Geostatistical Stochastic Mapping of Extreme Precipitation in Southern Portugal

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As other Southern European regions, the rainfall regime in Southern Portugal is highly variable in both the spatial and temporal dimensions, being clearly Mediterranean. Geostatistical techniques, known as kriging, provide statistically unbiased estimates of surface values from a set of observations at recorded locations, using the estimated spatial and temporal covariance structure of the observed data. Several geostatistical procedures also allow incorporating auxiliary information into the spatial prediction. However, traditional geostatistical techniques may not be appropriate for mapping precipitation patterns in Mediterranean climate regions, because of the well known smoothing effect of kriging. To overcome this weakness, a stochastic geostatistical approach is proposed for mapping extreme precipitation in Southern Portugal. Moreover, this approach has the advantage of allowing the uncertainty assessment of the generated maps. It is recognized that topography and other geographical factors are responsible for considerable spatial heterogeneity of the precipitation distribution at the sub-regional scale. For precipitation mapping we explore the application of the direct sequential cosimulation which allows incorporating covariates, such as altitude or distance to the coastline. The stochastic simulations were developed for extreme precipitation series in a 800x800m grid. The technique is illustrated using high quality daily precipitation observations measured at 105 monitoring stations located in Southern Portugal, within the period 1970-2000. The rainfall patterns are analysed in the spatial and temporal components, and uncertainty is assessed.