Spatial interpolation of global solar radiation in Poland

J. Walawender (1,2)

(1) Satellite Remote Sensing Centre, Institute of Meteorology and Water Management, Krakow, Poland (jakub.walawender@imgw.pl), (2) Department of Climatology, Institute of Geography and Spatial Management, Jagiellonian University, Krakow, Poland (j.walawender@geo.uj.edu.pl)

Sunlight is the Earth's primary source of energy. Solar energy activates most of the processes occurring on the Earth's surface and in the atmosphere. It is becoming increasingly appreciated because of its influence on living matter (especially people and crops). Solar radiation has also a great potential as a natural, renewable source of energy, which can be used for photovoltaic (PV) power and solar heating systems. For that reasons knowledge about spatial and temporal distribution of the global solar radiation seems to be crucial.

The main purpose of this study is to find the most appropriate interpolation method in order to create reliable maps of global solar radiation distribution over Poland. ArcGIS Desktop with Geostatistical Analyst was used as it provides a powerful set of tools for automated spatial analysis and mapping. Global solar radiation data were obtained from actinometrical station network which is relatively dense (21 measurement points were taken into account). Verified monthly mean daily sums (J/cm^2) for the period from January 1985 to December 2008 were used for the analysis. Several tests with different stochastic and deterministic methods were done. Additional variables such as elevation and latitude were applied. Various empirical semivariogram models were examined. Preliminary results show that the most adequate interpolation methods are universal kriging and co-kriging. However, depending on the spatial scale, different approaches (global / local) are optimal. Accuracy of prediction was assessed with use of cross-validation technique. More interpolation techniques for different time intervals are planned to be tested.