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SPI interpolation and mapping using kriging with external drift

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The standardized Precipitation Index (SPI) is among the tools adopted to monitor drought. For a given accumulation period expressed in months, it represents an indicator about the deviation from the climatological median. Values less than -2 indicate extreme drought category. The SPI was primarily defined based on the analysis of rainfall data at locations where a raingauge is available. In many papers, maps of SPI are presented using gridded rainfall data. There are large sources of uncertainties linked to SPI estimations. Within rainfall stations data, the uncertainty mainly comes from the assumption about the underlying distribution of the accumulated rainfall. The main problem is encountered with data including zeros. Another source of uncertainty is linked to the sample sizes. However it is usually reduced by using long series of more than 30 years. Within gridded data, the main uncertainty comes from the rainfall interpolation method especially in the tail of the distribution. With SPI mapping, another source of uncertainty is added. It is linked to SPI interpolation. When using only the observation network, the inverse distance method generally results in smoothed maps especially if networks are sparse. Proxy data may help to add a roughness to SPI maps. Elevation maps may be used as proxy of rainfall. We propose to quantify the uncertainty due to the choice of the underlying distribution by comparing the gamma distribution estimates and the leaks distribution estimates. Then we propose to compare the SPI maps obtained by using kriging with external drift and two different drifts: the elevation map and the map of the accumulated rainfall. The case study is the geographical region composed by the watersheds of the Mediterranean façade in northern Tunisia. 43 stations with records exceeding 30 years are considered. SPI-3 which is a good indicator of agricultural drought is analyzed.