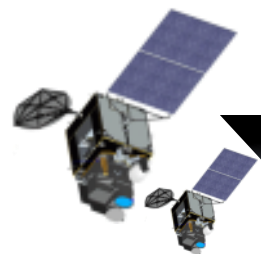


Introduction of Himawari-8 for Typhoon Monitoring



Kazumi KAMIDE
Meteorological Satellite Center / Japan Meteorological Agency

The 49th ESCAP/WMO Typhoon Committee
21st February 2017, Yokohama, Japan



2014 *Himawari-8*

2016 *Himawari-9*

Himawari-9

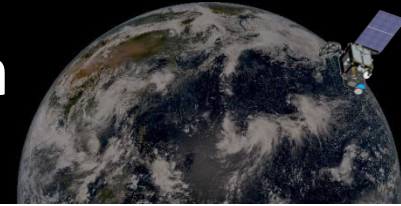
Launched in Nov. 2016

The first image of the new-generation
geostationary meteorological satellite
(02:40 UTC, 24 Jan. 2017)

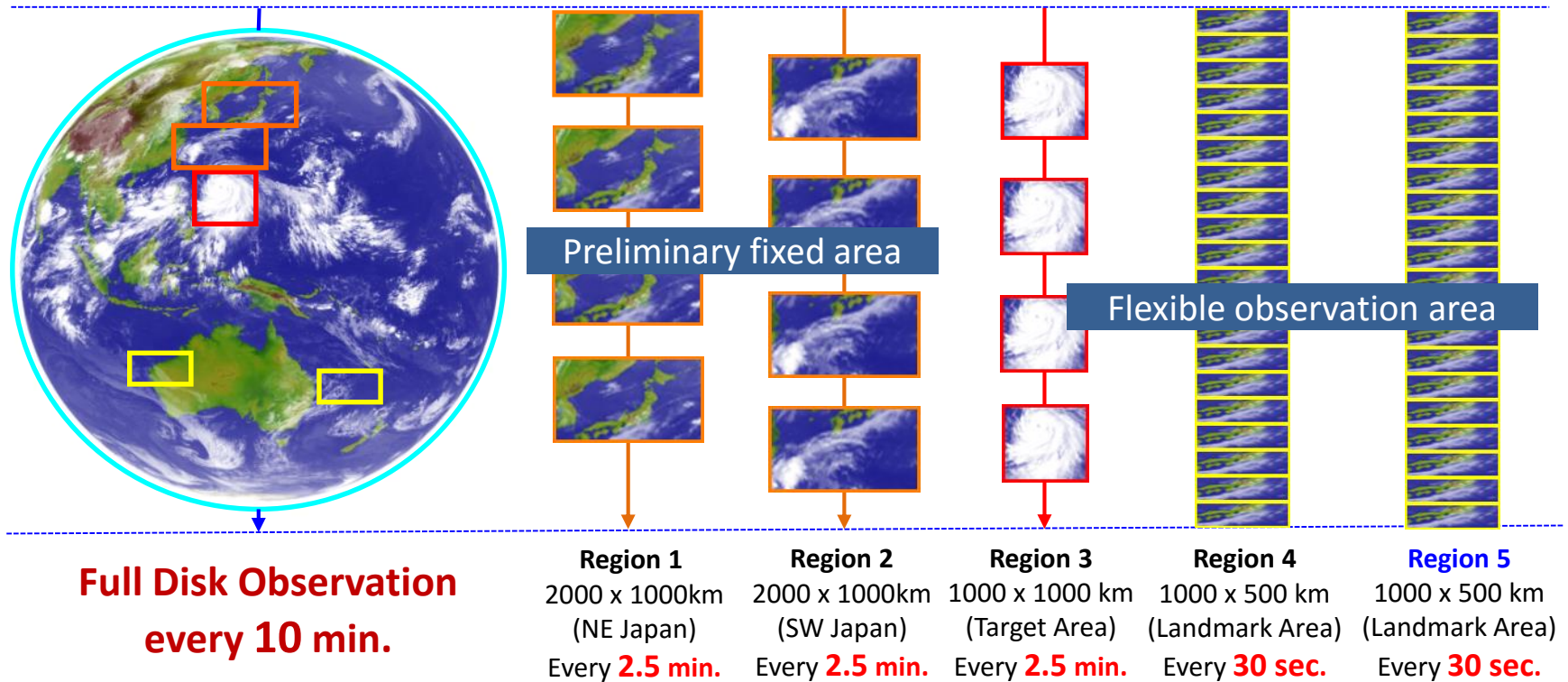


True Color Reproduction imagery

This imagery was developed on the basis of collaboration between the JMA Meteorological Satellite Center and the NOAA/NESDIS GOES-R Algorithm Working Group imagery team.



