Snow cover modelling under Climate Change conditions in North Calcareous Alps (Austria).

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Snow cover is an important parameter for the natural environment (glaciers, hydrology, vegetation) in alpine regions. Earlier snow melt and an elongation and/or shift of the snow-free period - correlated to increasing summer temperatures observed since the 90's – can impact on various facets of alpine environment.
The objective is here to use an existing hydrological model, *PREVAH* from Gurtz and Zappa (1999-2003; WSL, Switzerland) to generate various snow parameters (statistics, cover maps) that will then be tested as variables in predictive models of water supply. In the following, the focus is mainly given to issues pertaining to the development of the snow cover model.
The study area is located in the North-eastern Calcareous Alps (NCA) of Austria (47°30' to 47°50 N and 15° to 16° E) comprising four different mountain ranges (Mt. Hochschwab, Mt. Rax,, Mt. Schneealpe, Mt. Schneeberg) with an overall area of 150 km^2 .
This area is supervised by the Viennese Water Works because it provides 95% of the drinking water needs for the city of Vienna.

Inputs: meteorological data from the Austrian Meteorological Service (ZAMG) since 1980 and from the Technical University of Vienna since 1993 are used, providing daily means values : temperature, precipitation, humidity, wind speed, sun duration. Complementary data during the snow-free season are also available: land cover and soils classification. Then, a fine digital elevation model (DEM) at 20m grid spatialise these data.
Calibration: a set of snowpits in high elevation sites and Runoff gauges at the bottom of mountains are used to adjust the snow calculation from the hydrological model.
Outputs: the issue is to expand the Swiss model to predict mean annual snow cover duration and mean Julian day of snowmelt in a spatially explicit way.
Validation: a set of snow maps derived from orthorectified SPOT satellite images are used to estimate the accuracy of the snow cover modelling results.

The PREVAH model is used to obtain a physically-based predictor for snow cover duration, in a way that takes different climate change scenarios into account : HadCM3 (global) and HIRHAM4 (regional) from the 1960-1990 values reference. E.g. temperature increase, precipitation change, different distribution of solar radiation across the year and their impact on evapo-transpiration. The main parameter analysed will be the timing and duration of the snow-free period.

The methodology and the problems related to topography will be presented ; e.g. the necessity to correct temperatures and precipitations from valley stations to higher elevation sites using snow pits measurements. Also for each particular grid cell, how to provide interpolated local snow parameters (depth, duration), given the problems encountered in high mountainous areas. Here particulary the snow re- distribution is derived from near surface wind velocities due to a complex local topography.