



Snow reliability in ski resorts considering artificial snowmaking

M. Hofstätter, H. Formayer, and P. Haas

Institute of Meteorology, University of Natural Resources and Applied Life Sciences, Vienna, Austria
(michael.hofstaetter@boku.ac.at)

Snow reliability is the key factor to make skiing on slopes possible and to ensure added value in winter tourism. In this context snow reliability is defined by the duration of a snowpack on the ski runs of at least 50 mm snow water equivalent (SWE), within the main season (Dec-Mar). Furthermore the snowpack should form every winter and be existent early enough in season.

In our work we investigate the snow reliability of six Austrian ski resorts. Because nearly all Austrian resorts rely on artificial snowmaking it is of big importance to consider man made snow in the snowpack accumulation and ablation in addition to natural snow. For each study region observed weather data including temperature, precipitation and snow height are used. In addition we differentiate up to three elevations on each site (valley, intermediate, mountain top), being aware of the typical local winter inversion height. Time periods suitable for artificial snow production, for several temperature threshold (-6,-4 or -1 degree Celsius) are calculated on an hourly base. Depending on the actual snowpack height, man made snow can be added in the model with different defined capacities, considering different technologies or the usage of additives. To simulate natural snowpack accumulation and ablation we use a simple snow model, based on daily precipitation and temperature. This snow model is optimized at each site separately through certain parameterization factors. Based on the local observations and the monthly climate change signals from the climate model REMO-UBA, we generate long term time series of temperature and precipitation, using the weather generator LARS. Thereby we are not only able to simulate the snow reliability under current, but also under future climate conditions.

Our results show significant changes in snow reliability, like an increase of days with insufficient snow heights, especially at mid and low altitudes under natural snow conditions. Artificial snowmaking can partly compensate this effect, but this depends on the local climate conditions, the capacity of the snow making facilities and the time period (climate change signal) under consideration.