Overview of the Himawari-8 observation (10 minutes Repeat Cycle)



- AHI (Advanced Himawari Imager) on Himawari-8 has the ability of various scans during 10 minutes Full Disk observation.
- AHI can flexibly change the scan range of **“Target Area”** for observation of phenomena such as **typhoons and active volcanoes**.
- Lunar observation: performed using Landmark Area (Region 5)

Imagery products for Asia-Oceania Region

Anyone can get these products by Real-time JPEG imagery service through MSC website for Asia-Oceania region via the Internet.

<http://ds.data.jma.go.jp/mscweb/data/himawari/index.html>

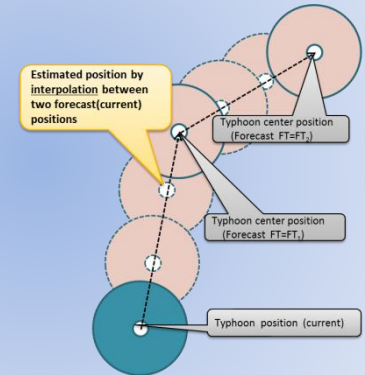
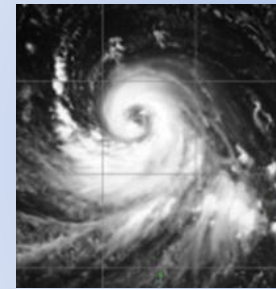
Providing imagery on MSC website

- Easy access to Himawari imagery
- Processed into sectored images in JPEG format for
 - Australia
 - Central Asia
 - Pacific Islands
 - Southeast Asia

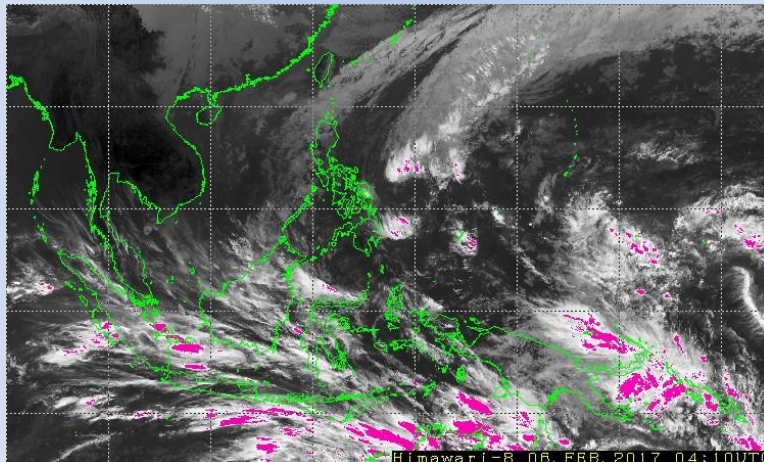
and more....

