Himawari-8: Experiences and Lessons Learned

(Submitted by JMA)

Summary and Purpose of Document

This document reports on the latest information about Himawari-8.

ACTION PROPOSED

The second session is invited to:

(a) Take note of the current status of Himawari-8;

(b) Provide comments and suggestions.
DISCUSSION

1. Introduction

The Himawari-8 geostationary meteorological satellite managed by the Japan Meteorological Agency (JMA) began operation at 02 UTC on 7 July 2015, replacing the previous MTSAT-2 operational satellite.

Himawari-8 was launched using H-IIA Launch Vehicle No. 25 on 7 October 2014 from the Tanegashima Space Center, and JMA subsequently conducted testing and checking of the satellite and related systems. During the commissioning phase, Himawari-8's capacity for superior earth monitoring with multi-band, high-resolution and high-frequency observation was verified.

2. Status of Himawari-8

Major Events

7 October 2014 Himawari-8 launched
18 December 2014 First images released
7 July 2015 Himawari-8 operation initiated
4 December 2015 Termination of direct dissemination of MTSAT-2 imagery via MTSAT-1R

Upcoming Events

24 March 2016 MTSAT-2 observation parallel to Himawari-8, to be stopped
TBD 2016 Himawari-9 to be launched

Data distribution

JMA provides two types of method to distribute the multi-band, high-frequency and high-resolution data of Himawari-8. One is the HimawariCast service, which disseminates a primary set of imagery for operational meteorological services via a communication satellite. The other is the HimawariCloud service, which delivers a full set of imagery to the National Meteorological and Hydrological Services (NMHSs) via an Internet cloud service.

Himawari-8 imagery has been disseminated via the HimawariCast since 02 UTC 3 July 2015. The JCSAT-2A communication satellite located at 154 degrees east is used to broadcast data for the HimawariCast service. The JCSAT-2B unit will then take over from JCSAT-2A as the communication satellite at the same location. HimawariCast users will need to prepare for the transition from JCSAT-2A to JCSAT-2B during a dual operation period (approximately one week) of JCSAT-2A and JCSAT-2B. The up-to-date information can be seen on the following website.

JMA started operation of the HimawariCloud service with distribution of Himawari-8 imagery at 00 UTC on 8 April 2015, 3 months before the satellite became operational. Since then, the service has been distributing Himawari-8 imagery to registered users stably. The following website provides the latest information about the HimawariCloud service.

Cal/Nav

Okuyama et al. (2015) reported the current status of Himawari-8 AHI (Advanced Himawari Imager) navigation and calibration. Validation results showed a navigation error of less than one pixel. Co-registration errors represent small biases of less than around 0.2 pixels for infrared bands with further smaller diurnal variation. In regard to infrared-band calibration, the estimated brightness temperature bias is less than 0.2 K at the standard radiance, and there is no significant diurnal variation. Visible and near-infrared band calibration was validated using ray-matching with reference to S-NPP/VIIRS and comparison with simulated radiance based on a radiative transfer model. There is no significant bias for bands 1 to 4, while a potential gap of around 5% is seen for bands 5 and 6 in results obtained with the two approaches.
Results of monitoring of AHI navigation and calibration are provided at the following websites.
http://www.data.jma.go.jp/mscweb/data/monitoring/navigation.html
http://www.data.jma.go.jp/mscweb/data/monitoring/calibration.html

