

Use of AMSU/MSU FCDR as an in-orbit reference to monitor ATMS

By Manik Bali, Lawrence E Flynn, Cheng-Zhi Zou and Ralph Ferraro

The Global Space Based Inter-calibration System (GSICS) is a consortium of 15 satellite agencies under the aegis of the World Meteorological Organization. They have come together to collaborate in monitoring their geostationary and polar satellites by comparing these instruments with high quality in-orbit references. GSICS member agencies use IASI-A, AIRS, CrIS (for IR monitoring) and MODIS (for VIS Monitoring) as the on-orbit references to monitor their GEO (SEVIRI, GOES, MTSAT) and LEO (AVHRR) instruments and monitor global means of differences.

However, the GSICS community faces several challenges. The first being that while the inter-comparing global means is able to empirically correct mean biases in the monitored instrument however this assumption is not enough if one were to re-calibrate the monitored instrument in-order to permanently correct any biases. For a re-calibration one needs to know the cause of the biases for which it is important to select a reference instrument with minimal scan angle dependence of measurements, minimal temperature dependence bias and an extremely high stability so that its inter-comparison with monitored instrument is able to reveal these biases in the monitored instrument and give more insights into in-orbit calibration defects.

The second challenge is to identify suitable in-orbit reference for monitoring the Microwave instrument. It is widely recognized that microwave instruments have not demonstrated stability that is comparable to IR instruments so as to directly act as references.

The first goal of this presentation is to present a GSICS reference selection criterion (Weng 2016, Bali 2016) that uses stringent (evaluates scan angle, spectral, temperature time dependent biases) conditions of candidate references to select reference instrument. We apply this on selection of IR and Microwave instruments and show that IASI-A, AIRS and CrIS fulfill our selection criterion. Second goal is to propose the use of Fundamental Climate Data Record (FCDR, Zou 2016) as in-orbit reference for Microwave instruments. We would show that the FCDR fulfills the selection criterion and can act as a robust reference for monitoring the ATMS. We would also suggest a path forward to mitigate the impact of anomalies in reference instrument on inter-comparison results and suggest the use 'reference records' (Flynn and Bali, 2016) instead of using directly L1 radiances.

Reference:

Bali, M.(2016): Comparisons of IASI-A and AATSR measurements of top-of-atmosphere radiance over an extended period. , Atmos. Meas. Tech. Discuss., 8, 9785-9821, doi:10.5194/amtd-8-9785-2015

Bali et al (2016): Selecting a GSICS reference instrument IR, VIS and Microwave: GSICS- Annual Meeting, Tokyo: http://gsicswiki.net/pub/Development/20160229/3e_manik_reference.pptx

Zou C-Z (2013) Atmospheric temperature climate data records from satellite microwave sounders. **Source:** Satellite-based Applications on Climate Change Pages: 107-125 Published: 2013/01/01 DOI: 10.1007/978-94-007-5872-8_8