



# Evaluation of empirical models for predicting monthly mean horizontal diffuse solar radiation



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## ARTICLE INFO

### Article history:

Received 26 August 2015

Received in revised form

11 November 2015

Accepted 22 November 2015

Available online 11 December 2015

### Keywords:

Solar energy

Solar radiation models

Empirical models

Diffuse radiation

Model comparison

## ABSTRACT

In many solar applications knowing diffuse solar radiation on horizontal surface represents an important requirement. The measurement of diffuse radiation is quite expensive, and because of that solar radiation measurements are not easily available in many locations around the world. Therefore many empirical correlations have been developed by various researchers to predict diffuse radiation from available meteorological data. The main objective of this study is to assess and compare different diffuse solar models available in the literature. These empirical models have been derived for specific location using long term measurements for that location. There is no general formula to calculate the diffuse solar radiation at any location in the world. While there are several studies in which authors compare different diffuse models for specific location, there is no comprehensive study in which these models are compared on a global scale. In this study we used statistical analysis to evaluate performance of analyzed models using long term measurements at 267 different sites around the world. Ten statistical quantitative indicators are used to evaluate different diffuse solar radiation models. The results are also visually presented by means of Taylor diagrams, which give a clear picture of how close a particular model is to measured data and how it is relatively compared to other models.

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## 1. Introduction

Solar energy is being widely considered as important energy source for the future due to the environmental issues associated with the use of fossil fuels as well as their limited reserves. For the

prediction, study, and design of solar energy systems, availability of a complete and accurate data on solar radiation and its components at a given location is essential [1]. Ideally, such information should be obtained from a dense network of stations where global, direct and diffuse radiations are routinely measured [2]. However, for many countries, particularly for developing ones, solar radiation measurements are not easily available [3]. On the other hand, while information exists on global solar radiation, the

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