Mass balance fluctuation of Qaanaaq Ice Caps and its vicinity in northeastern Greenland

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Many of glaciers and ice caps (GICs) exist at the margin of the Greenland. The contribution of GICs mass loss to sea level rise under recent warming is large. The northeastern Greenland is one of the areas, which experienced large mass change and has little in-situ mass balance observation. Bolch et al. (2013) estimated that the surface elevation change of ice caps in northeastern Greenland from 2003 to 2008 was -0.6 m a^{-1}. Saito et al. (2015) revealed that the mean surface level change of six ice caps in northeastern Greenland from 2006 to 2010 was -1.1 m a^{-1}.
We have estimated surface mass balance of five ice caps in northern Greenland by a mass balance model constructed by Hock (1999). The model takes temperature index method for calculating ablation. The model computes spatial variation of surface mass balance for the ice caps. The 100m - gridded DEM and surface condition of the ice cap, derived from modified ALOS (Advanced Land Observing Satellite) data, were used for the model calculation. The climate data as input of the model was air temperature and precipitation at Thule climate station (TCS, 77.2N, 68.4W), which is one of the long-term running climate stations in Greenland situated about 100 km south to Qaanaaq. The air temperature at TCS has been increasing after 1990.
The calculation has been done for Qaanaaq Ice Cap (QIC) since 1980s. The mass balance of QIC has been negative since 1980s. The mass balance calculation by the model has been done for other four ice caps for 2006 -2009 and compared with the surface elevation change reported by Saito et al. (2015). Ice caps situated in coastal area show less negative mass balance than those situated inland. The ice caps situated in coastal area show higher albedo (Saito, et al., 2015), which is possibly because higher fraction of precipitation falls as snow.

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