure changes in the mean ocean mass at monthly intervals. These variations are caused by exchange of water among the ocean, land, and ice sheets, and the general consensus is that the ocean mass should be rising at a rate of about 1 to 1.5 mm/year due to ice melting. However, one has to be careful about ocean mass trends from GRACE data, and not just because of the short 4-year time-period. Since hydrology signals are of an order of magnitude larger in variation than ocean signals, one has to be worried about leakage because of the smoothing required on the GRACE data. We quantify the size of this leakage using several ocean averaging functions in the presence of hydrology signals in the GLDAS model and a simulation of ice melting on Antarctica, Greenland, and mountain glaciers at uniform rates. We will also discuss the size of the glacial isostatic adjustment (GIA) correction and its uncertainty. Using 4-years of new CSR Release-04 solutions, we find that the ocean mass has been increasing significantly between 2003 and 2006, but that the uncertainty on the estimate is still considerable. The uncertainty arises mostly from uncertainty in the GIA correction, followed by uncertainty caused by our lack of knowledge of the geocenter, and then leakage of signals outside the ocean into the average.