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Study of atmospheric turbidity over Northern Benin

As it passes through the atmosphere to the ground, solar radiation is attenuated by atmospheric constituents that absorb and diffuse it. Two parameters are used to estimate this attenuation: Linke and Angstrom's turbidity coefficients. In this study, we evaluate these coefficients in order to characterize the thermodynamic state of the northern Benin using data acquired from 2010 to 2015 at two micrometeorological sites (Nalohou and Bellefoungou). Two radiometric models are used to estimate the Angstrom turbidity coefficient (the Dogniaux and Louche models) while the Kasten-adjusted Louche model is used to calculate Linke turbidity.

We found that atmospheric turbidity on the Northern Benin varies per season. Similar diurnal and annual variations were obtained for the two coefficients. During the day, solar radiation attenuation is low in the morning and afternoon (turbidity values are the lowest) and high at midday (turbidity values are the highest). Over the year, the atmosphere tends to be less transparent especially in July and August during the wet season where the greatest solar radiation attenuation was observed. Meanwhile, the turbidity consistently rises in dry season and peaks in wet season indicating a significant decline in atmospheric transparency. These variations are attributed to the seasonal changes in atmospheric humidity and aerosols within the atmosphere. Comparing the two radiometric models, we observed that the Louche model gives a higher estimate of Angström turbidity.

Abstract Category

Energy

Author: GNONLONFOUN, david

Co-authors: Mrs HOUNSINOU, Miriam; MAMADOU, Ossenatou

Presenter: GNONLONFOUN, david

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