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# SNOWPACK model simulations in complex orography: sensitivity to the accuracy of the meteorological forcing

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Estimating the amount of water stored in mountain snowpack and its variability during the snow season is crucial to make forecasts on water availability in downstream regions during the dry months. Snow estimates can be achieved using physical, spatially distributed land-surface models. However, one of the issues in modeling snowpack characteristics in high elevation environments is the uncertainty and the spatial representativeness of the meteorological forcing, owing to the high spatial variability of meteorological parameters in complex topography.

In the present study we employ the SNOWPACK model (Bartelt and Lehning, 2002) to reproduce the snowpack temporal evolution at the experimental site in Torgnon, 2160 m a.s.l. in the Western Italian Alps, during five snow seasons from 2012 to 2017. We assess the model performances in different cases: i) the "ideal" case, when high-frequency and accurate meteorological in-situ station data are available, ii) the case when data are provided by gridded data sets derived by spatial and temporal interpolation of surface station measurements, and iii) the case when forcing is provided by global reanalyses, such as ERA-Interim and the latest ECMWF product ERA5, at spatial resolutions of about 80 and 30 km, respectively.

The present study provides information about how sensitive the snow model is to the accuracy of forcing data, enlightening the feasibility of driving such kind of models with lower resolution data sets, including reanalyses, to obtain fine scale information on snowpack characteristics also in areas with little availability of in-situ station data, and climate model outputs, to explore the long-term projected changes of the snowpack conditions at very fine spatial scales.