



STATUS OF HIMAWARI-8/9 AND THEIR FOLLOW-ON SATELLITE PROGRAM

Presented to CGMS-50 PLENARY, agenda item 2 (JMA-WP-01)

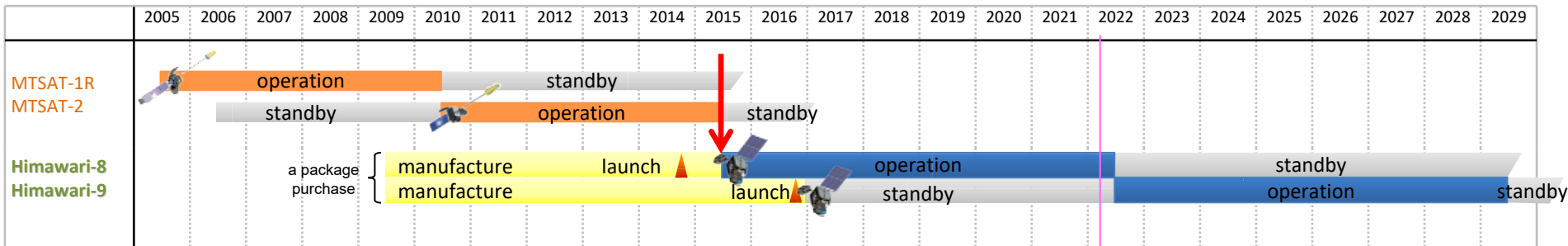
Japan Meteorological Agency

Himawari-8/9



Himawari-8 began operation on 7 July 2015, replacing the previous MTSAT-2 operational satellite

Geostationary position	Around 140.7°E
Attitude control	3-axis attitude-controlled geostationary satellite
Communication	1) Raw observation data transmission Ka-band, 18.1 - 18.4 GHz (downlink)
	2) DCS (Data collection System) International channel 402.0 - 402.1 MHz (uplink) Domestic channel 402.1 - 402.4 MHz (uplink) Transmission to ground segments Ka-band, 18.1 - 18.4 GHz (downlink)
	3) Telemetry and command Ku-band, 12.2 - 12.75 GHz (downlink) 13.75 - 14.5 GHz (uplink)

