

Assessment of Greenland Ice Sheet elevation changes using merged ERS-1/2 radar altimeter measurements

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ERS-1 and ERS-2 satellite altimeter measurements were used to study Greenland Ice Sheet thickness variations over period 1992-2004. Different methods were applied to estimate elevation change rates over this period and to create time series of seasonally averaged elevation change. For joint analysis of measurements from both satellites the technique for ERS-1/ERS-2 bias determination was developed. Investigation of this bias shows its spatially variant character. Ranges measured from the ERS-2 satellite typically give higher elevations in comparison with those obtained from ERS-1 data and largest differences are observed over the ice sheet margins. Elevation growth is revealed over most of the interior regions, while for margin areas, where outlet glaciers are located, mostly thickness decreasing is typical. The seasonally averaged time series of elevation change indicate an annual cycle with elevation maximum in autumn and winter and minimum in spring and summer over interior areas, and summer minimum and winter maximum over margin areas of the ice sheet, where summer melting occurs. Comparison of obtained surface elevation change with snow accumulation, which determines, over the short time scale, the most of ice sheet thickness variations, revealed their good agreement. Moreover a dependence of interannual change of elevation on migrating the Icelandic low was revealed and indicated the key role of winter and autumn seasons, when this low-pressure area is mostly developed. This relationship is reflected in high negative correlation coefficient between elevation change and North Atlantic Oscillation (NAO) index. It also confirms mentioned earlier the key role of winter and autumn, since NAO phenomenon is also mostly pronounced during these seasons.