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The Value of the Solar Constant – Is a Problem Resolved

The value of the Solar Constant, or more accurately the Total Solar Irradiance (TSI), is a key climate variable. We review the TSI and discuss the current state of the art in TSI metrology. Our new best estimate of 1362.9 +/- 0.9 W/m² at solar minimum is derived from the revised absolute value measured by the DIARAD/SOVIM instrument on the ISS in 2008. Compared to earlier versions of the DIARAD TSI evaluation we apply a new method for the determination of the so-called non-equivalence between electrical and optical power. This new evaluation method was validated during a laboratory measurement campaign at the LASP TRF facility in 2013. During this same campaign we identified an underestimation of the irradiance measured by the LASP TRF cryogenic radiometer, which after elimination of all other possible causes can only be attributed to an underestimation of the amount of scattering and diffraction occurring around the LASP TRF primary aperture. Since the TIM/SORCE space radiometer has a similar geometry and TSI evaluation method as the LASP TRF cryogenic radiometer, this suggests that the TIM/SORCE radiometer measures a too low TSI value.