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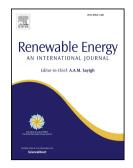
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Solar resource assessment through long-term statistical analysis and typical data generation with different time resolutions using GHI measurements

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12 Abstract

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13 This work addresses the solar resource assessment through long-term statistical analysis and 14 typical weather data generation with different time resolutions, using measurements of Global 15 Horizontal Irradiation (GHI) and other relevant meteorological variables from eight ground-16 based weather stations covering the south and north coasts and the central mountains of 17 Madeira Island, Portugal. Typical data are generated based on the selection and concatenation of hourly data considering three different time periods (month, five-day and typical days) 18 19 through a modified Sandia method. This analysis was carried out by computing the Root Mean 20 Square Difference (RMSD) and the Normalized RMSD (NRMSD) for each time slot of the typical 21 years taking the long-term average as reference. It was found that the datasets generated with 22 typical days present a lower value of overall NRMSD. A comparison between the hourly values 23 of the generated typical data and the long-term averages was also carried out using various 24 statistical indicators. To simplify this analysis, those statistical indicators were combined into a 25 single Global Performance Index (GPI). It was found that datasets based on typical days have 26 the highest value of GPI, followed by the datasets based on typical five-day periods and then 27 those based on typical months.

28 Keywords

Solar resource assessment; Global Horizontal Irradiation; Typical Meteorological Year; MadeiraIsland

31 Nomenclature

| 32 | FS | Finkelstein-Schafer statistics |
|----|----------------|--------------------------------------------------------------------------------------|
| 33 | GPI | Global Performance Index |
| 34 | Н | Hourly global horizontal irradiation (kWh/m ² -hour) |
| 35 | \overline{H} | Long-term average of hourly global horizontal irradiation (kWh/m ² -hour) |
| 36 | k | Ranked order number |
| 37 | MBE | Mean Bias Error (kWh/m²-hour, °C, % or m/s) |
| 38 | n | Total number of data records |
| 39 | Ν | Number of daily records in a month |

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