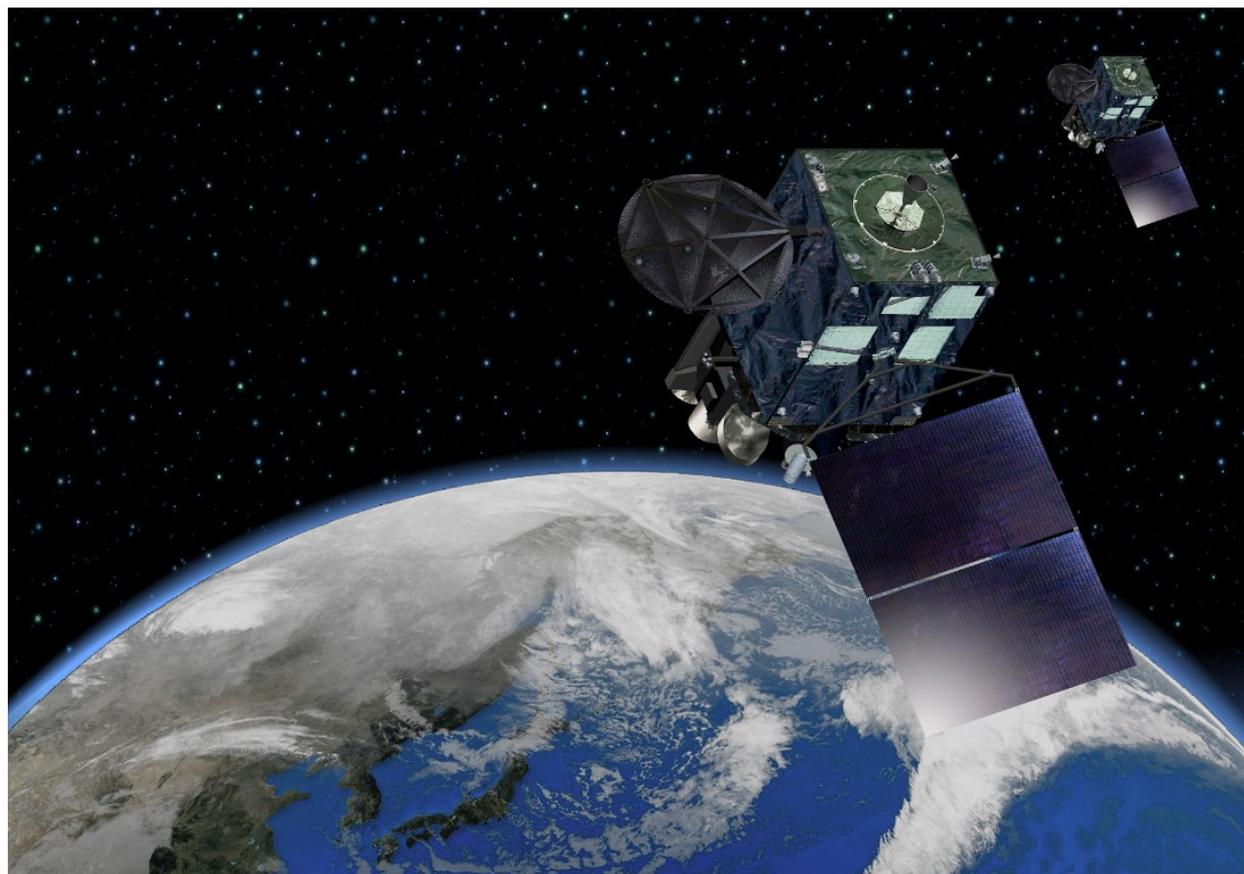




Status of Next Generation Japanese Geostationary Meteorological Satellites Himawari-8/9 and their Products



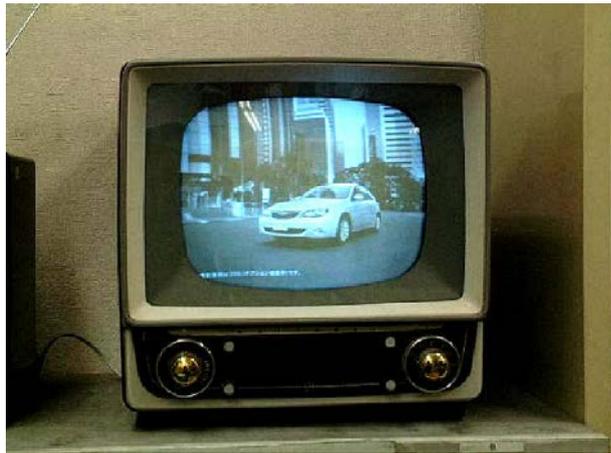
Contents

- **What will Himawari-8/9 bring to us?**
- **Development of Products**
- **Preparation of launch and operation of Himawari-8**
- **Data Dissemination**

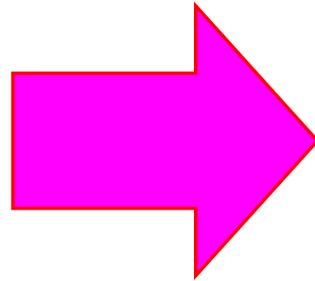
What will Himawari-8/9 bring to us?

