

31 January 2018
Meteorological Satellite Center
Japan Meteorological Agency

Himawari-8 Maintenance

Maintenance of the Himawari-8 satellite is scheduled to take place over a two-day period from 02:30 UTC on 13 February to 07:20 UTC on 14 February 2018. All products during this time will be created using data from the operational Himawari-9 satellite.

This maintenance is for the Advanced Himawari Imager (AHI) on Himawari-8, and will encompass the following:

- 1) Scanner calibration
- 2) Special observation with switching of AHI detectors
- 3) Update of best detector select (BDS) map

For information on Himawari-9 product performance see JMA (2017), which reports on validation results from a period of Himawari-9 in-orbit testing (IOT).

1) Scanner calibration

The Himawari-8/AHI (AHI-8) has two scan mirrors (Fig. 1). One rotates on the X axis and the other on the Z axis to scan the earth's surface. The mirrors are commanded using the angle of the X/Z axis to fix the line of sight. There are differences between the commanded and actual mirror angles, and these discrepancies gradually increase with operation. This could in turn cause image navigation and registration (INR) errors.

Annual scanner calibration is recommended to reduce these differences and maintain INR performance.

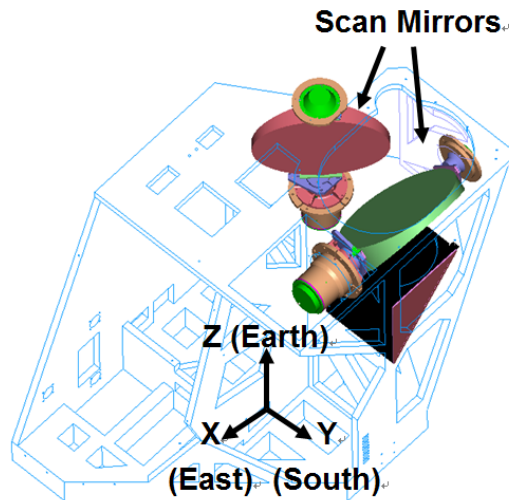


Fig. 1. NS and EW scan drive assemblies of the Advanced Himawari Imager (Griffith 2015)

2) Special observation with switching of AHI detectors

AHI-8 has several redundant detector columns for each band (three for Bands 1 to 3 and six for the other bands), and the best detector in each row is selected. The layout of selected detectors (known as the best detector select (BDS) map) can be expressed as shown in Fig. 2 (right).

The performance of all detectors was evaluated during IOT in December 2014 and the best detectors were chosen, but the performance of several detectors has changed over the past three years. To evaluate the latest characteristics (e.g., signal-to-noise ratios) of all detectors, special observation will be performed with switching of redundant detector columns.

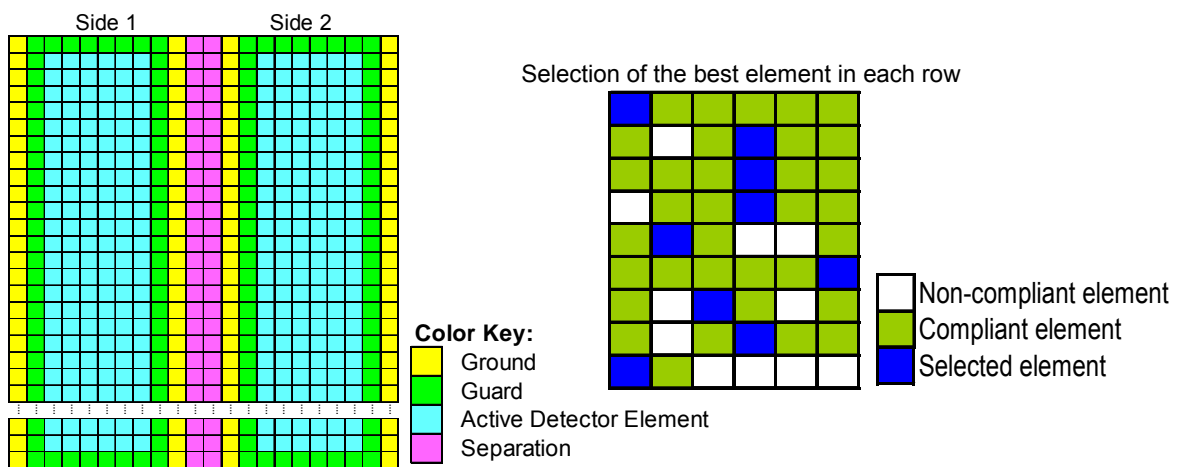


Fig. 2. Left: Layout of detectors for one of Bands 4 to 16
 Right: A BDS map for one of Bands 4 to 16 (Griffith 2015)

3) BDS map update

As described in Section 2, the characteristics of several AHI-8 detectors have become unstable in orbit, resulting in stripe noise in the E-W direction on Himawari-8 imagery.

Fig. 3 shows two examples of such noise. (a) and (b) show an infrared differential image and a Band8 image, respectively, with very clear stripe noise in the E-W direction. This can degrade the quality of geophysical products (e.g., the number of valid grid-point data) and affect the qualitative use of satellite imagery (e.g., for volcanic ash monitoring).

To eliminate this noise, the use of around 15 unstable detectors in infrared bands will be switched to redundant detectors. Table 1 shows the number of detectors to be changed for each band.