on real-time basis with animation in the last 23 hours

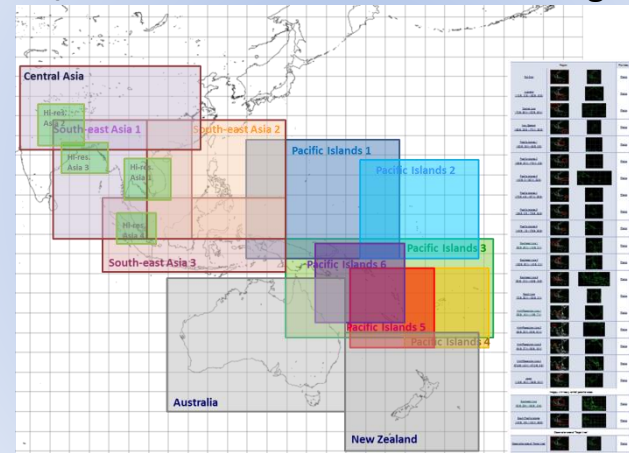
Target area observation



Imagery with heavy rainfall potential areas



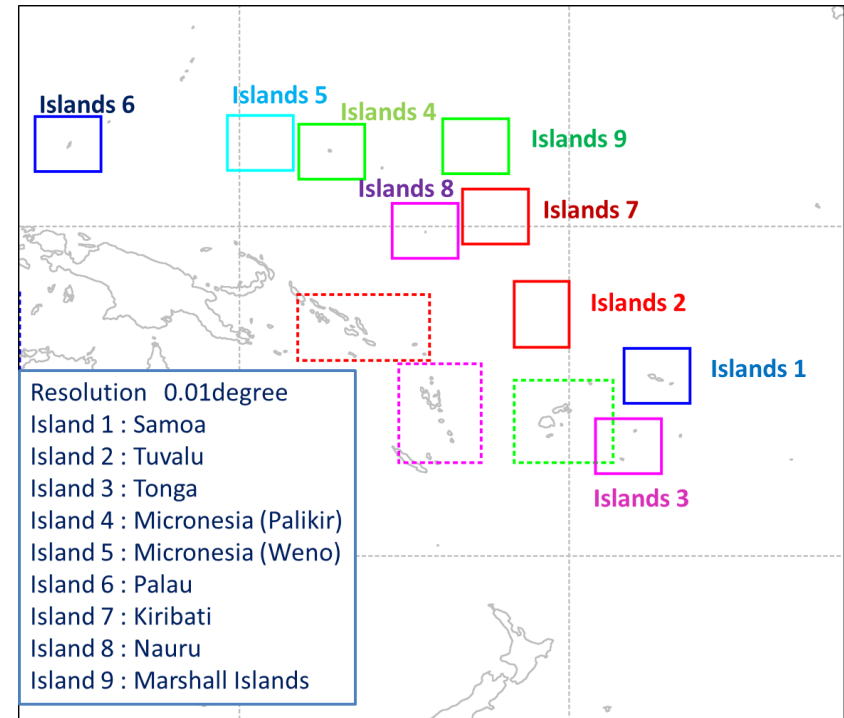
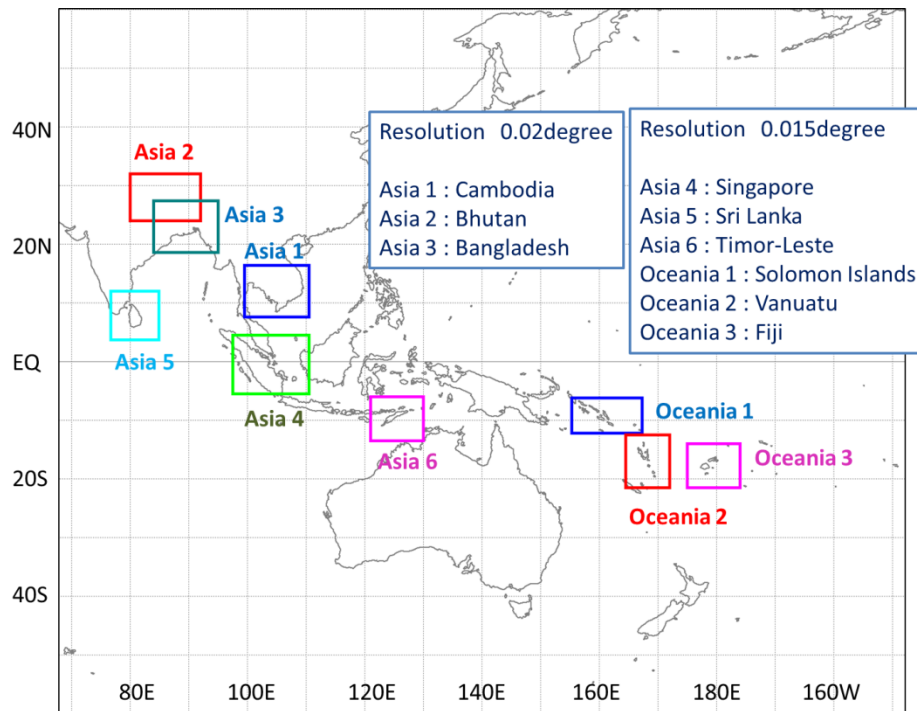
Real-time JPEG Imagery Service through JMA/MSC Website for Asia-Oceania Region



