太陽能光電設置對校園微氣候之觀測分析

Observation and analysis of the effect of solar photovoltaic installation on campus microclimate

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摘　要

隨著再生能源政策推動，太陽能光電系統廣泛設置於校園及都會區，但其對當地微氣候之實際影響仍有待釐清。本研究於中央大學及桃園高中等多處場域，佈設地面型移動式監測系統並設置自主開發微型溫溼度感測器與熱顯像儀，透過輻射與氣象觀測，針對不同天氣型態與風場下，分析太陽能板設置對周遭溫度、濕度、輻射場與風場的微氣候變化。此外，結合一維地表過程模式，針對不同土地利用類型與調整參數進行模擬，有助評估未來環境友善型光電案場設置策略。本研究可為都市熱島效應緩解、永續能源規劃及校園微氣候管理提供科學參考。

關鍵字：太陽光電、微氣候、都市熱島

Abstract

With the advancement of renewable energy policies, solar photovoltaic (PV) systems have been widely installed in campuses and urban areas; however, their actual impacts on local microclimates remain to be clarified. In this study, we deployed ground-based mobile monitoring systems, self-developed miniature temperature and humidity sensors, and thermal imagers at multiple sites including National Central University and Taoyuan Senior High School. Through radiative and meteorological observations, we analyzed microclimate changes in temperature, humidity, radiation, and wind fields near PV installations under different weather conditions and wind regimes. In addition, we incorporated one-dimensional land surface process models to simulate various land use types and parameter adjustments, which can help assess environmentally friendly strategies for future PV site deployments. This study provides scientific references for urban heat island mitigation, sustainable energy planning, and campus microclimate management.

Key words : solar photovoltaics, microclimate, urban heat island