Upgrade of number of channels

Upgrade of spatial and temporal resolutions



B/W TV



HD TV

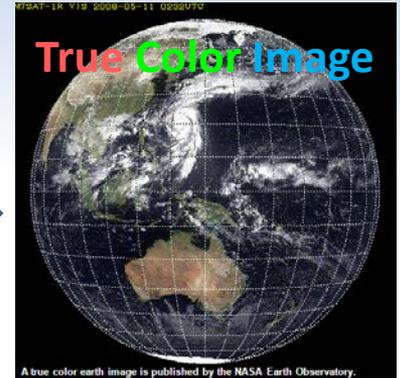
Specification of Himawari-8/9 Imager (AHI)

MTSAT-1R/2

	Band	Wavelength [μm]	Spatial Resolution
VIS	1	0.46	1Km
	2	0.51	1Km
	3	0.64	0.5Km
	4	0.86	1Km
	5	1.6	2Km
	6	2.3	2Km
IR4	7	3.9	2Km
IR3	8	6.2	2Km
	9	7.0	2Km
	10	7.3	2Km
	11	8.6	2Km
	12	9.6	2Km
IR1	13	10.4	2Km
	14	11.2	2Km
IR2	15	12.3	2Km
	16	13.3	2Km

Similar to ABI for GOES-R

RGB band Composited



0.51 μm (Band 2) instead of ABI's 1.38 μm

Water vapor

SO₂
O₃

Atmospheric Windows

CO₂

Products and Applications

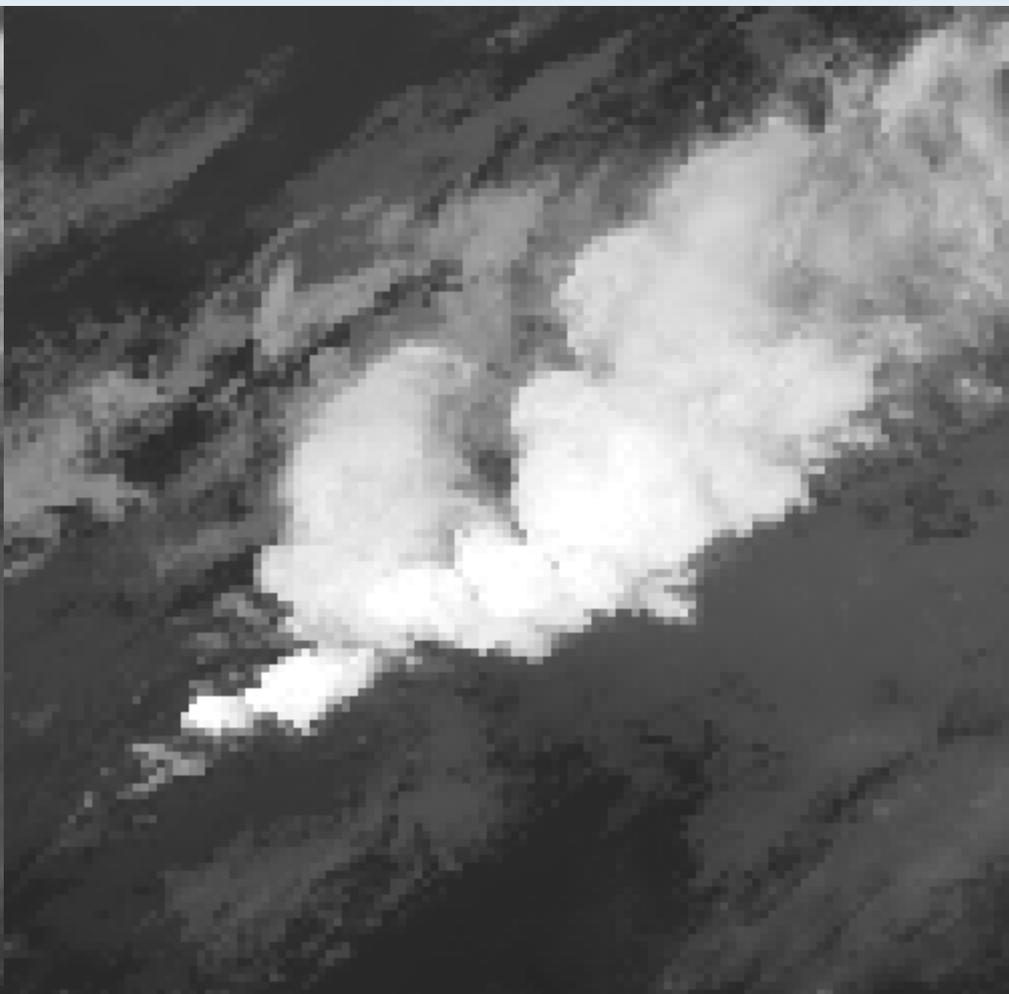
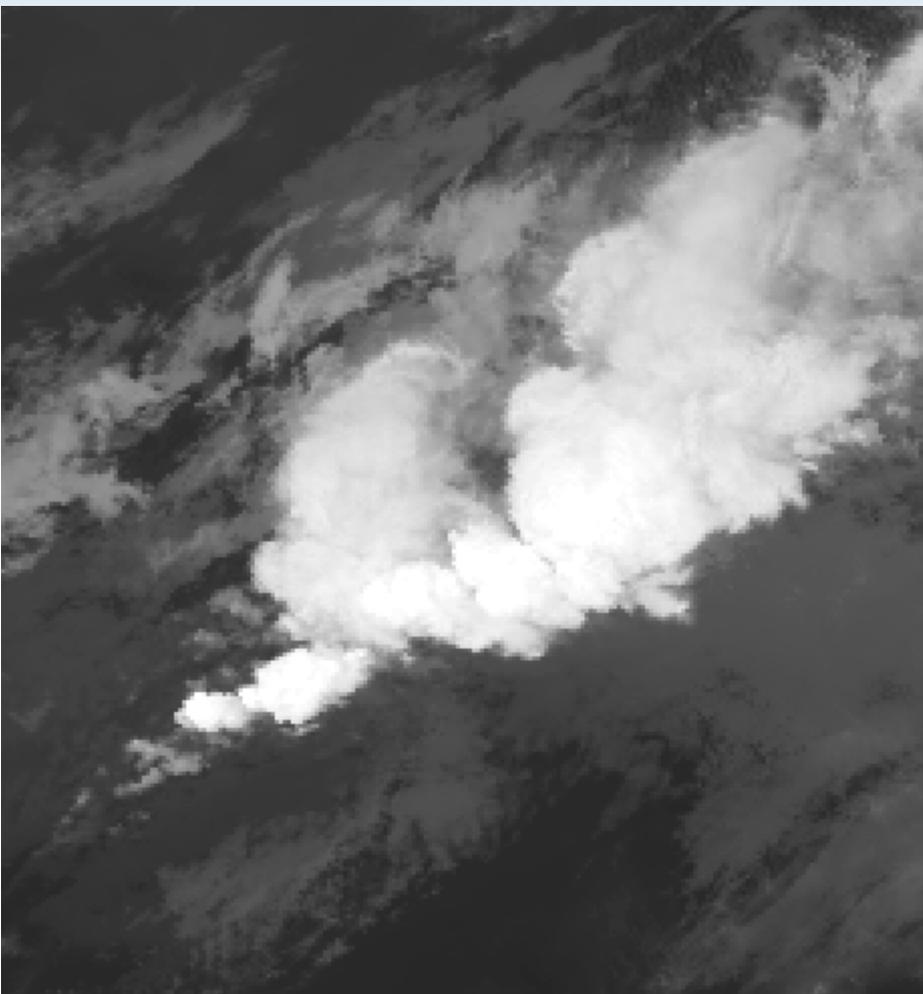
- Volcanic Ash
- Global Instability Index
- Nowcasting
- Typhoon Analysis
- Atmospheric Motion Vector
- Clear Sky Radiance
- Sea Surface Temperature
- Yellow Sands
- Snow and Ice Coverage



