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Greenland ice sheet elevation variations from 1992 to 2003 derived from ERS-1 and ERS-2 satellite altimeter data

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Greenland ice sheet surface elevation change was studied using 11-years of ERS-1 and ERS-2 satellites radar measurements data from 1992 to 2003. The calculations of ice sheet elevation change are based on the crossover analysis using the differences in ice-mode ranges at crossing points of the satellite orbit ground tracks. To carry out a comprehensive analysis of spatiotemporal variability in the elevation of the Greenland ice sheet a database of all available crossover points was created. Two methods were used to estimate surface elevation change rate and to create the seasonally averaged time series of elevation change. For performing of joint analysis of data obtained from both satellites investigation of ERS-1/ERS-2 bias was carried out. The assessed (ERS-2 – ERS-1) bias is mostly positive and not spatially invariant with lowest values over interior regions and largest over margins. The increase of the estimated elevation change rate due to this bias varies from $\sim$2 cm/year typical over plateau to about 20 cm/year over coastal areas. Spatial distribution of elevation change indicates ice sheet thickening of inland parts of the ice sheet and thinning over most of margin areas, resulting in positive value of spatially averaged ice thickness change of about 5 cm/year. Elevation decreasing over margins is especially revealed in regions, where outlet glaciers are located. Created time series of elevation change show that this decreasing became mostly pronounced from 2000. For the interior regions of Greenland ice sheet time series indicate a minimum of elevation in 1995, i.e. when elevation decrease change to elevation grows, especially revealed over southern and western parts of Greenland. Good agreement between elevation change and snow accumulation in these regions was revealed. Predominant role of precipitation was also indicated in

relation of elevation change to features of see level pressure fields near Greenland. A dependence of change of elevation from migrating of Icelandic low was revealed. It was indicated a key role of winter season in interannual variations of surface elevation. This relationship was confirmed by the high correlation coefficient between elevation change and NAO index, which accounted to -0.7 for 11 winter seasons considered from 1993 to 2003.