High resolution climatology
- towards climate change services

Spatial mapping of daily extreme temperature in Europe and Middle East

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We present an operationally applicable land-only daily high-resolution (1 km^2) gridded data set for minimum and maximum surface temperature (Tmin/Tmax) for Europe (WMO Region VI). This data set improves a previous product in its spatial resolution and extent, and in applying a more appropriate method for spatial interpolation of daily climate observations.

Regression Kriging (RK) is used which combines a regression of the dependent variable (Tmin/Tmax) on auxiliary variables with Simple Kriging (SK) of the regression residuals. Regression allows for extrapolation in regions with less elevated observation stations, and SK is used to fit the residuals, i.e. the unexplained variation.

We employ a three-step process of interpolation, by (1) first generating a raw map of monthly Tmin/Tmax values using multilinear regression, (2) then interpolating the regression residuals using SK and combining the raw map and the interpolation estimates which yields an average monthly map; (3) and finally interpolating daily residuals to the average monthly map which are summed and yield the daily extreme value map. Each step is calculated separately for 8 climatic subregions, to account for heterogeneous conditions within the WMO Region VI.

Interpolation uncertainty is quantified using cross validation by computing daily prediction errors for every left-out station. The daily uncertainty averaged across the entire region is shown to be largely dependent on the season and number of contributing observations.