IR image difference of spatial resolution

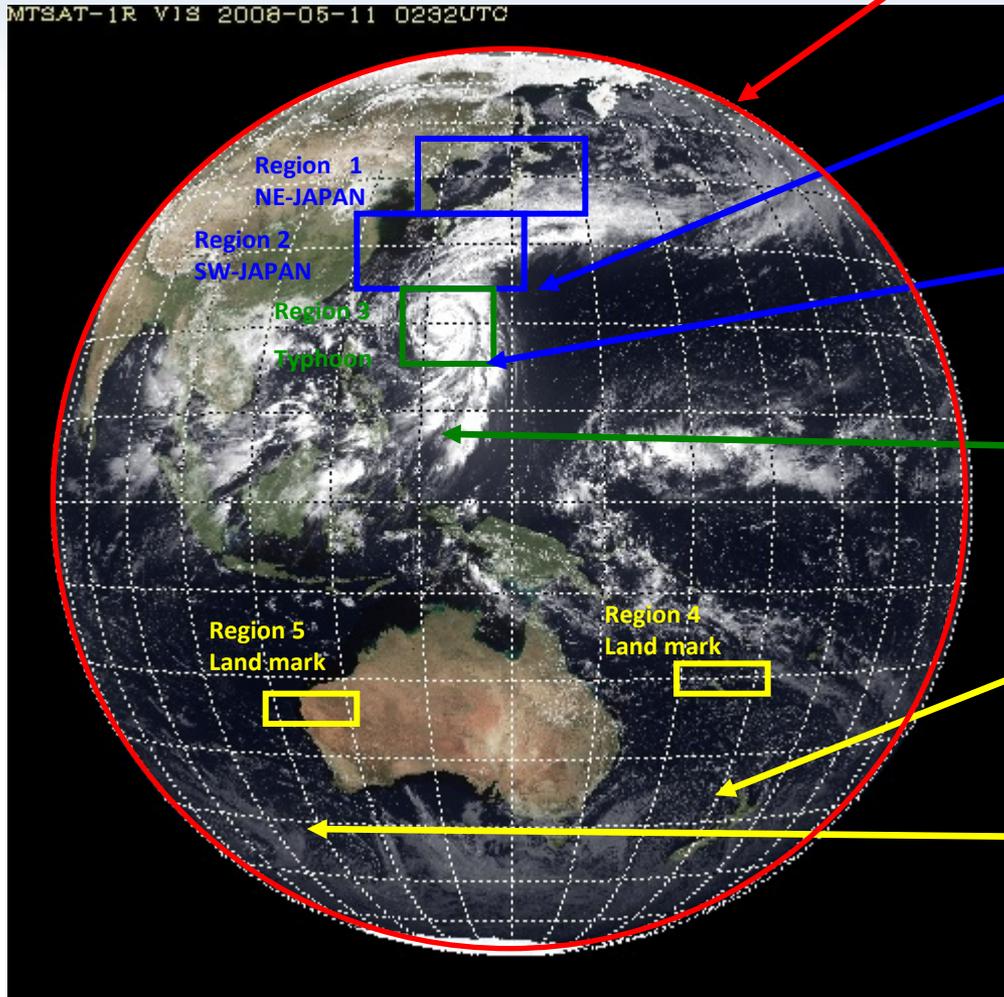
2km for H-8/9

4km for MTSAT



AHI will scan all sectors within 10 minutes

MTSAT-1R VIS 2008-05-11 0232UTC



Full disk

Interval : **10 minutes** (6 times per hour)
23 swath

Region 1 JAPAN (North-East)

Interval : **2.5 minutes** (4 times in 10minutes)
Dimension : EW x NS: 2000 x 1000 km
2 swath

Region 2 JAPAN (South-West)

Interval : **2.5 minutes** (4 times in 10minutes)
Dimension : EW x NS: 2000 x 1000 km
2 swath

Region 3 Typhoon

Interval : **2.5 minutes** (4 times in 10minutes)
Dimension : EW x NS: 1000 x 1000 km
2 swath

