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Analysis of the solar radiation data and the determination of regression coefficients for the Vhembe region of Limpopo Province, South Africa

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Abstract content
   (Max 300 words)

Vhembe region of the Limpopo Province in South Africa is rich in solar radiation and this makes it as one of the suitable places for the installation photovoltaic devices to harness solar energy. A comprehensive analysis of solar radiation in this region will greatly assist the renewable energy technologists to design suitable installations for rural development. In the present study an attempt has been made to determine the regression coefficients from the sunshine hours for the Vhembe region. The linear equation suggested by Angstrom and Prescott has been used to evaluate the regression coefficients a and b. The parameters such as horizontal average daily extraterrestrial solar radiation (Ho) and daily possible sunshine hours (Np) are computed while Na the actual sunshine hours (in hours) and H, the global solar radiation on the horizontal surface [in MJ/(m2.day)] are obtained from Agricultural Research Council (ARC) and South African Weather Services (SAWS). Five different stations in this region have been chosen for the present study. The plots of monthly average daily relative sunshine hours versus clearness index are drawn in order to find the monthly linear regression equation for each station. The monthly values of the regression coefficients, a and b, and the correlation of coefficients (r2) are evaluated from the derived linear equation. The calculated values of r2 are greater than 0.80 for all the selected stations for this study. From the computations, the values of a and b for Vhembe Region are evaluated and the results obtained are compared with the literature values for other regions in South Africa as well as for the other countries. The results of the present study will be discussed in detail during the presentation.

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