Correction of the Himawari-8 AHI's Sensitivity Trend

Meteorological Satellite Center
Japan Meteorological Agency

The Japan Meteorological Agency (JMA) updated the Himawari Standard Data (HSD) format on 25 July 2017, which includes the latest calibration coefficients with sensor sensitivity trends taken into account. Fig. 1 shows these trends for the Himawari-8 Advanced Himawari Imager (AHI-8) visible and near-infrared (VNIR) bands (i.e., Bands 1 to 6) as derived from solar diffuser observations. Degradations of approximately 0.5% per year are observed in the trends of Bands 1 to 4.

For evaluation of these trends, the sensor sensitivity correction coefficient D can be defined as

$$D = \frac{\widehat{m_{yyyy}}}{\widehat{m_{2015}}} \quad (1),$$

where $\widehat{m_{yyyy}}$ is the average calibration slope for all detectors of each band as derived from four solar diffuser observations conducted on 7 and 22 May and on 7 and 22 June yyyy, while $\widehat{m_{2015}}$ is the average calibration slope for 2015 as derived in the same way, though Himawari-8 was not yet operational at the time.

Multiplying the slope (no. 8 in the #5 calibration information block for HSD format) and intercept (no. 9 in the #5 calibration information block for HSD format) for 2015 by the sensor sensitivity correction coefficient D gives the corrected slope and intercept. The results are shown in Tables 1 and 2. Fig. 2 also shows the corrected sensor sensitivity trends. The degradations seen in the trends of Bands 1 to 4 in Fig. 1 are appropriately corrected.

JMA will update the latest calibration information derived from solar diffuser observations for VNIR bands at 07:00 UTC on 9 July 2018.
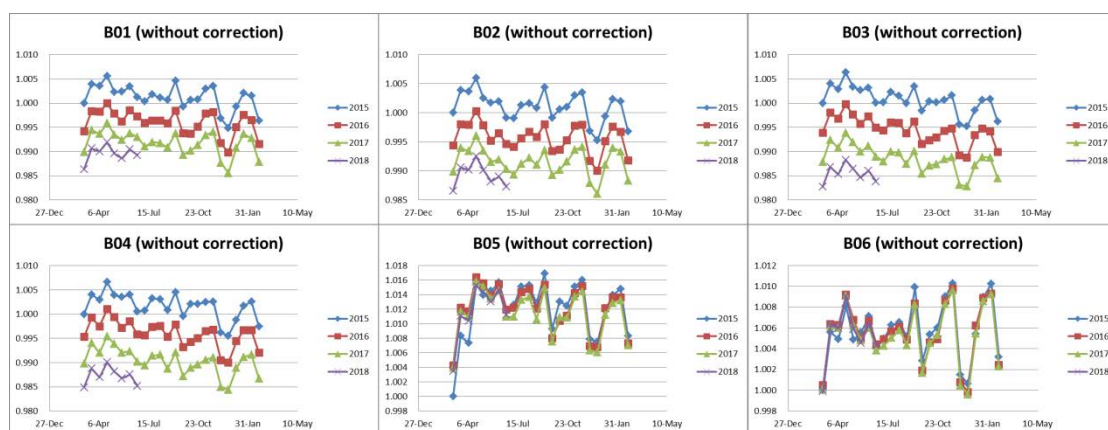

Fig. 1 Himawari-8 sensor sensitivity trends. Time-series representations of sensor sensitivity (inverse of calibration slope) as derived from AHI-8 solar diffuser observations. Values are averaged over the detectors and normalized with the first observation made on 7 March 2015. The range of the x axis is from 7 March to 22 February.
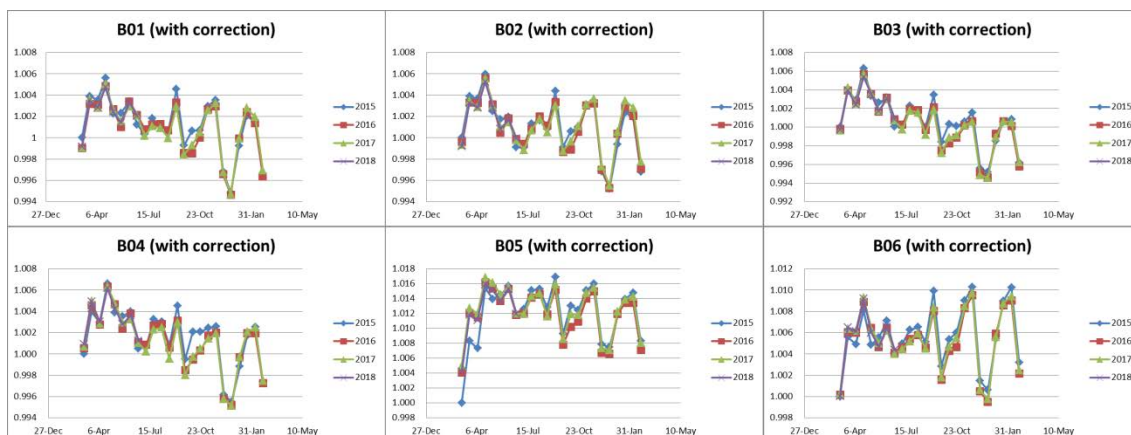
Fig. 2 Himawari-8 corrected sensor sensitivity trends. As per Fig. 1 but with correction of sensor sensitivity trends

Table 1 Slope of digital count – radiance conversion equation (Himawari-8). The latest data will be included in no. 12 of visible, near-infrared bands (Bands 1 – 6) in the #5 calibration information block for HSD format.

Band/Year	2015	2016	2017	2018
B01	0.37735835	0.37920237	0.38083577	0.38225655
B02	0.35410388	0.35598556	0.35748863	0.35863737
B03	0.30549747	0.30731905	0.30913652	0.31078894
B04	0.18197547	0.18294331	0.18397175	0.18494062
B05	0.04537718	0.04536906	0.04542336	0.04540857
B06	0.01406841	0.01406430	0.01407068	0.01407028

Table 2 Intercept of digital count – radiance conversion equation (Himawari-8). The latest data will be included in no. 13 of visible, near-infrared bands (Bands 1 – 6) in the #5 calibration information block for HSD format.

Band/Year	2015	2016	2017	2018
B01	-7.54716706	-7.58404731	-7.61671534	-7.64513097
B02	-7.08207765	-7.11971124	-7.14977261	-7.17274746
B03	-6.10994941	-6.14638096	-6.18273038	-6.21577883
B04	-3.63950941	-3.65886614	-3.67943502	-3.69881245
B05	-0.90754353	-0.90738115	-0.90846722	-0.90817149
B06	-0.28136824	-0.28128597	-0.28141362	-0.28140566

Documentation Change Record

Issue/revision	Date	Description
1	3 July 2017	Original edition
2	9 July 2018	Updated Fig. 1, Fig. 2, Table 1 and Table 2 to include analysis results from July 2017 to June 2018.