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Future trends of the Alpine and ephemeral snowpack at selected sites across Switzerland

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Snow is a key feature of mountainous environments because of its high implications for hydrology, vegetation and economics, such as winter tourism or hydropower. In particular, snow depth, the stored snow water equivalent, the duration of the snow on the ground or the snow load on a roof are all important parameters for services like road maintenance, avalanche warning, water management, hydro power, flood prevention or building code regulations. The measurement of these snow parameters is either not always possible or too expensive. To overcome this problem, snow models with input from meteorological stations are a worthwhile alternative.

In this study we apply the one-dimensional, physically based snow model SNOWPACK. We first demonstrate the performance of SNOWPACK in modelling the seasonal evolution of snow characteristics such as snow depth or duration of snow cover for single years. The required input data for SNOWPACK includes air temperature, relative humidity, wind speed and direction, incoming short- and long-wave radiation, and precipitation intensity. As most stations do not measure incoming long-wave radiation, it needs to be parameterized. Moreover, due to wind-induced errors, it is necessary to correct the precipitation measurements.

In a second step we show future trends of the Swiss snowpack at selected sites located at different elevations across Switzerland. Therefore we concentrate on the ability of SNOWPACK to model climatological mean values of seasonal snow depth, maximum snow depth and the length of snow season for example. For the assessment of future trends, scenario data from the recently released CH2011 report will be used in order to perturb the observed time series of temperature and precipitation.