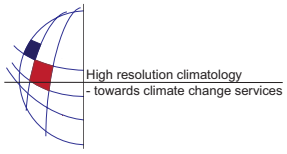
EMS Annual Meeting Abstracts
Vol. 7, EMS2010-726, 2010
10th EMS / 8th ECAC



Spatial interpolation for climate monitoring in Switzerland

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In regions of complex topography, the small-scale structure of meteorological phenomena poses a challenge to the generation of accurate climate monitoring products. Increasing the density of in-situ observations is costly and technically difficult in remote regions and under harsh conditions. In this paper we illustrate three examples of interpolation techniques addressing the problem of limited station density for interpolation over complex terrain. The presented techniques are part of an ongoing development at MeteoSwiss, aiming for the operational production of km-scale gridded climate monitoring datasets for the territory of Switzerland.

The three examples illustrate distinct approaches for enriching the information content of the station measurements: The first example – for relative sunshine duration –incorporates satellite data (a Heliosat clearness index) in conjuction with station measurements. The satellite information is integrated via linear combination of spatial covariance patterns and allows application also in the pre-satellite period. The second example – for temperature – includes topography information via a non-Euclidean distance weighting. The wheighting scheme itself is calibrated from station data and varies with time. The third example – for precipitation – includes information from non-simultaneous station measurements in terms of spatial covariance patterns.

The paper explains the basic principles of the three methods, illustrates their potential and limitations in case studies, and demonstrates the added value of the additional information elements through crossvalidation experiments.