EMS Annual Meeting Abstracts
Vol. 16, EMS2019-882-2, 2019

Return levels of extreme rainfall smoothed in space and time interval

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Generalized extreme value (GEV) distribution was used to calculate return levels for annual maxima of different time intervals (from 5 minutes to 24 hours). Pluviographic stations data of at least 15 years length were used to determine parameters (shape, location, scale) of GEV fit.
According to the literature shape parameter is only slowly varying in space. Due to relatively high uncertainty of estimated shape parameter we decided to set the same value of shape parameter for the entire territory of Slovenia for every time interval separately.
Location parameter was defined using regression-kriging of location parameter calculated from initial data. Slovenia is due to the Alps and the Dinaric Alps climatically divided into two distinctly different regions, therefore for short duration rainfall kriging was applied separately for the littoral and continental region. Results from both regions were merged along the border for Adriatic Sea and Black Sea drainage basins.
Scale parameter evaluated on a single station dataset is quite uncertain compared to the location parameter. We reduced this uncertainty of scale parameter with mapping the ratio of scale and location parameters as we assume almost stationary values of the ratio on a regional level. Kriging steps used were the same as for location parameter. Gridded values of scale parameter were then calculated by multiplying the maps of location parameter and the ratio.
Resulting maps of parameters values for 18 different time intervals were then smoothed using LOESS. Final results were thus spatially and temporally consistent, i.e. parameters values smoothly change both in space and time. Calculated parameters values were used to calculate return levels for 18 time intervals of different return periods (e.g. 2, 5, 10, 25, 50, 100 and 250 years) in a hundred meters grid, covering the whole territory of Slovenia.