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Spatio-temporal interpolation of daily precipitation using parallelized machine learning

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While spatio-temporal structures of a long term climatological fields are shaped by climatic factors like elevation, distance to the water bodies, solar cycle or prevailing air masses, meteorological fields on a shorter temporal scales, down to daily and hourly, are shaped by current weather situation and only partially depend on constant climate factors. This presents the challenge for spatio-temporal analysis leading to the development of the new methods, or adopting existing ones form other research domains. Data analyzed are daily precipitation sums from 500 precipitation stations for the 50 000 square kilometers of the climatologically diverse area of Croatia from the 2005-2010 period, that is around one million of precipitation records. The new method of Random Forest, as a generic framework for generating spatial and spatio-temporal predictions from point samples, is applied, with novel approach that accounts for spatial auto-correlation in the target variables, and which allows for incorporating spatial autocorrelation and geographical proximity effects into prediction process. The ordinary kriging geo-statistical method is used for comparison of the accuracy measures, as a method used in many operational daily precipitation products like daily precipitation sums in the Netherlands (urn:xkdc:ds:nl.knmi::Rd1/5/).