Region 4 Land mark

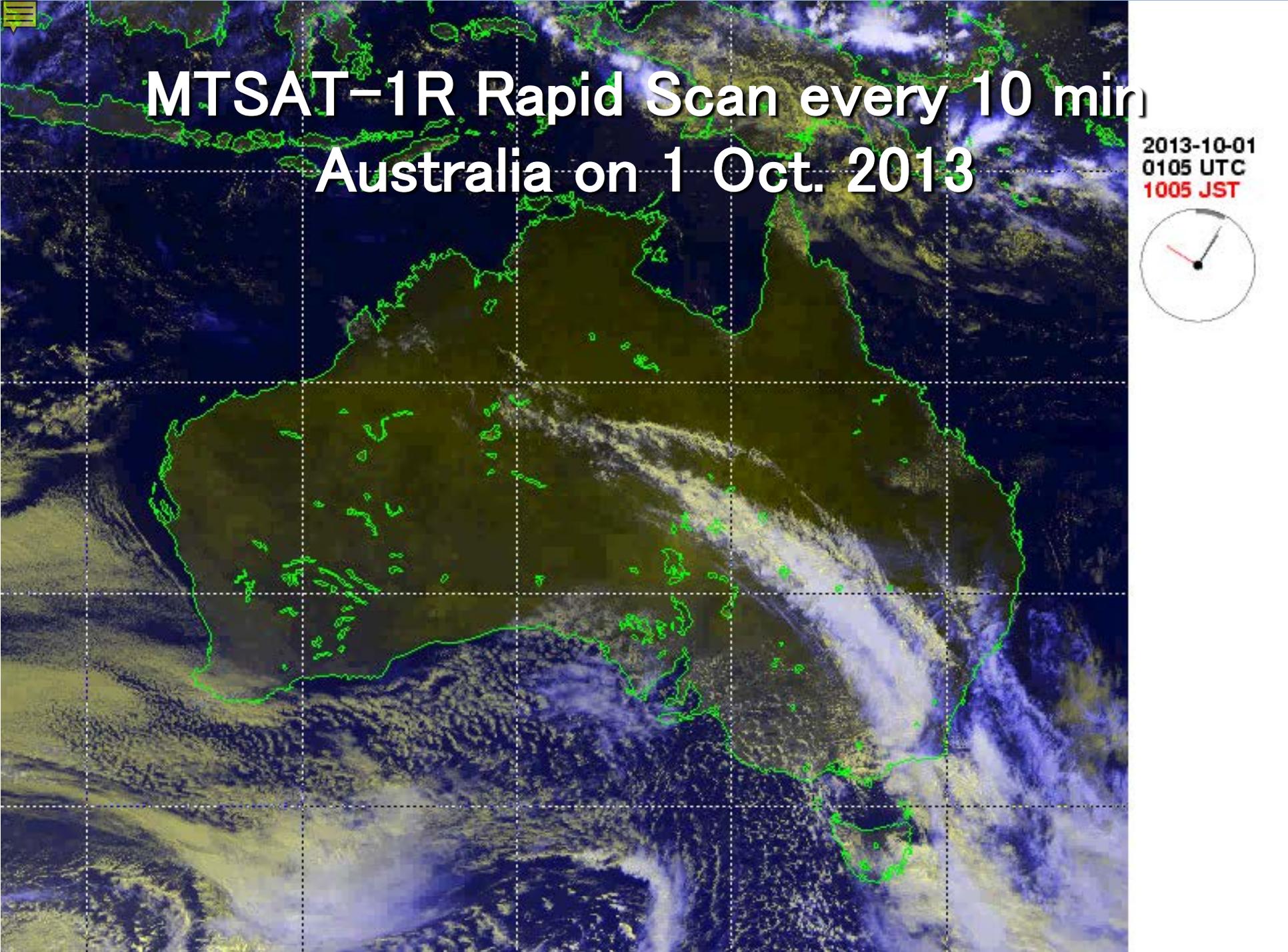
Interval : **0.5 minutes** (20 times in 10minutes)
Dimension : EW x NS: 1000 x 500 km
1 swath

Region 5 Land mark

Interval : **0.5 minutes** (20 times in 10minutes)
Dimension : EW x NS: 1000 x 500 km
1 swath

MTSAT-1R Rapid Scan every 10 min Australia on 1 Oct. 2013

2013-10-01
0105 UTC
1005 JST



Development of products of Himawari-8/9 AHI

Higher resolution

Spatial:

1km -> 0.5km for a VIS channel

4 min for a full disk scan

Temporal:

1 hr -> 10 min for a full disk scan

2.5min for limited areas

Increased observation channels

VIS: 1 -> 3 bands

IR: 1 -> 2 bands

WV: 1 -> 2 bands

Weather Satellite Revolution

toward

Examples of expected new/enhanced products

- Cloud Products
- Atmospheric Motion Vectors (AMVs)
- Aerosol (Dust) / Volcanic Ash

