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Providing Consistent (A)ATSR Solar Channel Radiometry for Climate Studies

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Data from the solar reflectance channels of the Along Track Scanning Radiometer (ATSR) series of instruments are being used in applications for monitoring trends in clouds and aerosols. In order to provide quantitative information, the radiometric calibrations of the sensors must be consistent, stable and ideally traced to international standards. This paper describes the methods used to monitor the calibrations of the ATSR instruments to provide consistent Level 1b radiometric data sets.

Comparisons of the in-orbit calibrations are made by reference to data from quasi stable sites such as DOME-C in Antarctica or Saharan Desert sites. Comparisons are performed either by time coincident match-ups of the radiometric data for sensors having similar spectral bands and view/solar geometry and overpass times as for AATSR and MERIS; or via a reference BRDF model derived from averages of measurements over the site from a reference sensor where there is limited or no temporal overlap (e.g. MODIS-Aqua, ATSR-1 and ATSR-2). The results of the intercomparisons provide values of the long term calibration drift and systematic biases between the sensors. Look-up tables based on smoothed averages of the drift measurements are used to provide the corrections to Level 1b data. The uncertainty budgets for the comparisons are provided.

It is also possible to perform comparisons of measurements against high spectral resolution instruments that are co-located on the same platform, i.e. AATSR/SCIA on ENVISAT and ATSR-2/GOME on ERS-2. The comparisons are performed by averaging the spectrometer data to the spectral response of the filter radiometer, and averaging the radiometer data to the spatial resolution of the spectrometer. In this paper, the authors present the results of the inter-comparisons to achieve a consistent calibration for the solar channels of the complete ATSR dataset. An assessment of the uncertainties associated with the techniques will be discussed.

The impacts of the calibration on cloud and aerosol properties derived from AATSR L1 data are assessed. This will show that significant biases are introduced if the instrument calibration biases are not accounted for.