Spatial and temporal downscaling of RCM data for Alpine sites

Kristian Förster (1,2), Johanna Nemec (1), Florian Hanzer (1,2), Stefan Berlin (1), Thomas Marke (2), Ulrich Strasser (2):

(1) alpS Centre for Climate Change Adaptation, Innsbruck, Austria,
(2) Institute of Geography, University of Innsbruck

Predictions of hydrological processes in mountainous regions using detailed process-based models require a full set of meteorological forcing data. Many modelling approaches are designed for both sub-daily time steps and the representation of spatial entities smaller than 1 km^2. However, the resolution of available input data in space and time is generally lower than the corresponding scales of the models. This mismatch in data requirement and availability especially becomes evident in case of climate scenarios provided by Regional Climate Models (RCM). While their spatial resolution is mostly sufficient in lowlands, nowadays RCMs still exhibit a coarse representation of the topography in mountains which, in turn, requires adequate successive downscaling steps in order to apply detailed process-based models.
We present a set of methods that help to bridge these gaps in scale. Spatial downscaling from daily EURO-CORDEX RCM grids to observational sites is performed using the statistical Quantile Mapping (QM) approach which has been extended by optimum scale analyses. The next step encompasses temporal disaggregation based on the MELODIST software package in order to derive hourly meteorological time series. First, the entire processing chain is applied to the “historical” period of the EURO-CORDEX runs (2nd half of the 20th century) using a large set of daily and hourly recordings. Based on the statistics derived for the historical period, future scenarios are downscaled to study the projected climate of the 21st century in the framework of subsequent model applications. This overview briefly describes the methods along with first results achieved for numerous sites in the Ötztal Alps, Austria.