



Greenland's mass balance observed by GRACE between 2003-2008

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The Gravity Recovery and Climate Experiment (GRACE) satellites have been providing the scientific community with a quasi-continuous record of the Earth's gravity field over the last 6 years. Due to its global coverage, it offers an excellent tool to study mass changes over large regions. Among others, GRACE has led to a leap in our understanding of the mass balance of Greenland ice sheet, which was indirectly known until a few years ago. In this presentation, we demonstrate how the GRACE observations can be used to monitor changes in Greenland's mass distribution on a regional scale. Over the period of 2003-2008, the ice sheet lost annually approximately 210 cubic kilometers of ice on average, contributing 0.5 mm per year to global mean sea level. According to (Rignot, 2008) this value is unprecedented in the last 50 years suggesting a significant impact of global warming on the Greenland's ice volume. A forward modeling technique significantly helps to identify the hydrologic basins where the melt occurs. As a result we now know from the GRACE data that the main melting signal occurs during summer along the southeastern coast, although spreading to the northwest, with most pronounced changes so far occurring in 2007. Although 2008 was not a record year in terms of total mass lost, it may be called exceptional in terms of the spatial pattern of the summer losses, which mainly took place in the high North, consistent with surface melt observations and regional climate model results. Largest mass losses are observed in the regions surrounding the Humboldt Glacier and Zachariae Isstrom, two glaciers that have been reported to have retreated significantly in 2008.