GSICS Correction for
Inter-Calibration of Meteosat SEVIRI with IASI

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Method

This document summarises the process of applying the GSICS Correction to inter-calibrate the infrared channels of SEVIRI on the Geostationary (GEO) Meteosat Second Generation satellites with the Infrared Atmospheric Sounding Interferometer (IASI) on Low Earth Orbit (LEO) Metop satellites.

The inter-calibration process [EUMETSAT, 2009] is based on the comparison of thousands of observations of the two instruments, collocated in space, time and viewing geometry, taken within 15 days from the observation time. These observations are transformed spatially and spectrally to allow direct comparison by linear regression to estimate the coefficients, a_r and b_r, required to convert GEO radiances, I_{GEO}, to the reference LEO radiances, I_{LEO}:

Equation 1: $I_{GEO} = a_r + b_r I_{LEO}$

This relationship can be inverted to apply the regression coefficients, a_r and b_r, to convert GEO radiances, I_{GEO}, into radiances consistent with the LEO reference instrument, $\hat{I}_{LEO}$,

Equation 2: $\hat{I}_{LEO} = -\frac{a_r}{b_r} + \frac{1}{b_r} I_{GEO}$, together with the estimated uncertainty:

Equation 3: $\sigma^2_{\hat{I}_{LEO}} = \left(\frac{\sigma_{a_r}}{b_r}\right)^2 + \left[(I_{GEO} - a_r)\sigma_{b_r}\right]^2 - 2\frac{(I_{GEO} - a_r)}{b_r}\sigma_{a_r b_r}$,

The regression coefficients, a_r and b_r, and their uncertainties, σ_{a_r}, σ_{b_r} and $\sigma_{a_r b_r}$ are given in the NetCDF files for each available date, *yyyymmdd*, **W_XX-EUMETSAT-Darmstadt,GSICS+CORRECTION+COEFFICIENTS,MET09+SEVIRI+METOPA+IASI_C_EUMG_*yyyymmdd_hhmnss*.nc**, which are downloadable from http://www.eumetsat.int/Home/Main/Access_to_Data/IntercalibrationServices/SP_1222354446018 and http://gsics.eumetsat.int.

Applicability

These inter-calibration results have been derived over the geographical domain of ±35°N/S, ±35°E/W, using only night-time observations. Although strictly only applicable to these conditions, a sensitivity analysis [Hewison and König, 2008] suggest they are generally applicable, although diurnal variation in the bias of the IR3.9 channel is possible.

Typical Results

The mean bias of Meteosat-9 relative to IASI over the period May 2008-May 2009 is calculated for a reference scene radiance and given below, expressed as brightness temperature difference, together with its mean uncertainty, $\sigma_{\hat{I}_{LEO}}$ (also in K):

Channel	IR3.9	IR6.2	IR7.3	IR8.7	IR9.7	IR10.8	IR12.0	IR13.4	
Standard Scene T_b	285	235	255	285	265	285	285	265	K
Mean Bias, SEVIRI-IASI	+0.17	+0.06	+0.12	-0.01	-0.05	+0.06	+0.07	-0.77	K
Uncertainty (1-σ)	0.34	0.05	0.05	0.07	0.03	0.02	0.03	0.04	K

References

EUMETSAT, 2009: Algorithm Theoretical Basis Document for EUMETSAT's Inter-Calibration of SEVIRI-IASI, Ref.: EUM/MET/REP/08/0468.

Hewison, T.J. and M. König, 2008: Inter-Calibration of Meteosat Imagers and IASI, Proceedings of EUMETSAT Satellite Conference, Darmstadt, Germany, September 2008. (Available online).