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Modeling of ground temperatures in South Shetlands (Antarctic Peninsula): Forcing a land surface model with the reanalysis ERA-Interim

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This study focus on Livingston Island (South Shetlands Antarctic Peninsula), one of the Earth's regions where warming has been more significant in the last 50 years. Our work is integrated in a project focusing on studying the influence of climate change on permafrost temperatures, which includes systematic and long-term terrain monitoring and also modeling using land surface models. A contribution will be the evaluation of the possibilities for using land surface modeling approaches to areas of the Antarctic Peninsula with lack of data on observational meteorological forcing data, as well as on permafrost temperatures.

The climate variability of the Antarctic Peninsula region was studied using the new reanalysis product from European Centre for Medium-Range Weather Forecasts (ECMWF) Era-Interim and observational data from boreholes run by our group. Monthly and annual cycles of near surface climate variables are compared. The modeling approach includes the HTESSEL (Hydrology Tiled ECMWF Scheme for Surface Exchanges over Land) forced with ERA-Interim for modeling ground temperatures in the study region. The simulation results of run of HTESSEL are compared against soil temperature observations. The results show a favorable match between simulated and observed soil temperatures. The use of different forcing parameters is compared and the model vs. observation results from different results is analyzed. The main variable needing further improvement in the modeling is snow cover. The developed methodology provides a good tool for the analysis of the influence of climate variability on permafrost of the Maritime Antarctic.