

C3S high resolution Arctic reanalysis - impact of coupled surface-radiation modelling

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The Greenland ice sheet is the largest ice volume in the rapidly warming Arctic and covers an area of 1.71 million km². The solar-driven melt rate of this is determined by the co-albedo. Current weather models and reanalysis products have poor ice sheet albedo representations. We have addressed this issue in our model by using observed albedo datasets in a manner, by which the surface-radiation coupling is taken into account. This is important since the atmospheric forcing is itself affected by the surface reflectance. It is also important since the albedo of the snow and ice on the Greenland ice sheet, in addition to affecting the melt rate, also affects the general weather conditions in and around Greenland significantly. We are running a multi-year (1997-2021) high-resolution (2.5 km) reanalysis of Greenland, Iceland, Svalbard, Northern Scandinavia and parts of the Russian and Canadian Arctic as a part of the C3S regional reanalysis programme. The HARMONIE-AROME cy40h1.1.1 model with full 3D-variational data assimilation is used, and is nested into the global ERA5 reanalysis dataset. The external albedo dataset, that has been included in the surface analysis, is the MOD10A1 collection 6 daily gap-filled product with 500 m resolution. We show the impact of including the MOD10A1 data, and compare the results to the meteorological data from the synoptic weather station network.