Geophysical Research Abstracts
Vol. 13, EGU2011-3858, 2011
EGU General Assembly 2011
© Author(s) 2011

Climate impact on the ice mass balance in Greenland for the recent period

Inga Bergmann (1), Guillaume Ramillien (2), and Frédéric Frappart (2)
(1) Helmoltz-Centre Potsdam, GFZ Potsdam, Germany, (2) GET, GRGS, Université Paul Sabatier, Toulouse, France

We investigate the connection between the inter-annual variations of the ice mass and atmosphere and oceanic forcings over Greenland and for the recent period (2002-2010). Mass time-variations of glaciers fields are derived using Level-2 global GRACE solutions from different official providers: UTCSR, JPL and GFZ, whereas snow mass and sea surface temperature time series are from ECMWF-ERA re-analysis and NOAA products respectively. Post-processings of these GRACE solutions are made to cancel the effects of the noise (i.e. unrealistic North-South striping) before comparison per ice field region : classical low-pass gaussian filtering, as well as 400-500 km filtered Independent Component Analysis (ICA) separation. Annual signals in the regional time series were removed by a robust recursive smoothing method based on STL-decomposition to extract the inter-annual variations. Corrections of post-glacial rebound effects are made using the Paulson et al. (2007) model. Important actual loss of ice mass in Greenland is confirmed (up to -80 Gt/y), especially due to the negative contributions of glaciers fields of the east coast. Strong correlations between GRACE-based and atmosphere/ocean time series enable to distinguish two types of behavior are distinguished: (1) changes in the slow accumulation of snow that simply modify ice mass balance inside the continent, and (2) the influence of inputs of warm ocean water that accelerate periodically the calving of glaciers in coastal regions. These results suggest that ice mass balance of Greenland are driven by coastal sea surface temperature at shorter time scales than accumulation.