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Estimation of steric sea level variations from combined GRACE and Jason-1 data.

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We estimate the mean steric sea level variations over the 60˚S-60˚N oceanic domain for the recent period (from August 2002 to April 2006), by combining sea level data from Jason-1 altimetry with time-variable gravity data from GRACE. The observed global mean sea level change from satellite altimetry results in total from steric plus ocean mass change. As GRACE measurements averaged over the ocean represents the ocean mass change component only, difference between GRACE and altimetry observations provides an estimate of the mean steric sea level. Two different sets of GRACE geoid solutions (the GRGS EIGEN-GL04 and the GFZ EIGEN-GRACE04S products) have been used. Each GRACE data set ranges over approximately three years or more (August 2002 –April 2006 for the GRGS geoids and February 2003 – February 2006 for the GFZ geoids).

We first focus on the seasonal variations. The two GRACE data sets agree very well in terms of mean annual mass variation, both in amplitude and phase. The latter signal compares well with the steric annual sea level estimated from the World Ocean 2004 climatology and the Ishii et al. (2006) ocean temperature data. We also examine the interannual fluctuations of the Jason-1 minus GRACE sea level. The two resulting steric sea level time series (based on the two GRACE data sets) agree well. The inferred steric sea level curve exhibits an increasing trend during the last 3.5 years (August 2002- April 2006), of the same order of magnitude as the 1993-2003 steric sea level trend computed with in situ hydrographic data. However over the last 3.5 years, we

note a strong discrepancy between altimetry minus GRACE and in situ-based steric sea level trend, the latter exhibiting a negative slope. The cause for such a discrepancy is yet unknown but may be related to inadequate sampling of in situ ocean temperature measurements.