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# Parameter variability in transfer function modelling of snow depth dynamics

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The aim of this novel study is the modelling of snow pack evolution in high latitudes. Despite great interest in modelling snow depth dynamics, and its dependence on climatic variation, there is a lack of data from long-term meteorological time series. Moreover, due to difficult weather conditions, many observations are missing, which makes utilisation of the data even more difficult. An important aspect of the approach is that data from several sources have been used, allowing spatial variations at a global scale to be assessed.
Meteorological data from the Hornsund Polish Polar Station, Svalbard, and the McMurdo Dry Valleys, Antarctica, are used in this work. We apply Data Based Mechanistic (DBM) models, where a stochastic data-based identification of model structure and an estimation of its parameters are followed by a physical interpretation. The procedure consists of two steps. First, the observations are checked for consistency and data gaps are filled using Dynamic Harmonic Regression (DHR) methods. In the second step, a dynamic Stochastic Transfer Function (STF) model is developed. Models are independently identified for each season and station. Due to the variability of meteorological processes and other external forcing factors the Stochastic Transfer Function parameters vary largely between years and stations. The synthesis of the parameter variations is presented along with an attempt to relate parameter changes to external meteorological forcing not used during model identification.