

HimawariCast Newsletter

No. 16, 30 January 2024



Japan Meteorological Agency

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Himawari-10 – a Follow-on Satellite to Himawari-9

The Japan Meteorological Agency (JMA) plans the seamless introduction of a new geostationary earth-orbit satellite system in consideration of the CGMS baseline and the Vision for WIGOS in 2040. In FY 2018, JMA began consideration of the Himawari-8/9 follow-on program and contracted manufacturing of Himawari-10 in March 2023, with initial operation scheduled for FY 2029 (Figure 1).

Himawari-10 will carry the visible/infrared imager (Geostationary Himawari Imager: GHMI), infrared sounder (Geostationary Himawari

Sounder: GHMS). The GHMS is intended to improve JMA’s services in extreme weather monitoring, nowcasting and numerical weather prediction. JMA will also fly the space environmental suite developed by the Ministry of Internal Affairs and Communications (MIC) and the National Institute of Information and Communications Technology (NICT) on Himawari-10 as a hosted payload (Figure 2).

Ongoing evolution is planned for the Himawari satellite series to address universal concerns around climate-related issues such as heavy rain, droughts and floods across East Asia and the Western Pacific.

(SUMIDA Yasuhiko)

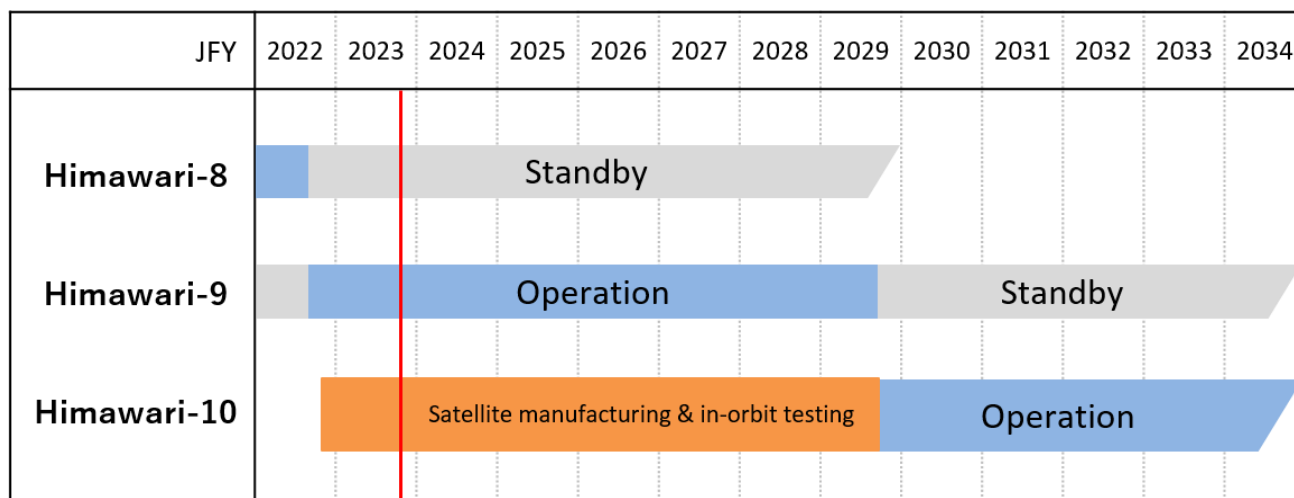


Figure 1. Himawari-8/9 and Himawari-10 timeline

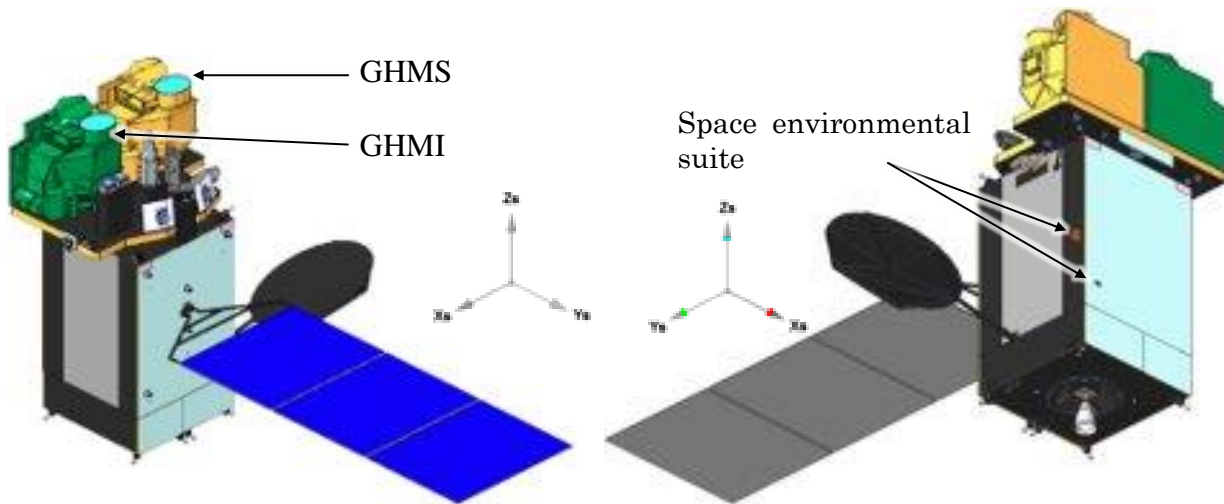


Figure 2. Himawari-10 Outline

Validation of AHI on Himawari-9 in Level 1 products

Introduction

On 13 December 2022, JMA switched over operation from the Himawari-8 geostationary satellite to its Himawari-9 successor after a period of data quality monitoring for AHI data from the latter (starting on 27 September 2022) based on parallel observation. Himawari-9 data validation for Level 1 and Level 2 products is described in the working paper CGMS-51 Working Group [1]. This article outlines validation for Level 1 products in image navigation and radiometric calibration.