Product

- **RGB composite images** from Himawari-8 are provided from the website of the Meteorological Satellite Center (MSC) of JMA since Himawari-8 became operational. The RGB products are based on WMO standard recipe.
- **Atmospheric Motion Vector (AMV) and Clear Sky Radiance (CSR)** are highly important products for use in Numerical Weather Prediction (NWP). Himawari-8 AMV and CSR have been distributed via GTS since 02 UTC 3 July 2015. JMA provided AMV and CSR from Himawari-8 in-orbit-test image data via JDDS (JMA Data Dissemination System) before Himawari-8 became operational so that NWP users could start evaluation of Himawari-8 AMV and CSR as soon as possible. MTSAT-2 AMV and CSR will be provided via JDDS and GTS until 24 March 2016 in order to help NWP users’ smooth transition from MTSAT-2 to Himawari-8.
- High-resolution Cloud Analysis Information product (HCAI) from Himawari-8 provides cloud mask, type and top height as 0.02-degree latitude/longitude grid data, which is almost the same as full resolution of Himawari-8 infrared bands. HCAI is provided to NMHSs of Indonesia, Malaysia, Myanmar and Vietnam (in progress) in response to their inquiries.
- For Himawari-8 volcanic ash product, JMA/MSC introduced VOLCAT software developed by Mike Pavoloni (NOAA/NESDIS). Himawari-8 volcanic ash product of MSC will be provided to JMA’s Tokyo Volcanic Ash Advisory Center (VAAC) for evaluation. Himawari-8 aerosol optical depth (AOD) product is for internal use in JMA for monitoring Asian dust.

3. Preparing and Supporting Users for Himawari-8

AOMSUC-6

The sixth Asia/Oceania Meteorological Satellite Users’ Conference (AOMSUC-6) was held in Tokyo, Japan from 10 - 12 November 2015. The conference was hosted and sponsored by JMA, and was co-sponsored by the China Meteorological Administration (CMA), the Korea Meteorological Administration (KMA), the Australian Bureau of Meteorology (AuBOM), the Roshydromet of the Russian Federation, the World Meteorological Organization (WMO), and the Group on Earth Observations (GEO). Over 170 scientists, users, and satellite operators representing 37 countries participated in the AOMSUC-6.

In conjunction with AOMSUC-6, a training workshop was hosted by JMA on 9 and 13 November 2015. The objectives of the workshop were a) to provide details on the next generation of satellites to assist with user preparedness, b) to give users an appreciation of the various applications of meteorological satellite data and products, and c) to provide participants with the skills to apply meteorological satellite observations to weather analysis, climate monitoring, and environment and disaster management.

The meeting summary and all presentation materials are provided at JMA/MSC website.

Training course for NMHSs with HimawariCast receiving system

WMO in cooperation with JMA has conducted a HimawariCast project, which is deploying HimawariCast receiving system in nine countries in RA II and V (Bangladesh, Cambodia, Micronesia, Myanmar, Palau, Papua New Guinea, Thailand, Tuvalu and Viet Nam). The project has achieved successful transition from MTSAT-2 to Himawari-8. JMA is offering a technical training course for Himawari-8 satellite imagery utilization to NMHSs with HimawariCast receiving system, including these nine countries.

Publication

4. Lessons Learned

**High data volume**
The multi-band, high-frequency and high-resolution observations of Himawari-8 results a dramatic increase in data volume compared to previous meteorological satellites. Some NMHSs have difficulties to obtain Himawari-8 full-spec data in real time with satisfactory speed through HimawariCloud, which requires high speed Internet. Therefore, JMA is providing alternative data distribution/dissemination services such as HimawariCast via a communication satellite. This implies that ensuring an environment for data distribution, processing and storage is critically important for data provider and users of new generation meteorological satellites.

**Parallel operation**
MTSAT-2 has been a backup satellite since Himawari-8 became operational on 7 July 2015. JMA will maintain MTSAT-2 observation and its data/product distribution parallel to Himawari-8 until 24 March 2016. The 9-month parallel distribution has been helpful to users in the transition from MTSAT-2 to Himawari-8. A long time parallel distribution would be crucial because some users may take times to start to use data from new generation meteorological satellites.

**Collaboration on product development**
It is recognized from AOMSUC-6 that some NMHSs in RA II and RA V have already used satellite data extensively and others show willingness to develop products from Himawari-8 data by themselves. It would become more important to create a scheme for encouraging cooperation on product development between satellite operators and users.

5. References
