

Quantitative research depicts clouds and their radiative effects in North China plain

June 1 2022, by Li Yuan



Xianghe observation site. Credit: IAP

Clouds have a significant impact on Earth's energy budget. Cloud cover fluctuations can influence temperature, the water cycle, and incoming solar radiation.

The cloud shortwave radiative effect (CRE) quantifies [radiation](#) changes due to variable cloud cover. At the surface, this variable is closely

related to both macro and micro physical properties of [clouds](#).

To better understand clouds' influence on incoming and outgoing radiation, researchers from Chengdu University of Information Technology, Institute of Atmospheric Physics (IAP) and Nanjing University of Information Science & Technology evaluated CRE alongside cloud type and cloud fraction (CF).

Their findings were published in *Advances in Atmospheric Sciences*.

The researchers studied the one-minute surface irradiance, or the flux or radiant energy per unit area, and cloud data at Xianghe observation station for five years. Xianghe station is an ideal location for radiation measurements, as it is within a frequently heavily polluted region surrounding the North China Plain.

"Our results suggest that the radiative forcing of clouds on irradiance and its components depend on the position of a cloud relative to the sun," said Prof. Xia Xiang'ao from IAP, corresponding author of the study.

The research provides reliable quantification of CF variation and corresponding radiative forcing at Xianghe for the first time. Additionally, results indicate that CF is a dominant factor affecting diffuse irradiance, or radiant energy scattered by the atmosphere.

Overall, this process affects global irradiance, especially under clear sky conditions. "CF affects both direct and diffuse irradiance, resulting in a non-linear relationship between CF and CRE, under sun-obscured conditions, or when clouds are in the sky, but do not block the sun," said Prof. Xia.

More information: Mengqi Liu et al, Data-driven Estimation of Cloud Effects on Surface Irradiance at Xianghe, a Suburban Site on the North

China Plain, *Advances in Atmospheric Sciences* (2022). DOI: [10.1007/s00376-022-1414-x](https://doi.org/10.1007/s00376-022-1414-x)

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