Fig. 4 shows the impacts of the BDS map update on Himawari-9 imagery. The clear black and grey stripe noise in the E-W direction in (a) is effectively removed in (b). The map update is expected to eliminate such striping (including that shown in Fig. 3).

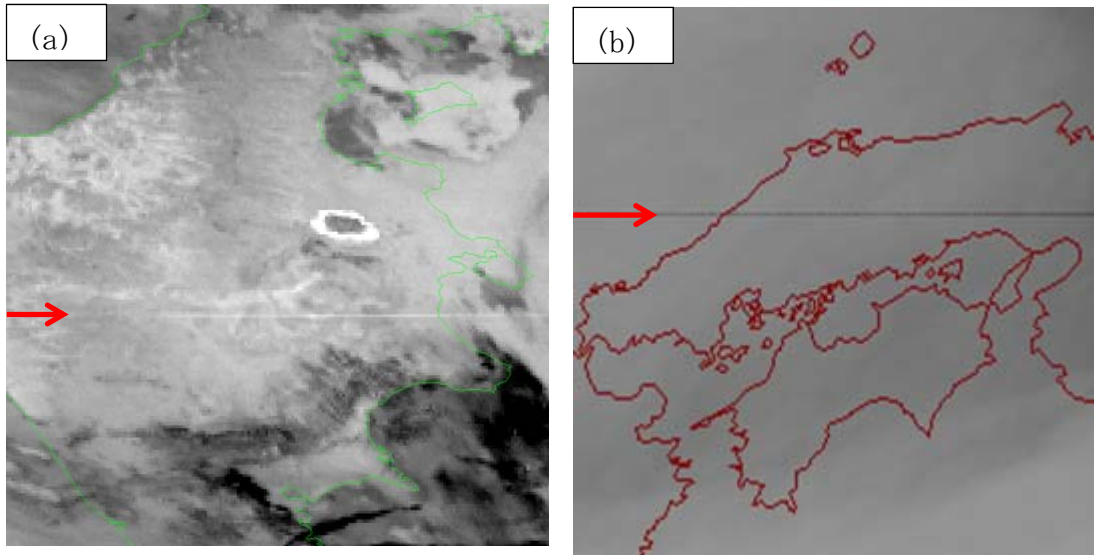


Fig. 3. Stripe noise in Himawari-8 imagery

- (a) Infrared differential image (Band13 – Band15), 17:10 UTC, 14 June 2017.
- (b) Band8 image, 19:00 UTC, 6 January 2017.

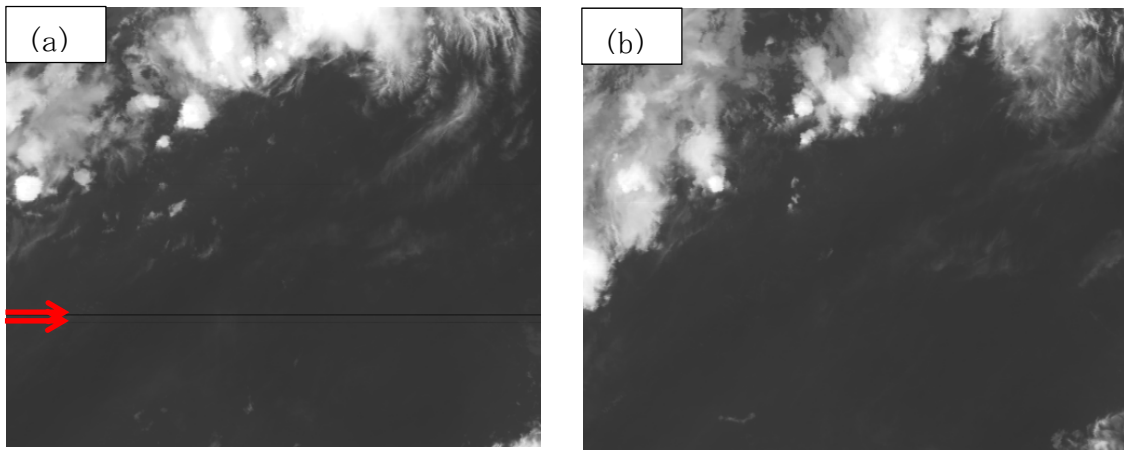


Fig. 4. Band15 imagery from Himawari-9, 8 September, 2017

(a) Before BDS map update, 00:50 UTC. (b) After BDS map update, 02:50 UTC.

Table 1. Number of detectors to be changed for each band

Band	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Number	0	0	0	0	0	0	0	2	0	7	0	0	3	0	2	2

References

- JMA, 2017: Validation of Himawari-9/AHI Level-1 and -2 data during In-orbit Test. Working Paper of the 45th Meeting of the Coordination Group for Meteorological Satellites, Jeju, Republic of Korea, 11-16 June, 2017. [Available at <https://www.cgms-info.org/Agendas/WP/CGMS-45-JMA-WP-04> (last access on 10 January 2018)]
- Griffith, P. C., 2015: Advanced Himawari Imager (AHI) Design and Operational Flexibility. Sixth Asia/Oceania Meteorological Satellite User's Conference, Tokyo, Japan, November 9-13, 2015. [Available at http://www.data.jma.go.jp/mscweb/en/aomsuc6_data/oral/s02-01.pdf (last access on 10 January 2018)]