



Ground-satellite measurement of Direct Normal Irradiance in South Portugal and its interaction with local atmospheric effects

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Direct Normal Irradiance (DNI) is of crucial importance for the performance of Solar Thermal Plants (STP) and their use of solar concentrators. This has triggered a worldwide interest in the evaluation of this resource that started around 40 years ago (Collares-Pereira and Rabl, 1979). This is especially relevant in regions that have exceptional good solar resources, as it is the case of the South of Portugal (Cavaco et al, 2016). For that reason a network of seven meteorological stations measuring Direct (DNI), Global and Diffuse Solar Irradiance has been installed in this region, one year ago. This study presents the first results from that initial effort. First, this network will be used in correlating ground-based measurements with satellite data, in order to improve data calibration of remote acquisition. This will allow the extension of the results to other locations. The long-term validity of the present time-series will be secured by statistical correlation with previous local Global and Diffuse Solar Irradiance data. Second, new insights are expected to emerge on the complex relation between DNI and local meteorological variables (namely, relative humidity, optical thickness, and atmospheric turbidity), in order to improve the selection of possible locations for STP. These relations will be connected to the calibration of satellite data and to the statistical weighting of the various atmospheric elements in the TMY algorithm, thus giving a physical meaning to those different weights.

Collares-Pereira, M. and Rabl, A. (1979). The average distribution of solar radiation correlations between Diffuse and hemispherical and between daily and hourly insolation values. *Solar Energy* 22(2), 155-164.

Cavaco, A., Canhoto, P., Costa, M.J., and Collares-Pereira, M. (2016). DNI measurements in the South of Portugal: Long term results through direct comparison with global and diffuse radiation measurements and existing time series. *Energy Procedia* (in press).