

Significant Improvements in Pyranometer Nighttime Offsets Using High-Flow, DC Ventilation

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Accurate solar radiation measurements using pyranometers are required to understand radiative impacts on the earth's energy budget, solar energy production, and to validate radiative transfer models. The accuracy of measured solar radiation depends on multiple conditions, such as instrument specification, measurement setup, and environmental conditions. Some pyranometers are equipped with ventilators which are used to keep the domes clean and dry; however, they affect instrument thermal offset as well. This poster examines different ventilation strategies. For the several commercial single-black-detector pyranometers and with ventilators examined here, high flow rate (50 CFM and higher), 12 VDC fans lower the offsets, lower the scatter, and improve the predictability of the offsets during the night compared to lower flow rate 35 CFM, 120 VAC fans operated in the same ventilator housings. Single-black-detector pyranometer nighttime average thermal offsets have reduced from approximately -7 Wm^{-2} using lower CFM AC fans, to -2 Wm^{-2} using higher CFM DC fans at ARM program SIRS sites.

Black-and-white pyranometers which are mainly used to measure diffuse horizontal irradiance sometimes show improvement with DC fan ventilation, but in some cases the offsets are made slightly worse. Since the offsets for these black-and-white pyranometers are always small, usually no more than 1 Wm^{-2} , whether AC or DC ventilated, changing their ventilation to higher CFM DC fan ventilation is not imperative.

An important outcome of future research should be to clarify under what circumstances nighttime data can be used to predict daytime offsets.

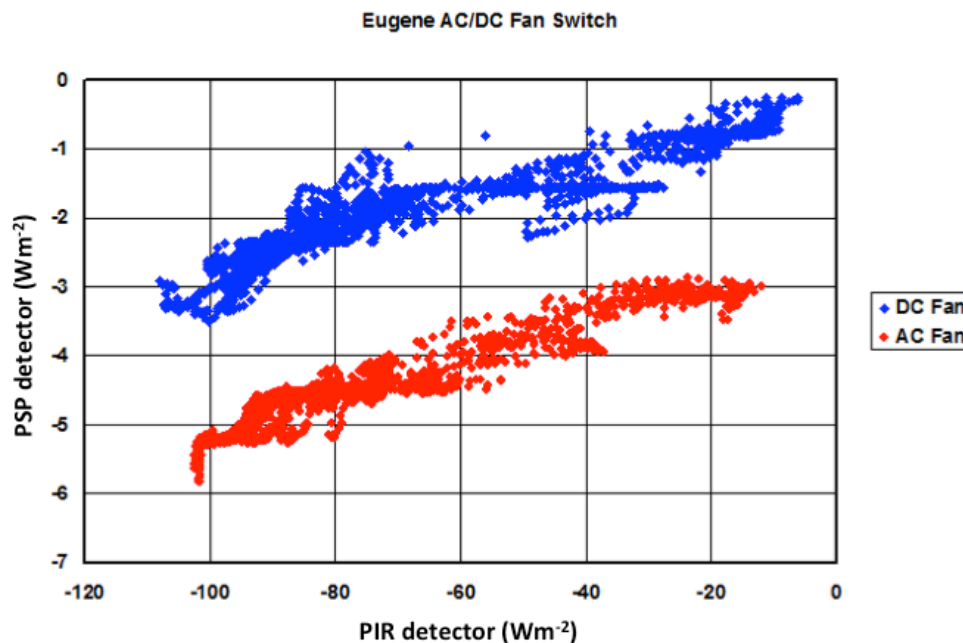


Figure 1. Nighttime thermal offset reduction and improvement is shown for an Eppley Precision Spectral Pyranometer (PSP) operated in a higher flow DC fan ventilator (blue) compared to operation in a lower flow AC fan ventilator (red) during a seven day test period at the University of Oregon.