



Effects of future Arctic sea ice decline on Greenland ice sheet melt

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CMIP5 models project substantial reduction of the Arctic sea ice cover during the current century, including the onset of a seasonally ice free Arctic. In this study we explore the effects of future Arctic sea-ice change on the mass balance of the Greenland ice sheet (GrIS). For this, we use 1850-2100 simulations from the Community Earth System Model version 1.0 corresponding to historical and RCP8.5 scenarios. We examine the impact of Arctic change on the surface energy and mass budgets of the Greenland ice sheet. We distinguish between winter Arctic change and Greenland-melt-season (Spring and Summer) future climate change.

We find a substantial reduction in summer incoming shortwave radiation over the GrIS both for clear-sky and all-sky conditions, that reduces the energy available for melt. Because of the large amount of energy that is used during summer to melt sea-ice, we find no amplified summer warming in the ocean around Greenland, except where summer-long ice-free conditions develop. The different nature of the processes controlling sea-ice change along the western and eastern Greenland coast is examined. We find no links in the timing of major sea-ice change and Greenland snow and ice melt, and justify why such a linkage is absent.