The solar radiation is the primary energy resource for several human activities. Nowadays, the environmental issues and climate concern are boosting the substitution of fossil fuel resources by renewable energy resources, including the adoption of solar energy for power generation. Although the solar power stands for 0.2% of the Brazilian electricity mix, the solar energy resource in the Northeastern Brazilian region (NEB) is higher than in countries where the solar energy market is already consolidated. Nowadays, it is crucial to deepen the comprehension of solar resource time and spatial variability in NEB to support and promote the solar energy market and save water to other purposes than power generation. The paper presents the data generated by Lima et al. (2019). The database, based on meteorological observations at 129 automated weather stations, provides reliable information on the spatial and seasonal variability of the incoming solar irradiation in NEB.

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The database provides reliable information and knowledge to identify and investigate the spatial and seasonal complementarity of the solar energy resource in the Northeastern region of Brazil (NEB) [1]. The dataset is organized in folders as described in Table 1, and it is available for public access at the Mendeley data repository [2].

| ID. | Folder name | Description |
|-----|-------------|-------------|
| 1. | Kriging Interpolation_Surface Solar Irradiation | The folder contains data and figures provided by Kriging interpolation method applied to the incoming solar irradiation data acquired in AWS operating in the Northeastern Brazilian Region. The worksheet contains seasonal averages for the surface global solar irradiation. |
| 2. | Cluster Analysis | The folder contains the database used to feed the Cluster Analysis (CA) script. The CA, based on the agglomerative hierarchical Ward method, identified five areas in the Northeastern Brazilian region presenting differing solar irradiation patterns. |
| 3. | Monthly & Annual_Avgs | The folder contains the annual and monthly spatial averages of the surface global solar irradiation in all five clustered areas in the Northeastern Brazilian region. |
| 4. | Box Plot_Dataset | The folder contains the data files used to prepare boxplot graphs of the surface solar irradiation for all clustered areas in the Northeastern Brazilian region. |
| 5. | Trend Analysis_dataset | The folder contains the data generated in trend evaluation of the surface solar irradiation in the Northeastern Brazilian Region. |

Value of the Data

- The available database can help to understand how solar energy can contribute in proposals for incentive policies and environmental agenda focused in saving water for other purposes than power generation (water, food, and energy security nexus) in the driest Brazilian region;
- The database contains vital information for the evaluation of the seasonal and spatial complementarity between renewable energy resources in the Northeastern Brazilian region;
- The database allows a reliable overview of the solar energy resource in the Northeastern Brazilian region based on local AWS measurements;
- The database can be useful to support energy planning activities to increase the solar power share in the Brazilian energy mix.

1. Data

The database provides reliable information and knowledge to identify and investigate the spatial and seasonal complementarity of the solar energy resource in the Northeastern region of Brazil (NEB) [1]. The dataset is organized in folders as described in Table 1, and it is available for public access at the Mendeley data repository [2].
Mendeley Data repository. The link to reach the complete database is https://doi.org/10.17632/ggb4xymxt2.1 [2].

2. Experimental design, materials, and methods

The experimental design is based on the incoming solar irradiation data acquired at 129 automated weather stations (AWS) operating throughout NEB territory from 2008 to 2015. The Brazilian Institute for Meteorology (INMET) operates and manages all AWS in the NEB used to generate the available database in Mendeley repository [2]. The AWS data is available for free by ordering to Brazilian Institute for Meteorology (INMET) according to the instructions presented at http://www.inmet.gov.br/portal/index.php?r=bdmep/bdmep.

Fig. 1 presents a diagrammatic representation of the experimental design labeling the main statistical methods used to evaluate the spatial distribution patterns and seasonal variability of the incoming solar irradiation in the Northeastern Brazilian Region. The green boxes are highlighting the dataset in Mendeley repository [2]. The datasets in yellow boxes are available under demand [8].

Fig. 1. Experimental Design and methods used in evaluation of the spatial distribution pattern and seasonal variability of the incoming solar irradiation in the Northeastern Brazilian Region. The green boxes are highlighting the dataset in Mendeley repository [2]. The datasets in yellow boxes are available under demand [8].
incoming global solar irradiation in the Northeastern Brazilian region. The statistical methods and tools used only reliable the incoming solar irradiation and air temperature data according to the WMO criteria [3].

Fig. 2 shows the AWS’s location together with regional orography. It is important to note that the number and spatial distribution of the AWS locations provide excellent coverage of the whole territory of NEB, including areas with high altitudes.

Fig. 3 presents the geographical location of areas showing similar solar irradiation regimes. The cluster analysis indicated five areas with particular global solar irradiation patterns and seasonal variability based on the agglomerative hierarchical Ward method [4]. The AWS’s data located in every five areas were used to evaluate the seasonal variability [5], and trend analysis [6,7].

Fig. 2. The location of 129 automated weather stations (small circles) operating in the Northeastern Brazilian region. Each AWS are named by identification code using the letter “A” followed by a number. The background colors are representing the regional topography.
Fig. 4a presents the box plot of the annual average of the surface solar irradiation in all five areas. The dataset demonstrates that the incoming solar energy is higher in HR5 than all the other areas of NEB. In contrast, the inter-annual variability of solar irradiation in HR2 is the lowest. Fig. 4b presents the plot for seasonal variability of the monthly average of the surface solar irradiation in all five areas.
The monthly average in HR2 is smaller than any other area in NEB. By the other side, the amplitude of the seasonal cycle in HR1 is the highest of the NEB.

The research results and conclusions were published in the article: “The Seasonal Variability and Trends for the Surface Solar Irradiation in the Northeastern Region of Brazil” [1].

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Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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