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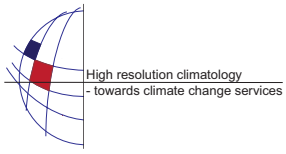

Spatial interpolation of air temperature for improving snow and hydrological forecasts on Alpine catchments

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Snow accumulation and ablation directly impact the hydrological regime of all the main Alpine rivers. In particular, when a rapid increase of temperature or a rain-on-snow event occurs, snowmelt is an aggravating factor of flood risk. Indeed, in order to have a good hydrological forecast, it is necessary to correctly predict the snowmelt runoff, depending on the snow cover patterns evolution under given meteorological conditions. Within this framework, the quality of input data fields (notably, precipitation and temperature) is a crucial point. The aim of the presented study is to propose a simple and robust algorithm devoted to air temperature mapping in mountainous regions, which could be further applied in an operational context over the Isere river basin at Grenoble ($\sim$5570km^2).

Data from more than 450 temperature stations available over the 1990-2008 period in the Western Alps, with elevations ranging from 100m to 4810m, are firstly analysed in order to detect the main statistical properties of the temperature fields (notably, the temperature gradients with altitude) under different weather conditions, at a sub-daily time step (when this time step is available, otherwise we consider a minimum and maximum daily temperature). Then, data are interpolated by kriging with external drift at a 1 km resolution over a 2,5°x 2° window (4°38'-7°6' E; 44°25'-46°36' N). The lack of data in some parts of the considered region (especially at high elevation areas above 2000m) decreases the quality of kriging, but on the whole the interpolated temperature fields seem to be competent for further snowmelt and snow cover dynamics modelling studies. A comparison is made with operational temperature products coming from meteorological models, supplied by the French Meteorological Office and ECMWF.