CGMS

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PLANS FOR FOLLOW-ON SATELLITES TO MTSAT-2

In response to CGMS Permanent Action 1 and Recommendations 36.01 and 36.04

This paper reports on plans for Himawari-8 and Himawari-9, the follow-on satellites to MTSAT-2.

JMA plans to launch Himawari-8 in summer 2014 and commence its operation in 2015, when MTSAT-2 is scheduled to complete its period of operation. The Agency also plans to launch Himawari-9 in 2016.

Himawari-8 and -9 are each scheduled to carry an imager comparable to the Advanced Baseline Imager (ABI). To disseminate the huge amounts of information that these satellites will gather, JMA plans to provide all observation data via the Internet.

PLANS FOR FOLLOW-ON SATELLITES TO MTSAT-2

1 INTRODUCTION

The Japan Meteorological Agency (JMA) has been operating the GMS series and MTSAT series at 140 degrees east covering East Asia and the Western Pacific since 1977 and contributing to the WMO's World Weather Watch (WWW) Programme. Currently, MTSAT-1R is operational, while MTSAT-2 is on standby in orbit. MTSAT-2, which will take over the meteorological mission of MTSAT-1R in 2010, is scheduled to complete its period of operation in around 2015 (see JMA-WP-02 for the status and plans regarding MTSAT-1R and -2).

JMA has made a contract for the manufacture of the follow-on satellites to MTSAT-2 (referred to here as Himawari-8 and Himawari-9). The Agency plans to launch Himawari-8 in 2014 and begin its operation in 2015. To ensure the robustness of the satellite observation system, the launch of a second follow-on satellite (Himawari-9) for in-orbit standby is also scheduled for 2016. JMA will continue to operate Himawari-8 and -9 at 140 degrees east covering East Asia and the Western Pacific as with the GMS and MTSAT series.

2 OVERVIEW OF HIMAWARI-8 AND -9

Observation mission

JMA has selected and defined the functions and specifications of the follow-on observation missions primarily based on user requirements for satellite data and products. To meet these requirements, Himawari-8 and -9 will each carry an imager with a capability comparable to that of GOES-R/ABI with the following functions:

- Multi-channel capacity (16 channels)
- High spatial resolution (0.5 – 1.0 km for visible and 1 – 2 km for infrared)
- Fast imaging (within 10 minutes for full disk)
- Rapid scanning with flexible area selection and scheduling

The specifications of the follow-on imager are summarized in Table 1.

JMA has decided that Himawari-8 and -9 will not carry hyper-spectral sounders due to the difficulty of manufacture in time for the launch in 2014. However, the Agency will continue its discussions with JAXA in regard to the feasibility of cooperation on the development of a hyper-spectral sounder for future geostationary satellites.

JMA plans to use frequency bands such as 18 GHz instead of the current 1.6 GHz band, since the latter is insufficient for the large amounts of data that Himawari-8 and -9 will gather and it is difficult to obtain additional bandwidth.

Table 1 Himawari-8 and -9 on-board imager specifications

Imaging channels		
	Spatial resolution	Number of observational bands
VIS (< 0.7 microns)	0.5 km – 1.0 km	3
NIR (0.7 – 3 microns)	1 km – 2 km	3
IR (> 3 microns)	2 km	10
Observation		
Scan capability	Full disk: normal operation Area: definable schedule and location	
Imaging rate	< 10 min (Full disk)	
Lifetime of meteorological mission		
7 years of in-orbit operation out of a 14-year in-orbit period		

Communication mission

The observation data collected by Himawari-8 and -9 may need several tens of Mbps as a communication link.

After studying different dissemination methods, JMA plans to provide all imagery data from Himawari-8 and -9 via the Internet rather than by direct broadcast (see CGMS-XXXV JMA-WP-07 for the data dissemination methods of the follow-on satellites to MTSAT).

JMA will continue the Data Collection System (DCS) service with Himawari-8 and –9, maintaining fundamentally the same specifications as those of the MTSAT series.

Data compression

The volume of data from MTSAT-1R is about 200 MB per observation. The compression technique applied to the current direct broadcast method (HRIT/LRIT) is JPEG, which is specified under ISO standard 10918 (Digital compression and coding of continuous-tone still images) and supports both lossy and lossless compression. JPEG compression is applied only to imagery data, and other data is not compressed. The JPEG modes used in HRIT/LRIT are as follows:

- Sequential mode
- Non-interleaved mode
- Non-hierarchical mode

The full-disk data volume of Himawari-8 and -9 will be about 3 GB in uncompressed form. The JPEG compression rate, which is about 50 percent in the

case of the current HRIT, would be insufficient to compress the data from Himawari-8 and -9. One promising method for providing observation data is JPEG 2000, which has an even higher compression rate than that of the current JPEG format.

JMA will continue its studies on advanced lossless compression techniques for efficient data dissemination.

3 SATELLITE OPERATION PLAN

The schedule for Himawari-8 and -9 is shown in Figure 1.

Figure 1 Schedule for the follow-on satellites to the MTSAT series