

Update of Calibration Information Used to Correct Himawari-8 AHI Sensitivity Trend

Meteorological Satellite Center
Japan Meteorological Agency

Overview of the update

The Japan Meteorological Agency (JMA) plans to update the calibration information used to correct the Himawari-8 sensor sensitivity trend at 07:00 UTC on 11 July 2022.

The corrected calibration parameters are included in the calibration information block in Himawari Standard Data (HSD). These are described as Nos. 12 and 13 in the #5 calibration information block for the visible and near-infrared bands (Bands 1 – 6) in HSD format¹. The values of the parameters are shown in Tables 1 and 2.

Trend of the sensor sensitivity

JMA revised the 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

$$D = \frac{\widehat{m}_{yyyy}}{\widehat{m}_{2015}}$$

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.

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.

¹https://www.data.jma.go.jp/mscweb/en/himawari89/space_segment/hsd_sample/HS_D_users_guide_en_v13.pdf

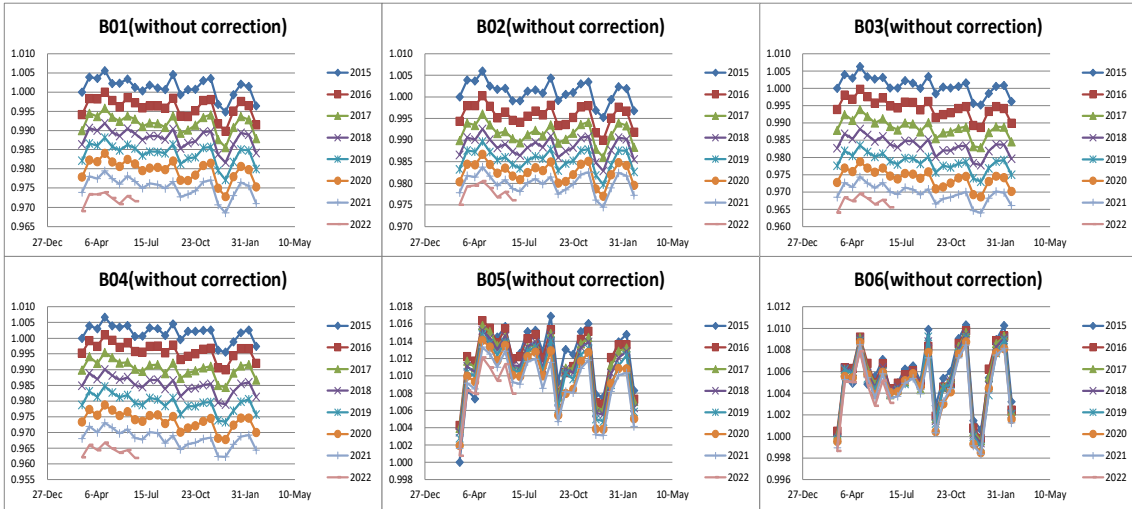


Fig. 1 Himawari-8 sensor sensitivity trends. Time-series representations of sensor sensitivity (inverse of calibration slope) as derived from AHI-8 solar diffuser observations. Values are averaged over the detectors and normalized with the first observation made on 7 March 2015. The start date and end date of the time-series from 7 March to 22 February.

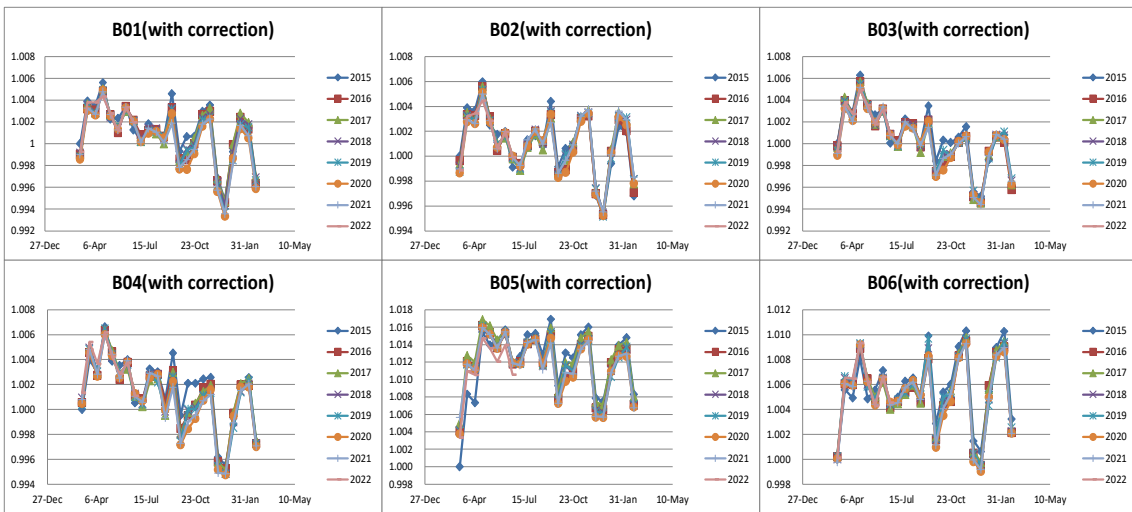


Fig. 2 Himawari-8 corrected sensor sensitivity trends. As per Fig. 1 but with correction of sensor sensitivity trends

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.

Year/Band	B01	B02	B03	B04	B05	B06
2015	0.37735835	0.35410388	0.30549747	0.18197547	0.04537718	0.01406841
2016	0.37920237	0.35598556	0.30731905	0.18294331	0.04536906	0.01406430
2017	0.38083577	0.35748863	0.30913652	0.18397175	0.04542336	0.01407068
2018	0.38225655	0.35863737	0.31078894	0.18494062	0.04540857	0.01407028
2019	0.38375996	0.35968951	0.31231127	0.18600134	0.04543758	0.01407496
2020	0.38533030	0.36070604	0.31370569	0.18705152	0.04545934	0.01407567
2021	0.38709430	0.36174703	0.31515006	0.18813809	0.04549396	0.01407989
2022	0.38913846	0.36275466	0.31665435	0.18939636	0.04556052	0.01408869

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.

Year/Band	B01	B02	B03	B04	B05	B06
2015	-7.54716706	-7.08207765	-6.10994941	-3.63950941	-0.90754353	-0.28136824
2016	-7.58404731	-7.11971124	-6.14638096	-3.65886614	-0.90738115	-0.28128597
2017	-7.61671534	-7.14977261	-6.18273038	-3.67943502	-0.90846722	-0.28141362
2018	-7.64513097	-7.17274746	-6.21577883	-3.69881245	-0.90817149	-0.28140566
2019	-7.67519925	-7.19379019	-6.24622538	-3.72002677	-0.90875151	-0.28149914
2020	-7.70660594	-7.21412089	-6.27411371	-3.74103040	-0.90918678	-0.28151331
2021	-7.74188599	-7.23494068	-6.30300124	-3.76276186	-0.90987927	-0.28159788
2022	-7.78276913	-7.25509324	-6.33308705	-3.78792720	-0.91121036	-0.28177376

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.
3	3 July 2019	Updated Fig. 1, Fig. 2, Table 1 and Table 2 to include analysis results from July 2018 to June 2019.
4	6 July 2020	Updated Fig. 1, Fig. 2, Table 1 and Table 2 to include analysis results from July 2019 to June 2020.
5	5 July 2021	Updated Fig. 1, Fig. 2, Table 1 and Table 2 to include analysis results from July 2020 to June 2021.
6	4 July 2022	Updated Fig. 1, Fig. 2, Table 1 and Table 2 to include analysis results from July 2021 to June 2022.