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Evaluation of regional hydrometeorological reanalysis for Russian Arctic: methodology and verification results

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Taking into account the increasing number of dangerous phenomena and outlooks for the Arctic coast, the task of providing the region detailed hydrometeorological and climatic information with a horizontal resolution of at least several kilometers becomes particularly topical.
In this work we would obtain for the first time the high-detailed archive of many hydrometeorological parameters with a spatial resolution of less than 5 km based on the long-term simulation experiments. Detailed hydrometeorological fields in the Arctic basin over a long period (1980 – 2016) will be derived by the two-step downscaling technology with domains of $\sim$13 km and $\sim$4 km horizontal resolutions and will cover most of Russian Artic area (while the western Arctic seas more detailed).
The main tool is the well known regional non-hydrostatic model COSMO-CLM, the climate version of COSMO model. ERA-Interim global reanalysis will be used as driving conditions for regional model. The spectral nudging technique will also be applied within all simulations.
First verification over hundreds Russian Arctic stations allowed to select the best configuration of model and domains, including many turbulent scheme options and starting time of experiments. Model results over coast have shown a good agreement with observations (mean errors 1 - 2 C), larger temperature biases over Eastern Siberia inland have been partially reduced using selected turbulence scheme options (mean errors from 5 - 6 C to 2 - 3 C). Differences between ERA-Interim and ERA5 driving conditions are not enough apparent, therefore the former was chosen as basic reanalysis taking into account data volume and computational resources limitations. Verification with ASCAT and AMSR satellite data over the seas have shown the good consistency of model wind speeds (RMSE about 1 - 2 m/s).
The near future long-term experiments with the chosen model configuration would be conducted. The regional reanalysis output would be possible to use in many applications, e.g. modelling the ocean's characteristics, coastal ecosystems, detailed investigation of individual extreme phenomena on nested domains, analysis of trends in the frequency of occurrence of extreme events and features of their spatial distribution, study of the hydrometeorological regime of coastal areas, climatology and tracking of polar mesocyclones, etc.
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