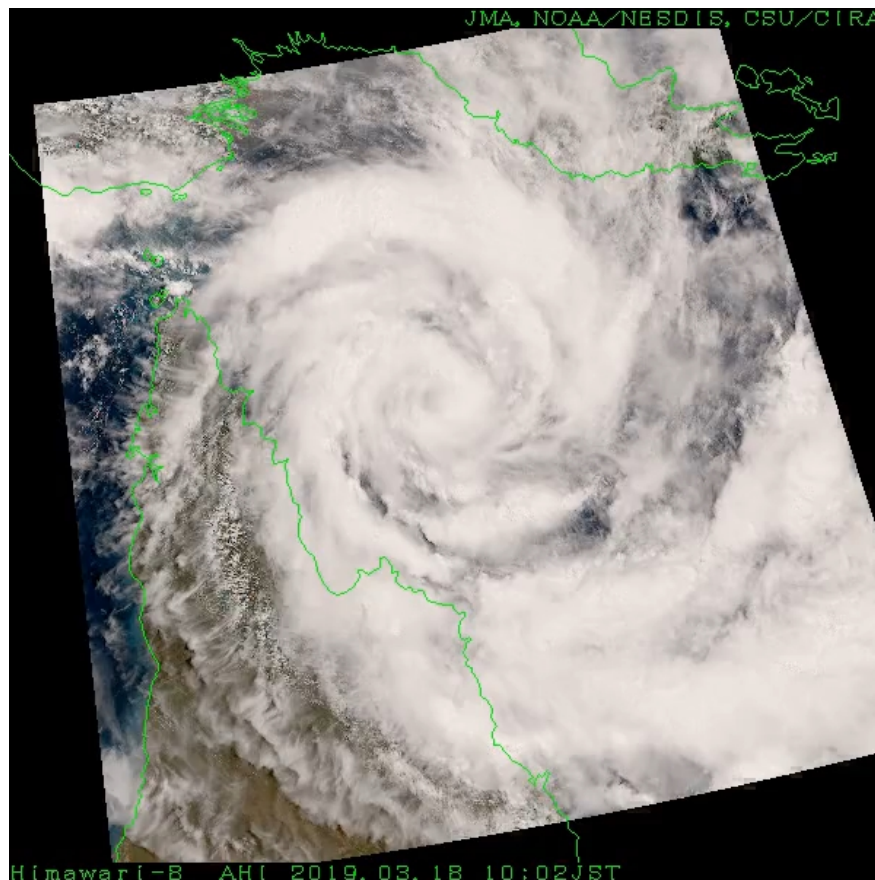


JMA is now planning the switch over from Himawari-8 to -9 around December 2022. Their parallel observation and data distribution are also under consideration.

HimawariRequest

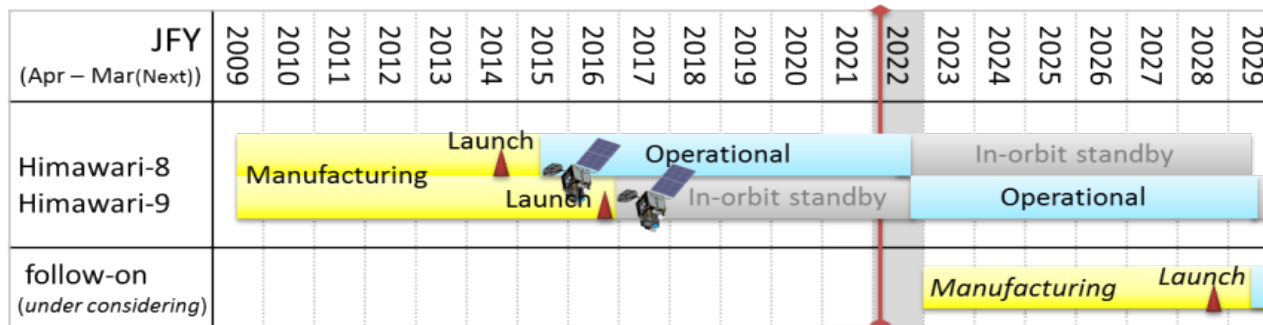
- HimawariRequest was started from January 2018 in cooperation with Bureau of Meteorology (BoM), Australia.
- International service for NMHSs in Himawari-8/9 coverage area to request Target Area observation (**1,000 x 1,000 km area every 2.5 minutes**).
- JMA expects this service to support **disaster risk reduction activities in the Asia Oceania** region.
- Status as of 25 May 2022
 - Registration: **22** NMHSs
 - **144** requests for TC, volcanic eruption, wildfires, etc.

HimawariRequest from BoM
on 13-19 Mar. 2019



Himawari Follow-on Program

- JFY2018: JMA has started to consider the next GEO satellite (Himawari-10) program.
 - “By **JFY2023** Japan will start manufacturing the Geostationary Meteorological Satellite that will be the successor to Himawari-8/9, aiming to **put it into operation in around JFY2029**”
Japan’s “Basic Plan on Space Policy” (June 2020)
 - JMA will pursue seamless GEO satellite system by considering CGMS baseline and WMO Vision for WIGOS in 2040 to contribute the establishment of Geo-Ring observation.
- JFY2019: Worldwide Technology Trends Survey on Future Satellites/Instruments
- JFY2020: OSSE of hyperspectral IR sounder on JMA NWP systems was implemented.
- JFY2021: Internal, domestic and international user requirements will be summarized.
- JFY2022: RFI and RFP**
- JFY2023: Start of manufacturing of H-10
- JFY2028: Launch of Himawari-10
- JFY2029: Start of operation of Himawari-10



