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Computing the diffuse and direct components of global solar irradiance on a horizontal surface in South Africa

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Most solar radiation measuring devices only determine the total irradiance on a horizontal surface, but for various applications diffuse and direct components are also needed. Because of this, several models have been developed to establish the correlations between the diffuse fraction and various predictors. This paper analyses the measured global irradiance at a Gauteng location as a function of the relative solar position. An equation is presented to estimate both components from the measured daily global solar irradiance only. In this equation, the diffuse component is related to the product of the cosine of the zenith angle and the Linke turbidity factor. The analysis attempts to reproduce the measured irradiance through basic modelling of the spectral opacity of the atmosphere in terms of the Linke Turbidity. This includes estimating direct beam attenuation and the diffuse component, which are then combined with the panel spectral response in an attempt to match the measured and modelled energy yield. The performance of the model have been graphically and statistically analyzed by two established methods, namely; Mean Bias Error (MBE) and Root Mean Square Error (RMSE).

Apply to be
 considered for a student
   award (Yes / No)?

yes

Level for award
 (Hons, MSc,
   PhD, N/A)?

MSc

Main supervisor (name and email)
and his / her institution

Prof. H. Winkler (hwinkler@uj.ac.za). University of Johannesburg

Would you like to <br> submit a short paper <br> for the Conference
 Proceedings (Yes / No)?

yes

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