the New Era

of

Severe weather

monitoring/nowcasting

Numerical prediction

Climate change

monitoring

Yellow sand/ dust storm

Volcano eruption

Ash area detection

Solar energy monitoring

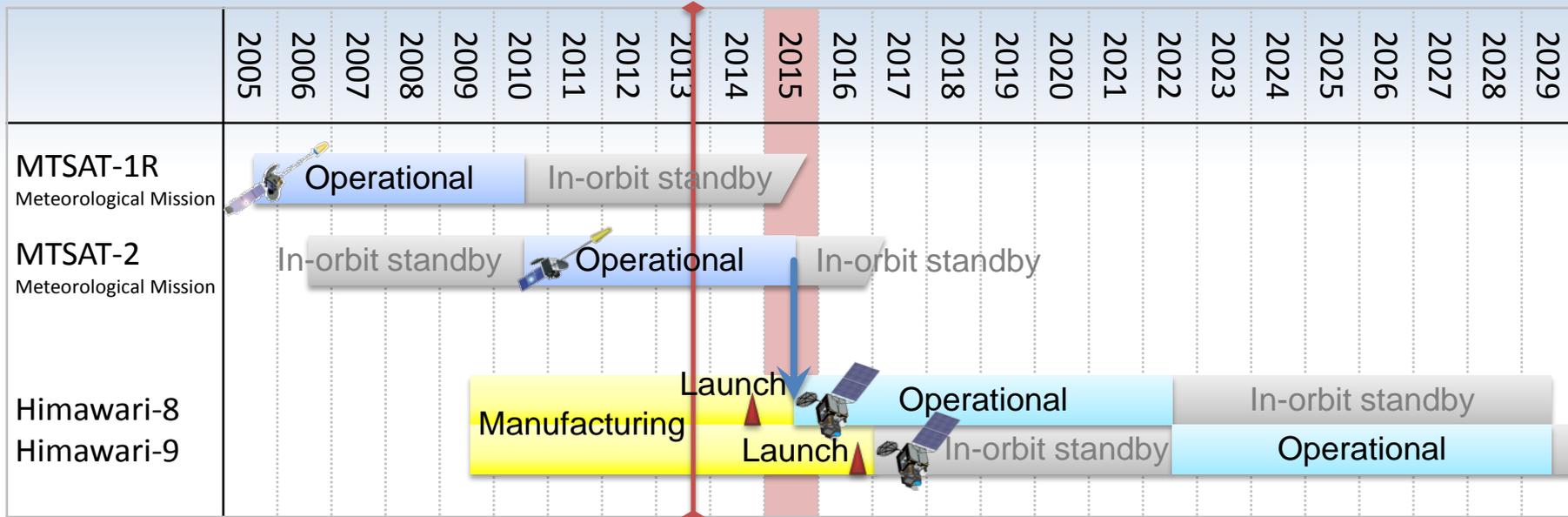
Mesoscale Satellite Meteorology

International Cooperation for developments of Cloud Product, AMV and Volcanic ash products

- **Nov. 2012** Look Up Table (LUT) and software for Volcanic Ash retrieval was provided from EUMETSAT.
- **Jan. 2013** JMA invited scientists from EUMETSAT and UK Met Office.
Dr. Hans-Joachim Lutz (EUMETSAT)
Dr. Régis Borde (EUMETSAT)
Dr. Peter Francis (UK Met Office)
- **Feb. 2013** JMA invited scientist from NOAA/NESDIS
Dr. Andrew Heidinger (NOAA/NESDIS)
Dr. Mike Pavolonis (NOAA/NESDIS)
- **April-May 2013** JMA/MSU scientist visited EUMETSAT for the development of OCA and AMV.

**We greatly appreciate kind cooperation of
NOAA/NESDIS and EUMETSAT.**

Transition of Operational Satellites

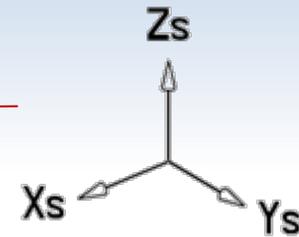


- JMA plans to launch **Himawari-8** in **2014** and begin its operation in **2015**.
- The launch of **Himawari-9** for in-orbit standby is scheduled in **2016**.
- **Himawari-8/9** will be in operation around **140 degrees East** covering the East Asia and Western Pacific regions for 15 years.

Appearance of Himawari-8/9

DS-2000

AHI (Advanced
Himawari Imager)



