Fractal classification of typical meteorological days from global solar irradiances: Application to two south Algerian sites

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This article deals with the fractal analysis of solar irradiances in order to quantify their random fluctuations and to achieve their classification according to the state of the sky (clear sky, covered sky,....). For this purpose, we have elaborated a new classification method. In this approach, the concept of fractal dimension is used to measure the solar irradiances fluctuations. Indeed, for daily solar irradiances, the fractal dimension ranges from 1 to 2. D close to 1 describes a clear sky state without clouds while a value of D close to 2 reveals a perturbed sky state with clouds. In fact, a straight line has a fractal dimension of one, just like its Euclidean dimension, once the line shows curls, its fractal dimension increases. The curling line will fill the plane more and more, and once the plane is filled up, it has a fractal dimension of two. Thus, the fractal dimension of a temporal signal has a fractal dimension between 1 and 2.

To carry out this work, the approach has been applied to 2 south Algerian sites: Tahifet and Imehrou characterized by sunny climate.

The validation of the classification method has been achieved by comparing, for every day, the results of the classification with the observation. A good concordance has been obtained. Other techniques have also been used to validate the classification.

The results obtained demonstrate that our classification method is very interesting to construct 3 typical days from global solar irradiances.