ABSTRACT

Solar radiation is the energy emitted by the Sun, reaching the Earth in the form of electromagnetic waves. This energy is essential for various fields, including solar energy production, weather forecasting, and environmental studies. Accurately calculating solar radiation is vital for predicting energy availability, understanding climate patterns, and optimizing solar panel systems. In this research, we focus on calculating solar radiation using the Pysolar library in Python, in combination with MetPy, a library for meteorological data analysis.

The **Pysolar** library provides tools for calculating solar position parameters, such as solar zenith and solar elevation, which are crucial for determining solar radiation intensity. By applying Pysolar's algorithms, we can estimate how much solar energy is received at a specific location and time. The solar zenith angle, which is the angle between the Sun's rays and the vertical direction, plays a critical role in calculating the intensity of solar radiation. These calculations depend on factors like the geographic location, time of day, and date of the year.

This project aims to calculate solar radiation in watts per square meter (W/m^2) by determining the solar position and applying solar geometry principles. Solar radiation intensity is influenced by the Earth's tilt, atmospheric conditions, and seasonal changes, which can all be modeled using Pysolar. The study demonstrates how these parameters can be computed for different locations, helping researchers and engineers better predict solar energy availability for various applications, such as solar power generation.

The **MetPy Mondays** series, hosted by Unidata, offers valuable insights into Python-based tools for meteorological and environmental data analysis. In this project, we leverage MetPy to guide the use of Pysolar for solar radiation modeling, making it easier for practitioners to apply these tools in real-world scenarios. Ultimately, this research contributes to the growing field of solar energy by providing a reliable method for calculating solar radiation and enhancing the prediction of solar energy output for renewable energy applications.

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