Mapping Solar Radiation in Southern Spain using ordinary kriging

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The solar radiation plays a major role in the energy exchange process between the atmosphere and the earth surface. As a consequence, the knowledge of the spatial distribution of the solar radiation is need in climatology, renewable energy applications, ecology, building design, land management and in environmental science in general. In the last decades, different spatial interpolation techniques have been developed in order to derive spatial climate variables databases from measurements of nearby stations.

In this work we present an evaluation study on the feasibility of using the ordinary kriging methodology for mapping solar radiation in Andalusia (Southern Spain). Particularly, we use ordinary kriging to obtain daily mean maps of global solar radiation. We use data collected in 166 radiometric stations, collected along the period 2003-2006 and covering the whole study region. One third of the stations were used for validation purposes. The area of study (80.000 km) is located in the transition region from middle latitudes to subtropical climates, with the Atlantic Ocean and the Mediterranean region in the southern bound. The western part of the region, covering around 30.000 km, is an almost homogeneous flat area, with about 100 m of mean elevation. On the other side, the eastern part the region presents a very complex topography, with several mountain ridges and elevation gradients of more 2000 metres in less than 20 km from the coast. As a consequence, the region presents a wide range of climatic characteristics and a considerable topographic variability.

Results showed the potential usefulness of this methodology for solar radiation mapping purposes. Particularly, the mean absolute error ranged from 0.81 MJ/m2 per day

in January to 2.31 MJ/m2 per day in October. Nevertheless, the model tends to underestimate the maximum values, probably due to the very complex topography of the eastern part of the study area.