UHF-band Antenna

Ku-band Antenna

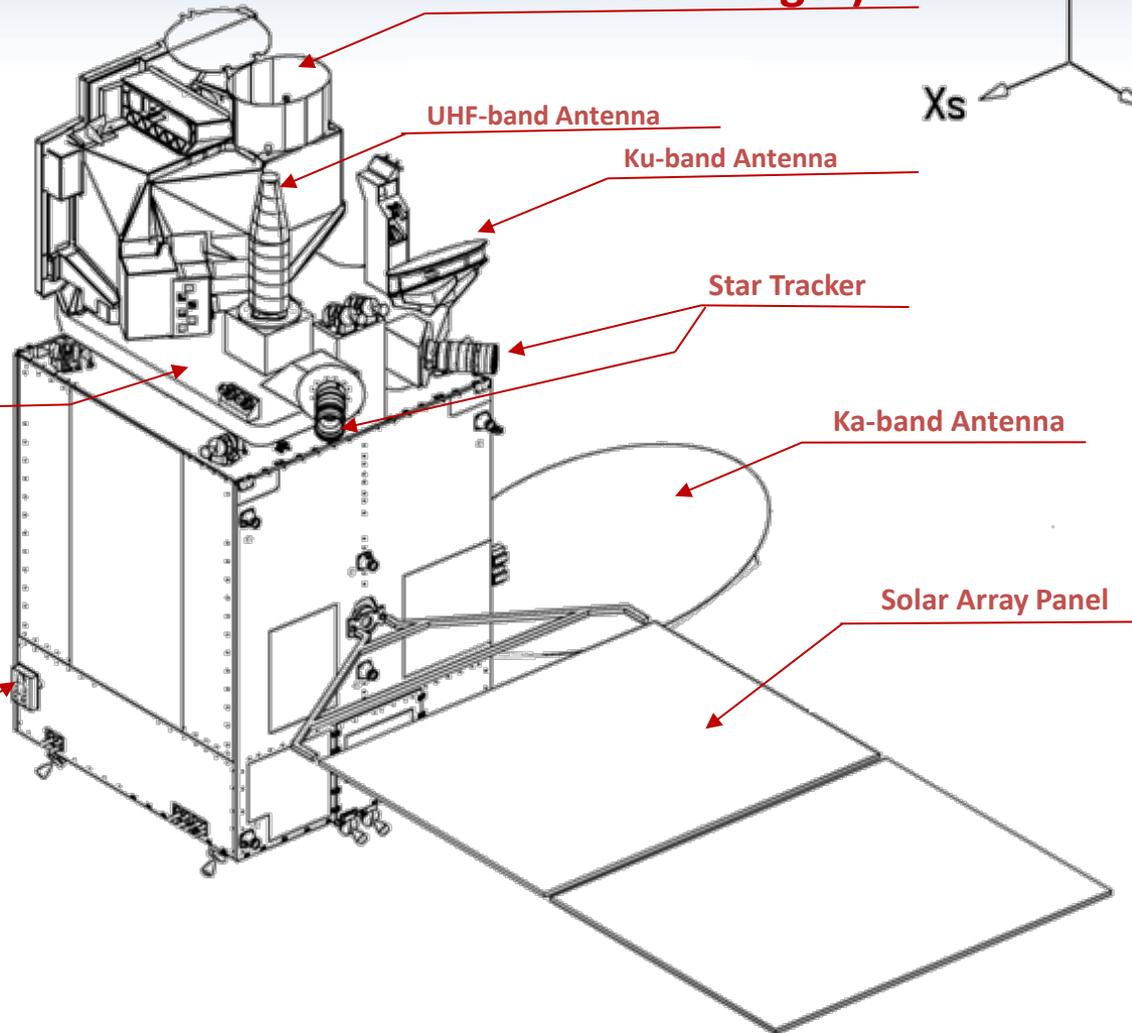
Star Tracker

Imager Bench

Ka-band Antenna

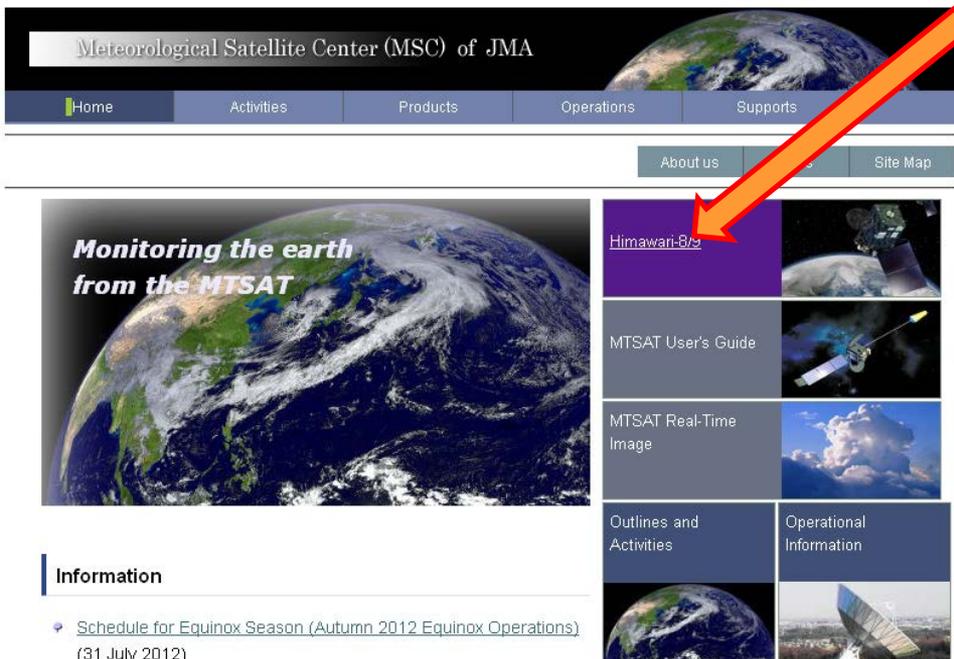
Space
Environment
Data
Acquisition
Monitor
(SEDA)

Solar Array Panel



MSC Web Page for Himawari-8/9 Information

MSC website top page
<http://mscweb.kishou.go.jp/>



Meteorological Satellite Center (MSC) of JMA

Home Activities Products Operations Supports

Current position: Home > Himawari-8/9

Himawari-8/9

Introduction Spacecraft Imager (AHI)

The Japan Meteorological Agency (JMA) has operated the GMS and MTSAT series of satellites at around 140 degrees east to cover the East Asia and Western Pacific regions since 1977, and makes related contributions to the WMO's World Weather Watch (WWW) Programme. As a follow-on to the MTSAT series, the Agency plans to operate next-generation satellites called Himawari-8 and Himawari-9 (*himawari* means "sunflower" in Japanese).

Overview of satellite observations

The functions and specifications are notably improved from those of the on-board imager of MTSAT, and enable better nowcasting, improved numerical weather prediction accuracy and enhanced environmental monitoring.

Enhancement of the observation function of Himawari-8/9 as compared to that of MTSAT-1R/2

Higher spatial resolutions		More frequent observations		More spectral bands		
MTSAT-1R/2 VIS 1km IR 4km	➔	Himawari-8/9 VIS 0.5 - 1km IR 2km	Full disk observation with 10-minute intervals	MTSAT-1R/2 VIS 1 band (black/white image) N/A IR 4 bands	➔	Himawari-8/9 3 bands (color image) 3 bands 10 bands 16 bands
			Small-sector observation			
			30 min.			
			10 min. 10 min. 10 min.			
			Every 2.5 minute around Japan			

