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Validation of ERA40/ECHO-G-dynamically downscaled MM5 with applications in permafrost modelling

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Permafrost regions have been identified as being particularly sensitive to climate change, and have already shown significant temperature increases. Assessing the severity and scope of climate impacts on permafrost regions is an integral part of climate change mitigation and is most readily accomplished via climate simulations. Future climate data from both the ERA40 reanalysis dataset and output from the millennial General Circulation Model (GCM) ECHO-G were used in dynamical downscaling experiments where these data serve as boundary conditions for the NCAR/PSU regional climate model MM5. Simulations of past climate were conducted for the period 1961-1990 and compared to gridded meteorological data from the Climate Research Unit (CRU). The model combination ECHO-G-MM5 was validated against CRU data and ERA40-MM5 simulations on the basis of magnitude and spatial and temporal variability of climate variables such as air and soil temperature. Special attention was also paid to the selection of MM5 model parameters and configuration options, such as inclusion of the POLAR MM5 routines or use of the NOAH land surface model, with emphasis on suitability and applicability to permafrost modelling. Results are given as spatial comparisons of climate variables between model(s) and CRU data, as well as temporal analyses of trends and model variability.