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Added values with Copernicus arctic regional reanalysis

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Copernicus Arctic Regional Reanalysis is an ongoing project targeting for a 24-year reanalysis for the European arctic regions (Greenland, Iceland, Svalbard and Northern Scandinavia) with a high model grid resolution of 2.5 km. The model system is based on the operational mesoscale nonhydrostatic forecast system HARMONIE-AROME as used in the nordic meteorological services, albeit with numerous adaptation to suit the needs in reanalysis. The system uses ECMWF ERA5 analysis as lateral boundary condition, assimilating with 3DVAR and surface analysis a comprehensive set of satellite observations including those reprocessed atmospheric motion vector, scatterometer wind, radio occultation bending angle. To enhance use of in-situ observation for this data sparse region, substantial efforts have been devoted to collect and assimilate non-GTS surface observation of different origins, such as those from nordic weather services, local Greenland observation network ASIAQ, glacier stations in GCNET and PROMICE. Huge efforts have been spent to quality assure observations collected in Greenland and Iceland including those from synoptic networks. Extensive work has been done to improve and correct orographic and physiographic databases about glacier mask, coast lines, leaf area index, cover types and soil. Satellite derived albedo has been used to enhance model realism in representation of permafrost surface in glacier areas. For sea states, reprocessed high resolution SST and ice cover data have been used. Using the extensive dataset from provisional reanalysis during the preparation phase, validation against observation data have been compared to the corresponding ones with global reanalysis as well as those with the operational Harmonie-arome setup, revealing many interesting features which help to identify strengths and weakness among the data sets, especially the added values of the arctic regional reanalysis.