EMS Annual Meeting Abstracts
Vol. 11, EMS2014-160, 2014
14th EMS / 10th ECAC

Performance Evaluation of Radiation Sensors for the Solar Energy Sector

Laurent Vuilleumier (1), Mathias Hauser (1,2), Christian Félix (1), Dominique Ruffieux (1), and Bertrand Calpini (1)

(1) Federal Office of Meteorology and Climatology, MeteoSwiss, Payerne, Switzerland (laurent.vuilleumier@meteoswiss.ch), (2) Institute for Atmospheric and Climate Science, Swiss Federal Institute of Technology (ETHZ), Zurich, Switzerland

Dedicated meteorological methods are designed for the solar energy sector, including specific measurement techniques. Measuring the overall solar energy flux over a horizontal surface (global horizontal irradiance) is not sufficient for assessing the solar energy input onto collection devices because of their various geometries and orientations. For example, one only needs to know the direct normal irradiance for solar concentrating technologies.

Separately measuring the solar direct and diffuse radiation components is desired for reconstructing the radiance distribution using only limited assumptions. Instruments have been developed that allow inferring the diffuse and direct component of solar radiation separately, and operate in a robust and cost effective way without sun trackers. They can be deployed for continuous field operation with limited maintenance.

Evaluating their performances against reference instruments and understanding their operational uncertainty is necessary when using these to monitor solar energy device yields, nowcast local radiation or when combining such ground data with satellite information. The necessity of such an evaluation was emphasized within COST Action ES1002 WIRE and Task 46 of the International Energy Agency Solar Heating and Cooling Programme. The Payerne Baseline Surface Radiation Network (BSRN) station was proposed as reference site for conducting such an evaluation over a 15 month period (June 2012 – September 2013).

The evaluation compares target instruments to high accuracy radiation sensors (references) from the Payerne BSRN site. The reference instruments are traceable to the World Radiometric Reference. Results concerning the performance of the evaluation will be presented focusing on direct normal irradiance, but results concerning diffuse and global irradiance will also be mentioned.