Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04338, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04338
EGU General Assembly 2008

Recent land ice mass changes determined from GRACE mascon solutions

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Understanding the evolution of the ice sheets and glacier systems is of paramount importance due to the vulnerability of the Earth's cryosphere to climate change and its contribution to sea level. Recent changes in the cryosphere highlight the importance of methods for directly observing the complex spatial and temporal variation of land ice mass flux. Since its launch in March of 2002, the NASA/DLR Gravity Recovery and Climate Experiment (GRACE) mission has been acquiring ultra-precise inter-satellite K-band range and range-rate (KBRR) measurements providing new observations of the complex spatial and temporal evolution of the Earth's land ice. Employing a surface mass concentration (mascon) solution technique, we have computed multi-year time series of surface mass flux for Greenland and Antarctica coastal and interior ice sheet sub-drainage systems as well as the Alaskan glacier systems. These mascon solutions provide important observations of the seasonal and inter-annual evolution of the Earth's land ice. Ice Sheet mass gains and losses during accumulation and melt seasons are quantified. For example, the data show large mass losses of the Greenland ice sheet during the 2005 and 2007 melt seasons with the largest mass loss experienced during the 2007 melt season. Coupled with a low mass gain observed during the 2006 accumulation season, the Greenland ice sheet experienced a significant mass loss over the 2006-2007 accumulation-melt season that is 44% larger than the four-year average. We present our latest mascon solutions of the Greenland and Antarctica ice sheets as well as the Alaska mountain glaciers. We compare these mass flux solu-

tions to ICESat and airborne laser altimeter observations of surface elevation change as well as surface melt observations derived from MODIS data. We also quantify the effects of solution technique and background modeling (e.g. atmospheric, tidal, ocean and hydrological mass flux) on the land ice mascon solutions.