Image navigation and registration

JMA/Meteorological Satellite Center (MSC) provides the information on Himawari-9 image navigation performance at the following webpage:

Himawari Navigation Monitoring:
<https://www.data.jma.go.jp/mscweb/data/monitoring/navigation.html>

Figure 3 shows the results of landmark analysis for Himawari-8/9. Outcomes based on B13 (10.4 μm) data indicate one-month averaged landmark errors of 0.26 and 0.27 km in November 2022 for Himawari-8/9 data, respectively, demonstrating similar navigation accuracy. Inter-band co-registration performance was also evaluated with reference to B13 (10.4 μm). Although performance varies by band, verification for both satellites showed values of less than 60 m, which corresponds to 0.03 pixels for all bands at the sub-satellite point. Himawari-8/9 exhibit comparable performance.

Radiometric calibration

Himawari-9 radiometric calibration performance information is also available at:

Himawari Calibration Portal:
https://www.data.jma.go.jp/mscweb/en/oper/calibration/calibration_portal.html

Figure 4 summarizes calibration performance as evaluated using radiative transfer calculation with reference to MODIS based on direct comparison (ray matching) with observation by VIIRS for Himawari-8/9 VNIR bands in September 2022. Himawari-8/9 AHIs data are consistent with references up to around 5%, although differences from references and validation methods are seen. The sensitivity of Himawari-9 AHI VNIR bands is stable in the months after parallel observation commencement. Monitoring will be continued.

Figure 5 shows infrared-band brightness temperature bias with hyper spectral sounders used for references. The observed brightness temperatures of Himawari-8/9 are within 0.3 K of the references, and the difference between the two satellites is also within 0.3 K.

