Geophysical Research Abstracts, Vol. 9, 08364, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-08364

Seasonal and inter-annual mass flux of coastal and interior ice sheet drainage systems from GRACE lumped harmonic mascon solutions

S. B. Luthcke (1), H. J. Zwally (1), D. D. Rowlands (1), W. Abdalati, (1), F. G. Lemoine (1), R. D. Ray (1), J.J. McCarthy (2), D. Chinn (2)
(1) NASA GSFC, Greenbelt, MD, USA, (2) SGT Inc., Greenbelt, MD, USA

Mass changes of the Greenland and Antarctica ice sheets are of considerable importance because of their sensitivity to climate change and their contribution to rising sea level. Observations and models have shown that in recent years the ice sheets have experienced significantly increased melt, thinning at the margins, and significantly increased discharge from many outlet glaciers. At the same time observations suggest the high elevation interior regions of the ice sheets have been growing. These recent changes in the ice sheets and the wide range of mass-balance estimates highlight the importance of methods for directly observing variations in ice sheet mass. Moreover, the fact that some regions are shedding mass dramatically while others are not indicates a clear need for measurements with a spatial resolution that allows assessment of the behavior of individual drainage systems.

Direct measurements of mass change have been made possible by the NASA/DLR Gravity Recovery and Climate Experiment (GRACE) mission. Since its launch in March of 2002, GRACE has been acquiring ultra-precise inter-satellite K-band range and range-rate (KBRR) measurements enabling a direct mapping of static and time-variable gravity. These data provide new opportunities to observe and understand ice mass changes at unprecedented temporal and spatial resolution. In order to improve upon the ice mass change observations derived from GRACE, we have employed unique data analysis approaches to obtain lumped harmonic local mass concentration solutions (mascon solutions) from GRACE inter-satellite range-rate measurements. We estimate the mass flux of Greenland and Antarctica ice sheet drainage systems at 10-day resolution. We have computed multi-year time series of surface mass flux for

the coastal and interior ice sheet drainage systems. These mascon solutions provide unprecedented observations of the seasonal and inter-annual evolution of ice sheet mass. In this presentation we discuss our analysis techniques and the details of our lumped harmonic mascon solutions. We present the results of our latest ice sheet mascon solutions focusing on the seasonal and inter-annual variations as well as multi-year trends. We also compare the GRACE mascon solutions with mass change observations derived from NASA's Ice Cloud and Land Elevation Satellite mission.