

EGU21-15391

<https://doi.org/10.5194/egusphere-egu21-15391>

EGU General Assembly 2021

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How to calibrate a solar radiometer

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Solar radiometers are deployed in many locations on the ground and in space. The radiometers in space are measuring the solar energy input into the Earth system per time and unit area, also known as the Total Solar Irradiance (TSI). TSI radiometers are also used to calibrate Earth Observation instruments and to measure the Total Outgoing Radiation (TOR) at the top of the atmosphere, which is a key component in the Earth Radiation Budget (ERB). Ground-based solar radiometers measure the local irradiance levels, which are used for monitoring of atmospheric properties and solar energy applications.

Traceability of the radiation measurements to SI units is crucial in all of these applications. However, calibrating and characterising a solar radiometer is a technically challenging task. Depending on the requirements for a specific application, different calibration concepts can be employed in the calibration and characterization process.

We will present the currently available calibration concepts, their advantages and disadvantages, and put special focus on recent technical developments, such as the cryogenic standard radiometers for solar irradiance on the ground and in space.