References

[1] CGMS-51 WG-II JMA-WP-03,
<https://www.cgms-info.org/Agendas/GetWp-File.ashx?wid=830e8596-04aa-4b9b-9ccc-560536350cb7&aid=bf6ed9e-122d-42d8-9cd9-d92320ce2103>

(YAMADA Kazutaka)

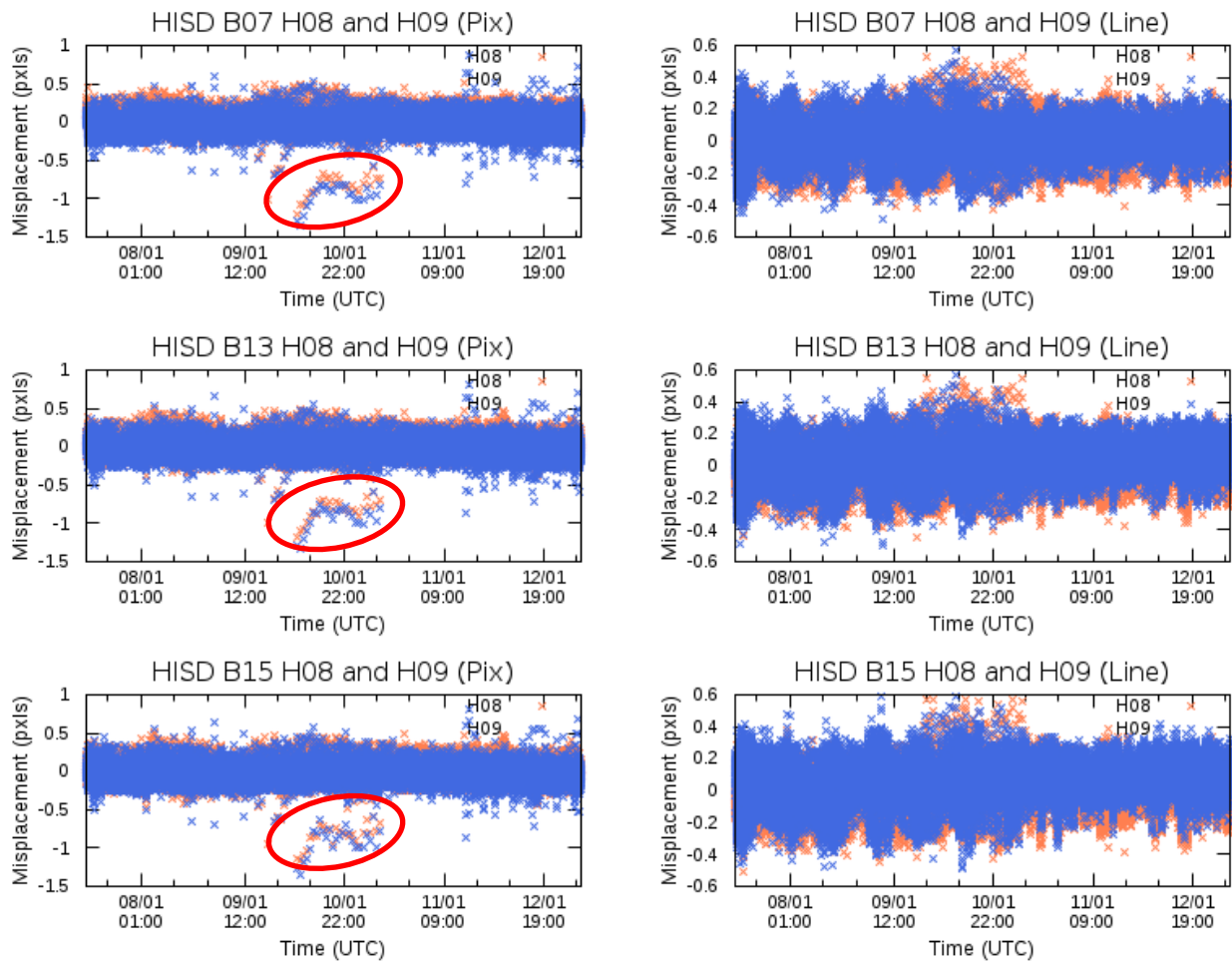


Figure 3. Navigation performance based on landmark analysis of B07 (3.9 μm), B13 (10.4 μm) and B15 (12.4 μm) of Himawari-8/9. Landmark errors from 7 July to 13 December 2022 for the Himawari-8 (orange crosses) and -9 AHIs (blue crosses) are shown. The red circles show midnight data point in the eclipse period. It is considered that relatively large deviation occurs at the time of updating for ground system orbit information.