WMO Vision for WIGOS in 2040 for GEO

	Application	Satellite/Instrument
VIS/IR Imager w/ rapid repeat cycles	Cloud amount/type/top height/temperature, wind, sea/land surface temperature, precipitation, aerosols, snow cover, vegetation cover, albedo, atmospheric stability, fires, volcanic ash, sand/dust storm, convective initiation	<ul style="list-style-type: none"> • NOAA: GOES-16,17/ABI • JMA: Himawari-8,9/AHI • KMA: GK-2A/AMI • CMA: FY-4A,4B/AGRI • EUMETSAT: MTG-I1/FCI (2022)
Hyperspectral IR Sounder	Atmospheric temperature/humidity, wind, rapidly evolving mesoscale features, sea/land surface temperature, cloud amount/top height/temperature, atmospheric composition	<ul style="list-style-type: none"> • NOAA: N/A • JMA: N/A • KMA: N/A • CMA: FY-4A,4B/GIIRS • EUMETSAT: MTG-S1/IRS (2024)
Lightning Mapper	Lightning, location of intense convection, life cycle of convective systems	<ul style="list-style-type: none"> • NOAA: GOES-16,17/GLM • JMA: N/A • KMA: N/A • CMA: FY-4A/LMI • EUMETSAT: MTG-I1/LI (2022)
UV/VNIR Sounder	Ozone, trace gases, aerosol, humidity, cloud top height	<ul style="list-style-type: none"> • NASA: TEMPO (2022) • JMA: N/A • KMA: GK-2B/GEMS • CMA: N/A • EUMETSAT: MTG-S1/UVN (2024)

JMA's 10-Year Strategy Toward

2030

1. Technology Developments

- Application of latest sci & tech;
 - ✓ Advanced **satellites**, remote sensing, big data
 - ✓ NWP and other prediction tech.
 - ✓ Collaboration etc.
- Improvement of forecasts
 - ✓ Nowcast up to 1 hour
 - ✓ **12-hour forecast of localized heavy rain**
(stationary linear mesoscale convective systems)
 - ✓ **3-day typhoon forecast** etc.

Synergy

2. Promotion of Effective Utilization of Info./Data

- Build environment for better usage
 - ✓ Larger data flow
 - ✓ Easier access
- Raise capacity for the utilization
 - ✓ Literacy about disaster, safety, etc.
 - ✓ Application technology/skill

Met.
Services
for Better
Society

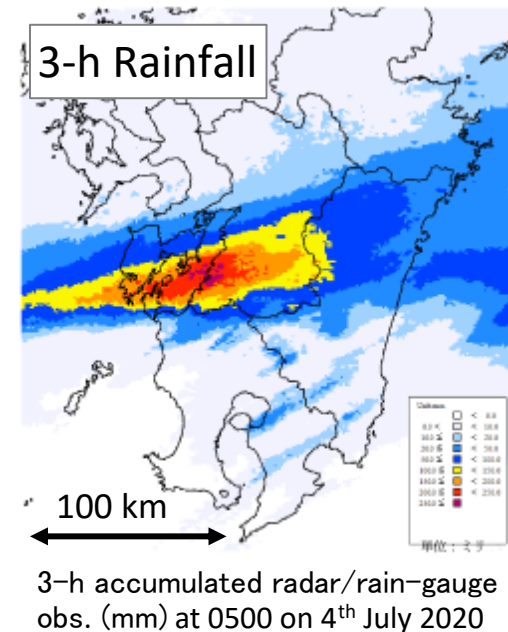
3. Contribution to Disaster Resiliency

- JMA to Contribute to “Disaster Awareness Society” and to play the leading role in met. services
 - ✓ Improved impact-based warnings on the basis of advanced sci & tech
 - ✓ Collaborate with stake-holders to build local decision making capacity
 - ✓ Raise individual disaster awareness and response capacity

We need to observe 3-D humidity information to improve these forecasts

Toward Better Prediction for Stationary Linear Mesoscale Convective Systems

- High-impact weather events in recent years have resulted in a demand for improving JMA's weather forecasts/warnings
- Torrential rain events during East Asian rainy season in 2020 and 2021 further enhanced this demand
 - ✓ Mainly caused by stationary linear mesoscale convective systems
- JMA established **WG with external experts** and internal TF to improve the prediction system to issue warnings with extended lead time by
 - ✓ Introducing advanced observation technologies such as GNSS receivers on vessels (short-term subject) and **geostationary IR sounders (long-term subject)**
 - ✓ Improving NWP models
- Enhanced collaboration with academia.



