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Dynamical Downscaling over Siberia: Is there an added value in representing recent climate conditions?

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The analysis of long-term changes and variability of climate variables for the large areal extent of Siberia - covering arctic, subarctic and temperate northern latitudes - is hampered by the sparseness of in-situ observations. To counteract this deficiency we aimed to provide a reconstruction of regional climate for the period 1948-2010 getting homogenous, consistent fields of various terrestrial and atmospheric parameters for Siberia. In order to obtain in addition a higher temporal and spatial resolution than global datasets can provide, we performed the reconstruction using the regional climate model COSMO-CLM (climate mode of the limited area model COSMO developed by the German weather service). However, the question arises whether the dynamically downscaled data of reanalysis can improve the representation of recent climate conditions.
As global forcing for the initialization and the regional boundaries we use NCEP-1 Reanalysis of the National Centers for Environmental Prediction since it has the longest temporal data coverage among the reanalysis products. Additionally, spectral nudging is applied to prevent the regional model from deviating from the prescribed large-scale circulation within the whole simulation domain. The area of interest covers a region in Siberia, spanning from the Laptev Sea and Kara Sea to Northern Mongolia and from the West Siberian Lowland to the border of Sea of Okhotsk. The current horizontal resolution is of about 50 km which is planned to be increased to 25 km. To answer the question, we investigate spatial and temporal characteristics of temperature and precipitation of the model output in comparison to global reanalysis data (NCEP-1, ERA40, ERA-Interim). As reference Russian station data from the “Global Summary of the Day” data set, provided by NCDC, is used. Temperature is analyzed with respect to its climatologically spatial patterns across the model domain and its variability of extremes based on climate indices derived from daily mean, maximum, minimum temperature (e.g. frost days) for different subregions.
The decreasing number of frost days from north to south of the region, calculated from the reanalysis datasets and COSMO-CLM output, indicates the temperature gradient from the arctic to temperate latitudes. For most of the considered subregions NCEP-1 shows more frost days than ERA-Interim and COSMO-CLM.