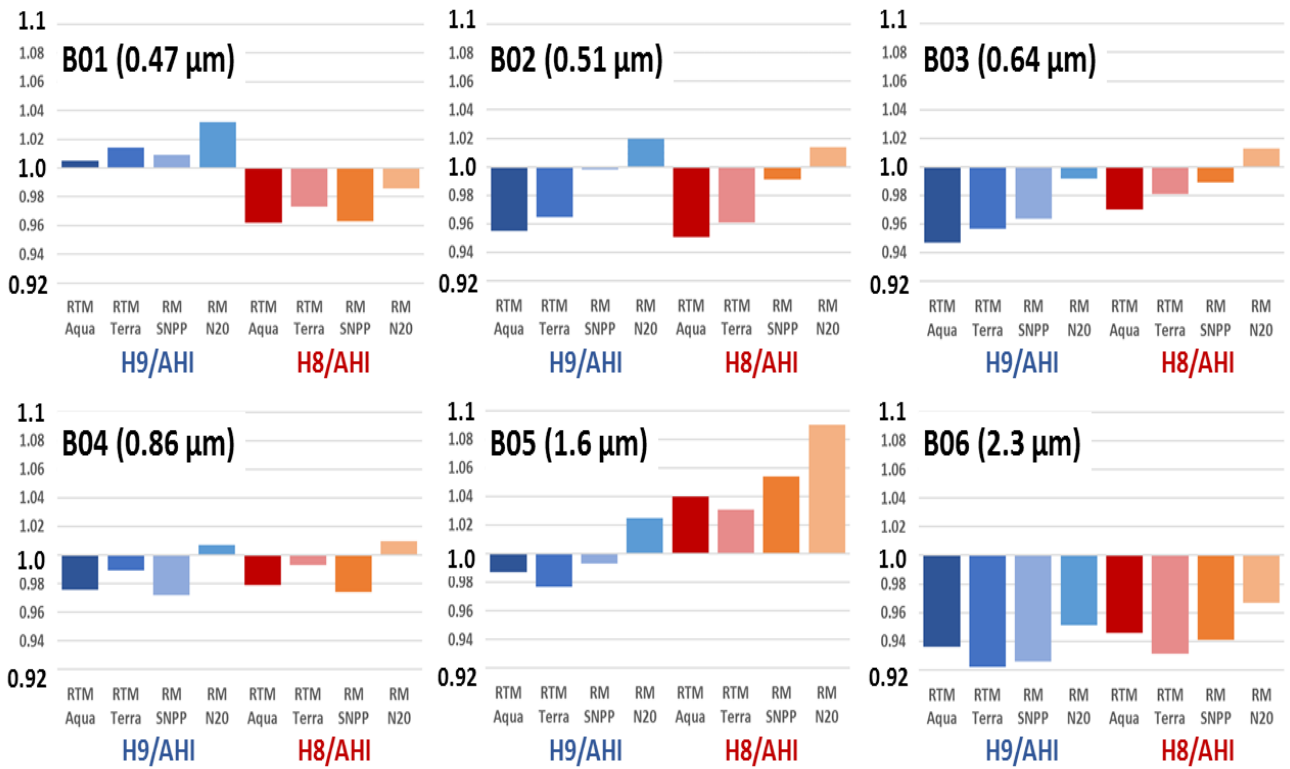


Figure 4. AHI/reference ratios based on regression of AHI observation and references. RTM represents the radiative transfer model-based approach. The data periods are from 1 to 30 September 2022 for the RTM-based approach and from 2 to 30 September 2022 for the ray-matching approach.