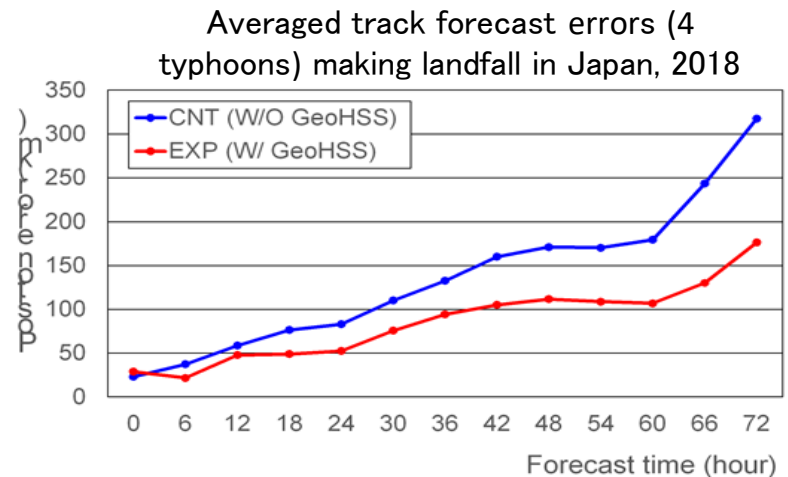
Houses submerged by the Kuma River on 4 July 2020 ([MLIT](#))

Concept of Himawari-10

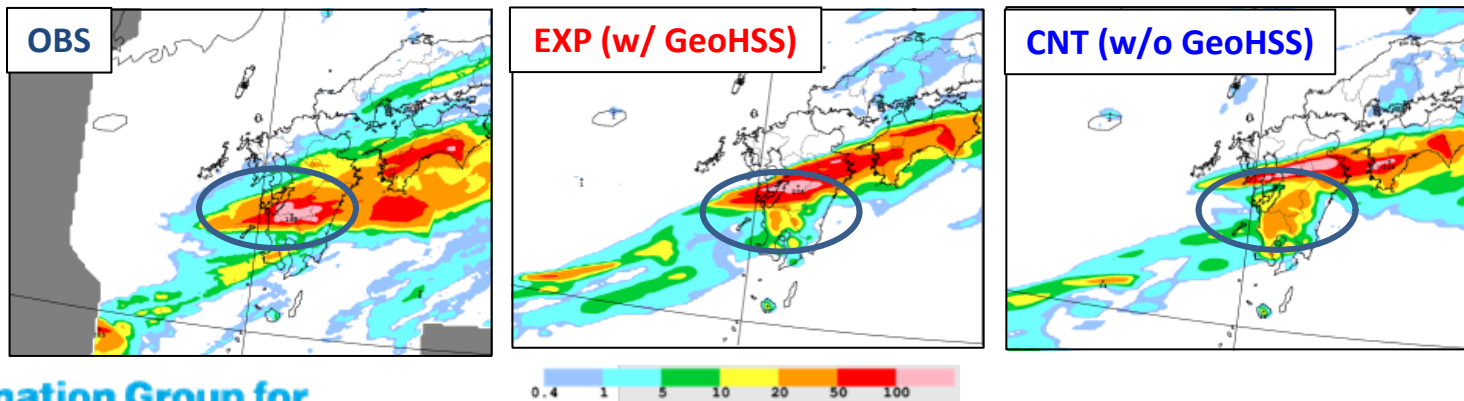
- **Mission Instrument(s)**
 - AHI-class or FCI-class VIS/IR imager (with optional improved capabilities)
 - New instrument (under consideration)
 - ✓ Hyperspectral IR sounder
- **Orbital location**
 - Around 140 degrees East
- **Design lifetime**
 - 15 years (10-year in-orbit operation and 5-year in-orbit storage)
- **Communication subsystems**
 - Ka-band (18 GHz) for mission raw data downlink
 - Ku-band (12-14 GHz) for telemetry, tracking & command
 - Data Collection System (collection of in-situ meteorological data)

OSSE of GEO Hyperspectral IR Sounder

- Several experiments were implemented with [Okamoto et al. \(2020\)](#)
 - Operational DA configuration (incl. use of AIRS/CrIS/IASI in global model)
 - Hypothetical IRS on GEO at 140.7 E, hourly full-disk obs w/ 30 km spatial resolution from ERA5
- Global DA (upper figure)
 - ~140 km improvement in typhoon position for 3-d forecast (time of landing)
- Regional DA (bottom figures)
 - Better location of the heaviest rain area which caused devastating floods



3-hour accumulated rainfall (mm), 12-h forecast valid at 0900 UTC on 2020-07-04



Thank you!!

