Geophysical Research Abstracts
Vol. 18, EGU2016-4584, 2016
EGU General Assembly 2016
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Arctic Amplification and the Northward shift of a new Greenland melting record

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Large-scale atmospheric circulation controls the mass and energy balance of the Greenland ice sheet through its impact on radiative budget, runoff and accumulation. Using reanalysis data and the outputs of a regional climate model, here we show that the persistence of an exceptional atmospheric ridge, centred over the Arctic Ocean was responsible for a northward shift of surface melting records over Greenland, and for increased accumulation in the south during the summer of 2015. Concurrently, new records of mean monthly zonal winds at 500 hPa and of the maximum latitude of ridge peaks of the 5700±50 m isohypse over the Arctic were also set. An unprecedented (1948 – 2015) and sustained jet stream easterly flow promoted enhanced runoff, increased surface temperatures and decreased albedo in northern Greenland, while inhibiting melting in the south. The exceptional 2015 summer Arctic atmospheric conditions are consistent with the anticipated effects of Arctic Amplification, including slower zonal winds and increased jet stream wave amplitude. Properly addressing the impact of Arctic Amplification on surface runoff of the Greenland ice sheet is crucial for rigorously quantifying its contribution to current and future sea level rise, and the relative impact of freshwater discharge on the surrounding ocean.