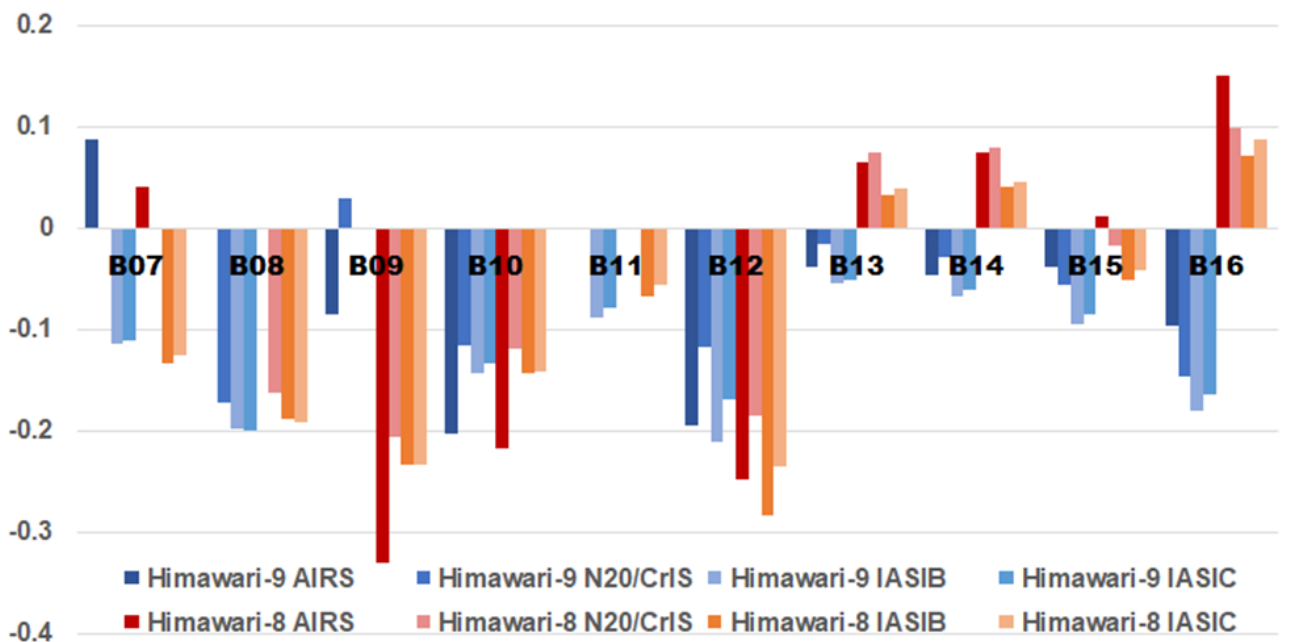


Figure 5. Brightness temperature bias of Himawari-8/9 IR bands with reference to observation from hyper-spectral sounders such as Aqua/AIRS, NOAA-20/CrIS, Metop-B/IASI and Metop-C/IASI, showing values in brightness temperature equivalent to a clear-sky sea surface. The data period is from 2 to 30 September 2022. Bias wrt. CrIS at B07, bias wrt. AIRS at B08 and bias wrt. AIRS and CrIS at B11 are omitted due to large uncertainty.

The 51st Coordination Group for Meteorological Satellites Plenary Session

The 51st Coordination Group for Meteorological Satellites (CGMS-51) Plenary Session was held in a hybrid face-to-face and online format at JMA headquarters from 26 to 28 June 2023. The CGMS is composed of representatives from meteorological satellite operators, space agencies and international organizations such as the World Meteorological Organization (WMO). Hosting of the plenary session, held annually since 1972, rotates among the member organizations, with the duty this year falling jointly to JMA and the Japan Aerospace Exploration Agency (JAXA). The session had 131 participants (95 in person) from 22 organizations in 12 countries. Representatives from the participating organizations presented on the status of their satellite observations and future plans. Fruitful discussions were also held on coordination of observation functions/products and collaboration among satellite operators.

JMA gave two oral presentations and announced its commencement on the production of Himawari-10 featuring infrared sounder equipment capable of 3-D atmospheric water vapor monitoring.

Programs and presentation materials can be accessed at:

<https://www.cgms-info.org/agendas/agendas/CGMS-51-Plenary>



Figure 6. CGMS-51 Plenary Session participants

The 23rd Session of the Global Space-based Inter-Calibration System Executive Panel

The 23rd Session of the Global Space-based Inter-Calibration System (GSICS) Executive Panel (GSICS-EP-23) was held in a hybrid in-person and

online format at JMA headquarters from 29 to 30 June 2023 following the CGMS-51 Plenary. GSICS is an international collaborative effort initiated in 2005 by the World Meteorological Organization (WMO) and the Coordination Group for Meteorological Satellites (CGMS). It is intended to support consistent accuracy among space-based observations worldwide for weather forecasting, climate monitoring and environmental applications. The Executive Panel (EP), which consists of representatives from the participating agencies, sets strategic priorities and monitors/evaluates GSICS evolution and operations.

