

Absolute Accuracy of Total Solar Irradiance Measurements in Space

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Abstract. Accurate measurements of total solar irradiance (TSI) from space with electrically calibrated radiometers started on NIMBUS-7 launched in November 1978. Since then a set of TSI measurements is available which covers now more than 25 years. During this period results from at least two independent experiments on different spacecraft are available. Comparing the measurements made by the different radiometers, HF on NIMBUS 7, ACRIM I on SMM, ERBE on ERBS, ACRIM II on UARS, VIRGO on SOHO and ACRIM III on ACRIMSat, the differences in the absolute value decreased from more than $\pm 0.3\%$ to within about $\pm 0.15\%$ in the course of the years indicating an improvement of the scale representation and its transfer to space. This confirmed also the stated uncertainty of the individual radiometers of less than about 0.2%. With the launch of SORCE in 2003 this situation changed drastically as the radiometer TIM showed results which were more than 0.3% lower than those of the other experiments simultaneously in space, although its stated uncertainty is estimated to be of the order of a few 0.01%. This major difference initiated a workshop which was organized by NIST at Gaithersburg in July 2005 to discuss the problem in terms of absolute uncertainty estimates and how this difference could possibly be resolved. This presentation will summarize the outcome of this workshop and report on the conclusions. More specifically, the results of the detailed uncertainty analysis of all current space experiments will be discussed in some detail.