A comparison of some kriging interpolation methods for the production of solar radiation maps

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ABSTRACT
Many environmental processes depend on the amount of solar radiation at the ground level. Ground measurements are often available, even for long time series, and are used as input for spatial interpolation models to produce continuous maps of solar radiation. The aim of this work is to evaluate the results of different kriging interpolation approaches. This kind of comparison presents a relevant meaning since the availability of a physical model for the direct evaluation of solar radiation, which has been used as reference to validate the interpolation results. The procedure integrates the use of some GIS-GRASS capabilities, such the r.sun module which implements the solar radiation physical model, and of the statistical analysis tools provided by the R software package. Some interpolations have been performed taking into account also the values of slope and aspect as geomorphologic quantities correlated to the solar radiation value. The study has been performed at different spatial scales to evaluate how resolution affects the results. Accuracy maps have been produced and a brief analysis has been also performed to check the occurrence of significant correlation between geomorphological features and the magnitude of errors. The analyzed solar radiation measurements refer to a zone of the Italian Trentino-Alto Adige region located in the South-East part of the Alpine arc.