The activities of GSICS working groups were reviewed and discussed at the meeting, and reports on GSICS-related activities were given by JMA, JAXA, NICT and other participating agencies.

Main points to note from the meeting:

- Mitch Goldberg, who has led GSICS activities since its establishment, stepped down as the GSICS-EP chair, and Bojan Bojkov of EUMETSAT was appointed as the new chair.
- The Space Weather Sub-Group was endorsed and accepted as a new subgroup of the GSICS Research Working Group (GRWG) with Tsutomu Nagatsuma of NICT as subgroup chair.
- Collaboration with the International Satellite Cloud Climatology Project (ISCCP) was reported, and this activity will continue as part of GSICS user feedback.

Meeting programs, presentation materials and the final report can be accessed at:

<https://community.wmo.int/en/meetings/gsics-ep-23>



Figure 7. GSICS-EP-23 participants

The 13th Asia-Oceania Meteorological Satellite User's Conference

The 13th Asia-Oceania Meteorological Satellite Users' Conference (AOMSUC-13), hosted by the Korea Meteorological Administration (KMA), was held in person from 3 to 10 November 2023 in

Jincheon and Busan in the Republic of Korea. This annual event serves the meteorological and broad-earth science community in Asia-Oceania, with satellite operators, users, scientists, and students from around the world sharing findings and plans relating to the use of meteorological satellite data.

The event consisted of:

- (1) 3 – 5 November
Comprehensive training on satellite data and product utilization in Jincheon
- (2) 6 – 9 November
Plenary and scientific sessions in Busan
- (3) 10 November
Joint RA-II and RA-V coordination meeting (by invitation) in Busan

At the comprehensive training, JMA gave a presentation and provided hands-on experience with the use of Satellite Animation and Interactive Diagnosis (SATAID).

The plenary and scientific sessions incorporated oral presentations category on:

- (1) The Space Program and Data Access Up-dates
- (2) Satellite Activities and Data Exchange
- (3) Application for Weather Analysis and Nowcasting
- (4) Application for Numerical Weather Prediction
- (5) AI/ML in Satellite Data Processing
- (6) Application for Land Surface and Sea Surface Derived from Satellite Observations
- (7) Space Weather
- (8) Performance and Calibration of Satellite Instruments

JMA also gave presentations on Himawari-8/9 data distribution and dissemination, the status of the follow-on Himawari-10 satellite, and other matters. The Joint RA-II and RA-V coordination meeting at the event involved individual regions and the WMO-CGMS Virtual Laboratory (VLab) reporting on the status of activities and future plans.

Programs and presentation materials can be found on the website below:

https://nmsc.kma.go.kr/enhome/html/conference/AOMSUC_2023.do



Figure 8. AOMSUC-13 conference session participants



Figure 9. AOMSUC-13 Training Event participants

(WATANABE Ibuki)

Feedback

JMA welcomes feedback from users on HimawariCast data usage, and particularly invites articles to be posted in this newsletter. Such input will help other users consider new ideas for their services.

The Agency also invites questions on HimawariCast services. These may relate to the functions of the SATAID program, interpretation/analysis of multi-band imagery or other areas of interest. Feel free to send queries to be answered in this newsletter.

All articles and questions are welcomed. Your contributions are greatly appreciated.

Comments and Inquiries

Comments and inquiries on this newsletter and/or the HimawariCast Web Page are welcomed.

Back numbers of HimawariCast Newsletters:

https://www.data.jma.go.jp/mscweb/en/himawari89/himawari_cast/himawari_cast.php

Mr. SAKASHITA Takuya

Senior Scientific Officer, Satellite Program Division, Information Infrastructure Department

Japan Meteorological Agency

3-6-9 Toranomom, Minato-ku, Tokyo, 105-8431, Japan

Email: metsat@met.kishou.go.jp