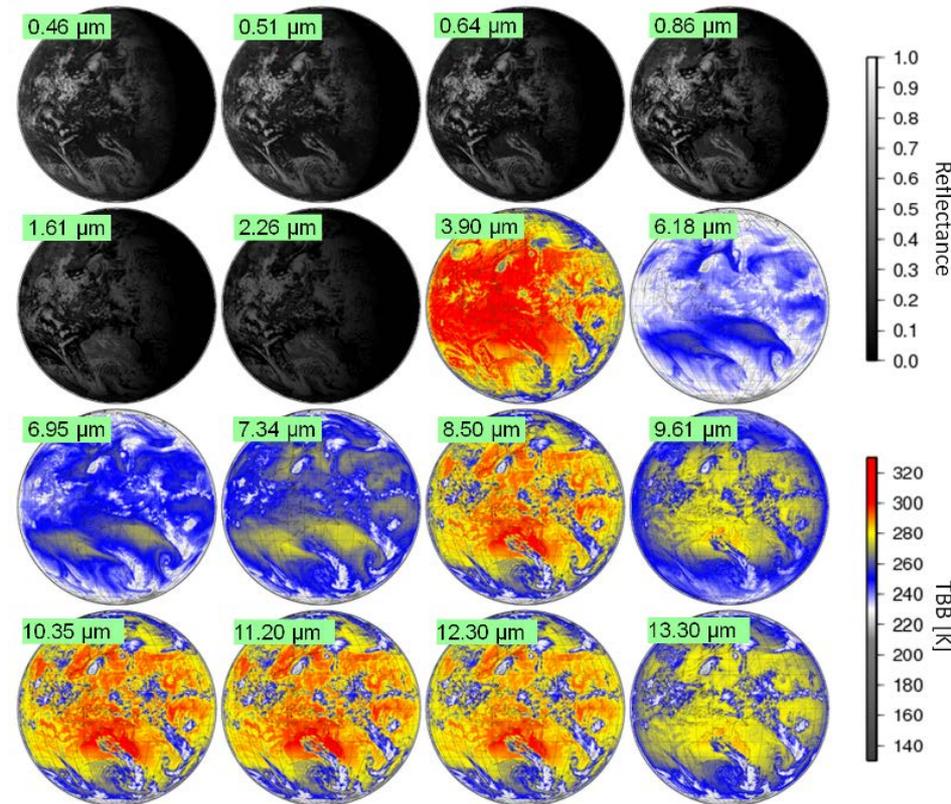
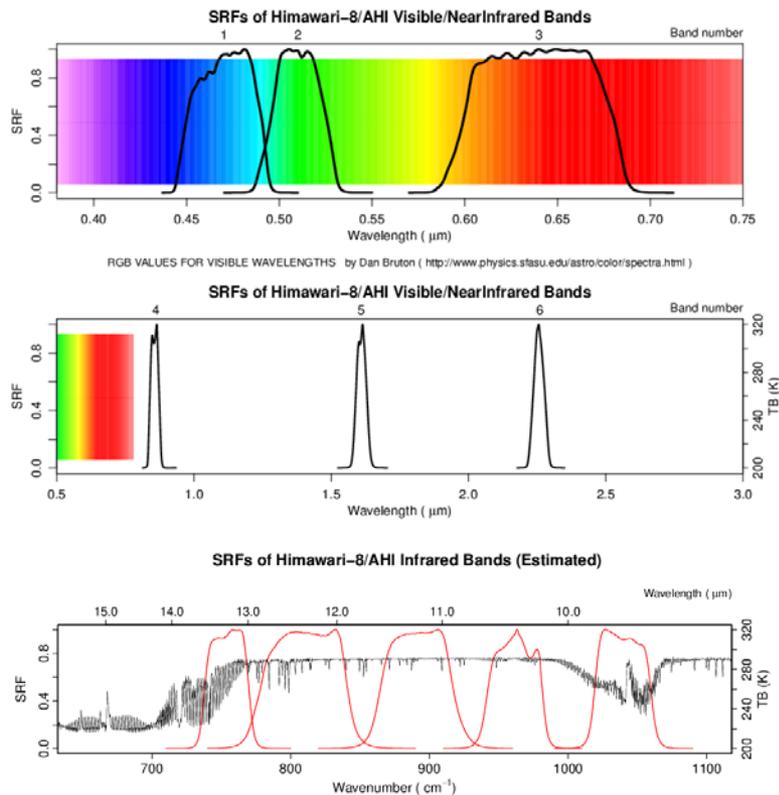
Details of AHI

Himawari-8/9: Technical Information

To support research and development of products based on **Himawari-8/9**,

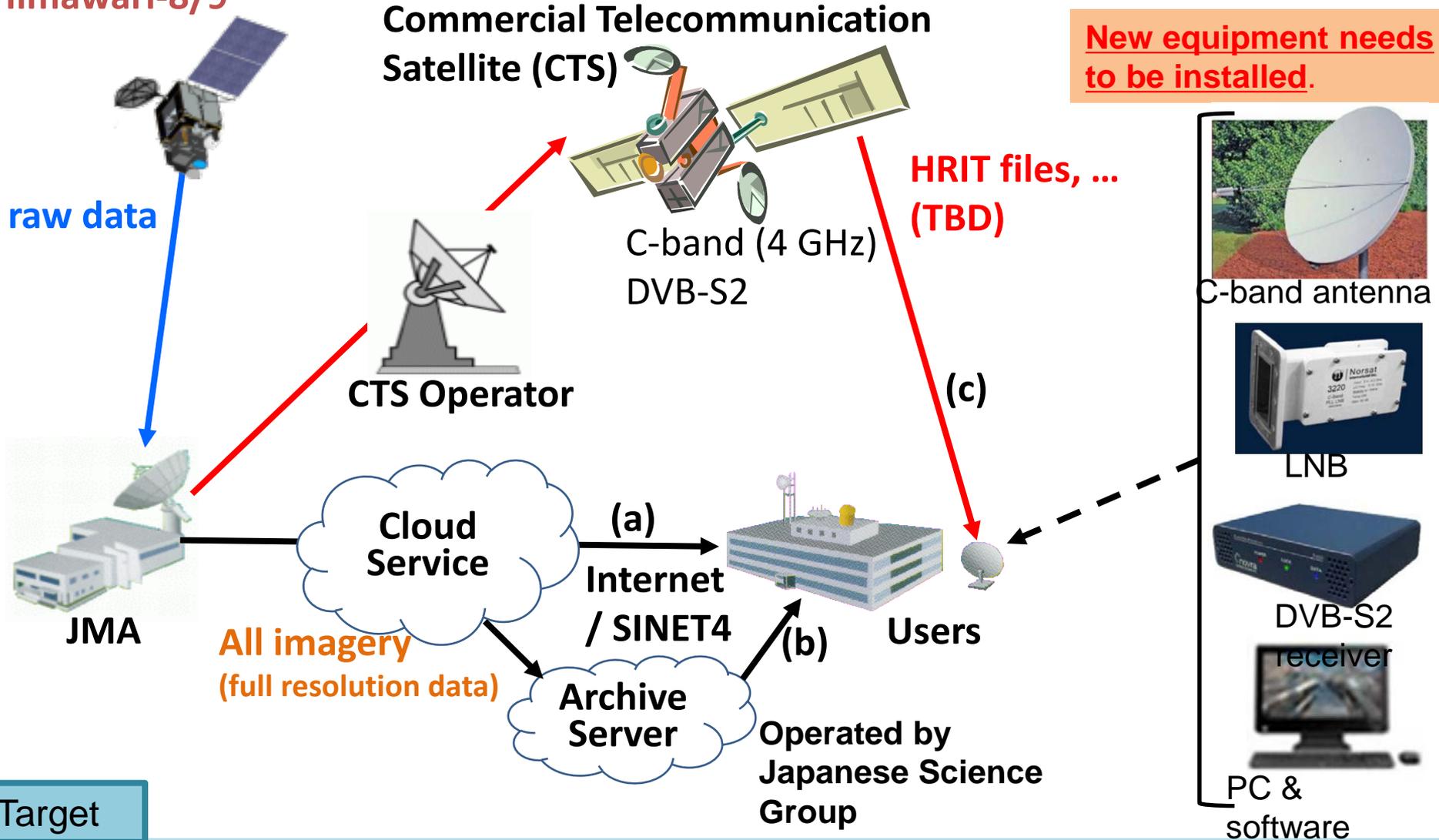
- Himawari Standard Data Format and Sample data
- Estimated Spectral Response Functions (SRFs) of **AHI** are available on JMA website.

