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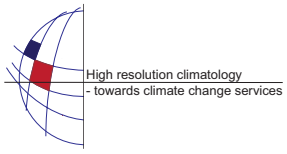

Spatial interpolation of solar irradiation data over complex orography: Solar map of Canaries Islands

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In this paper, we describe the calculation methodology we used to determine the spatial structure of solar irradiation over a very complex orography, such as the Canary archipelago, that is broken in seven islands, with only 7500 km^2, and with heights in some of the islands upper than 1800 m, that reach to 3718 m in the case of Tenerife island. Starting with the method of Cumulative Semivariograms[1], already used to face the irradiation spatial interpolation problem, although not for a complex orography. In this sense, some major modifications are introduced to deal with our needs, which can be summarized as: a) interpolation of clearness index data (Kcd, defined as the division of the global horizontal data, between the corresponding clear sky global horizontal values, obtained from a suitable model) instead of solar irradiation data; b) topographic considerations are included in the clear sky model, such as topographics shadows. This impacts directly over direct component of solar irradiation, and has a minor effect over the diffuse component, arising from a non plane visible horizon; c) the meteorological stations are selected by a criteria of weather proximity, instead of geographic proximity as it was proposed in the original methodology of Cumulative Semivariograms; d) the final result is obtained as the composition of various maps obtained from error minimization within a neighborhood of each available station, instead of using irradiation isolines. A preliminary result with data registered only by Canary Islands Institute of Technology's stations, spread over the whole archipelago, is showed. From our results we can see both, the power of the developed methodology and some limitations due to the extremely complex orography as it is the case of Canary Islands, which consists of a wide variety of microclimate regions. Whenever additional information is available, either in the form of empiric knowledge of the local weather, or in the form of other available radiometric data sources, the results do improve. In the case that all available stations are already used, the empirical knowledge of weather conditions can be introduced in our model by means of a strain parameter that modifies the statistical weight associated to the corresponding station in a given neighborhood. On the other hand, whenever it is possible to increase the spatial density of data sources, that is, to incorporate data from others stations, the result improves provided that data quality is good enough. To validate the results obtained with our methodology, we calculate the error between the estimated solar irradiation at the location of the stations with the records obtained by them.

[1]SPATIAL INTERPOLATION AND ESTIMATION OF SOLAR IRRADIATION BY CUMULATIVE SEMIVARIOGRAMS. ZEKAI SEN, and AHMET D. SAHIN. Istambul Technical University. 2001.