- **Simulation data** generated using a radiative transfer model are also **available** on JMA website.



Himawari-8/9: Data Distribution/Dissemination

Himawari-8/9



(a) **Cloud Service:** National Meteorological and Hydrological Services

(b) **Archive Server:** Researchers

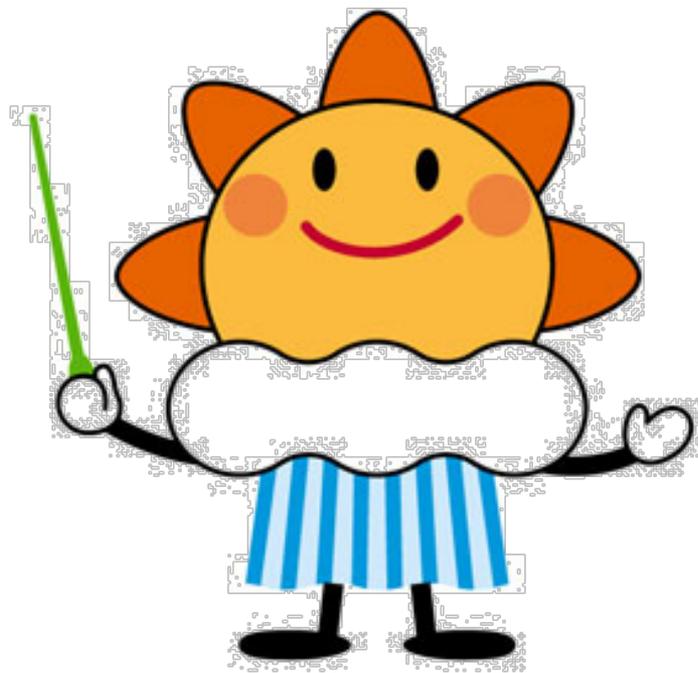
(c) **CTS:** Everyone in the East Asia and Western Pacific regions

Summary

- Himawari-8/9 will bring us Revolution, “*Mesoscale Satellite Meteorology*”.
- JMA has strong international cooperative relations for new satellites.
- Preparation of launch and operation of Himawari-8 is on going.
- We will just do it!!



Thank You.



Appendix

Imagery via the **Internet**

	Name	Interval	Channel & Resolution	Size
Full disc observation	TBD	10 min	All (16) channels #3: 0.5 km #1, 2, 4: 1 km #5-16: 2 km	329 GB (1 day) #3: 930 MB (10 min) #1, 2, 4: 230 MB (10 min) #5-16: 60MB (10 min)
	PNG	10 min	Composite (#1-3) 1 km	49 GB (1 day) 350 MB (10 min)
	HRIT (same as MTSAT)	10 min	5 channels Vis: 1 km IR: 4 km	41 GB (1 day) Vis: 230 MB, IR: 15 MB (10 min)
	LRIT (same as MTSAT)	10 min	3 channels 5 km	432 MB (1 day) each: 1 MB (10 min)
Regional observation (Typhoon)	TBD & netCDF	2.5 min	All (16) channels #3: 0.5 km #1, 2, 4: 1 km #5-16: 2 km	12 GB (1 day) #3: 8 MB (2.5 min) #1, 2, 4: 2 MB (2.5 min) #5-16: 0.5 MB (2.5 min)
Cut-out (several regions)	PNG JPEG	10 min	TBD	Not so large

Imagery via a **CTS**

	Name	Interval	Channel & Resolution	Size
Full disc observation	TBD	10 min	All (16) channels #3: 0.5 km #1, 2, 4: 1 km #5-16: 2 km	329 GB (1 day) #3: 930 MB (10 min) #1, 2, 4: 230 MB (10 min) #5-16: 60MB (10 min)
	PNG	10 min	Composite (#1-3) 1 km	49 GB (1 day) 350 MB (10 min)
	HRIT (same as MTSAT)	10 min (TBD)	5 channels Vis: 1 km IR: 4 km	41 GB (1 day) Vis: 230 MB, IR: 15 MB (10 min)
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Cut-out (several regions)	PNG JPEG	10 min	TBD	Not so large

Equipment to receive imagery via a CTS

Tentative!

Needed equipment



C-band antenna



LNB



DVB-S2



PC & software

	Required/recommended specifications	Estimated cost (US\$)
C-band antenna	Dish type with a diameter of 1.2 – 2.4 m	1,500 – 9,000
Low-noise block (LNB)	Standard-performance type	600 or less
DVB-S2* receiver	Standard-performance type such as Novra S300, Comtech EF DATA CMR-5975 or Advantech S4020	1,500 – 3,000
Software for DVB acquisition and processing	KenCast Fazzt standard software	900 or less

* DVB-S2: Digital Video Broadcasting – Satellite – Second Generation (a digital video broadcast standard)

Notes

- HRIT imagery can be displayed on a PC using a set of software modules for data processing and visualization.
- Construction of dish antenna foundations and wiring work for antenna-PC connection are required for installation of the above equipment.
- The diameter of a dish antenna depends on its geographical location and the footprint of the commercial telecommunication satellite to be used by JMA.