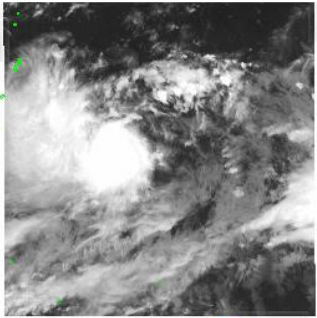
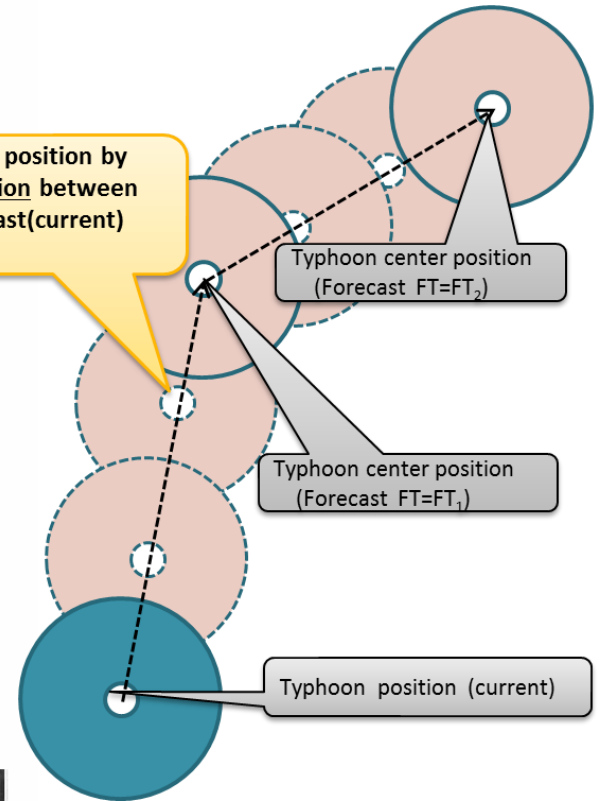
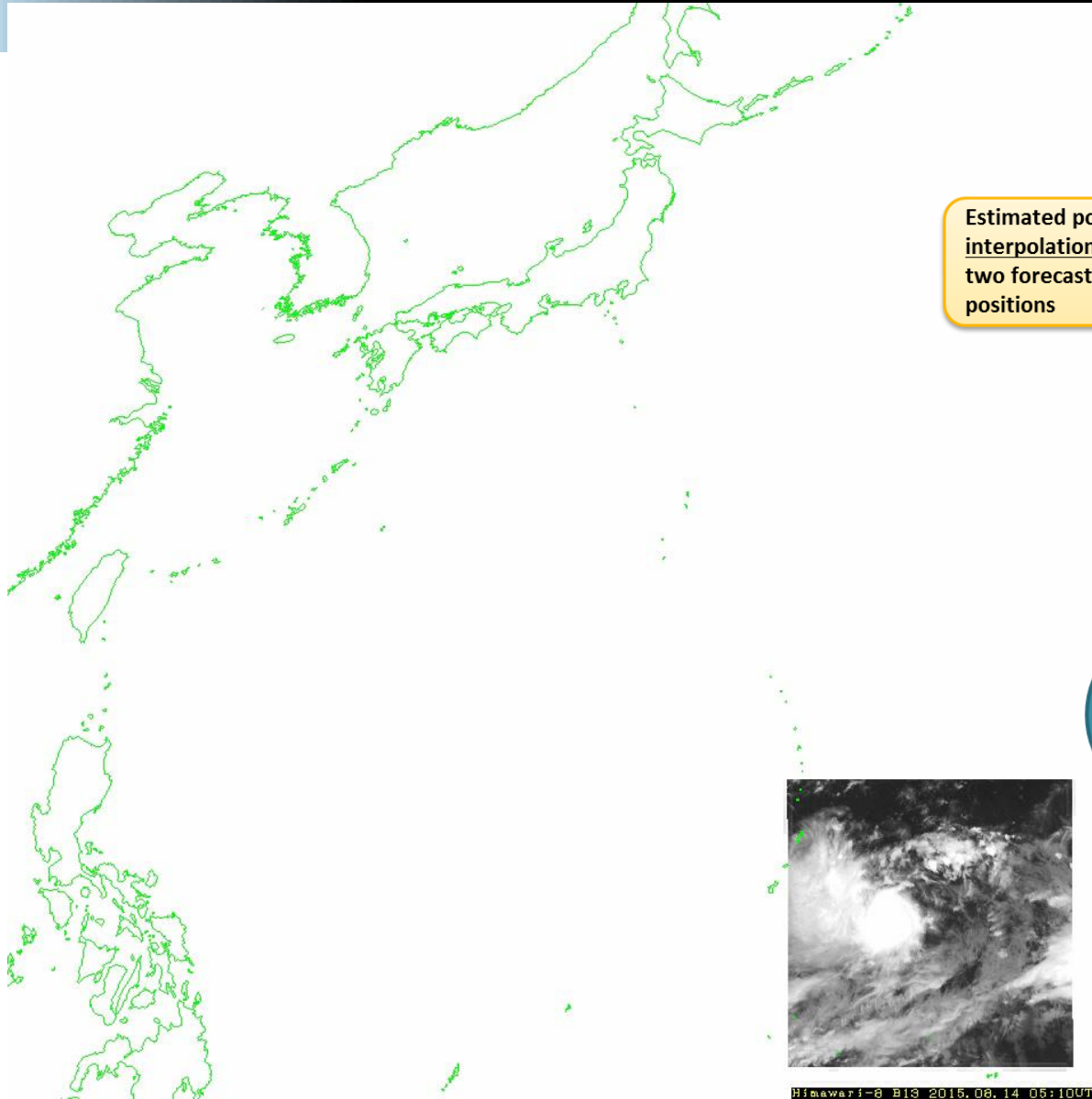


Real-time JPEG Imagery Service on JMA/MSC Website for Oceania Region

JMA/MSC provide high resolution imagery with tiny file size via the Internet to be able to get even under an unstable Internet environment.



Ex. Target area observation of T1515 (Typhoon No.15, 2015)



Himawari-8 B13 2015.08.14 06:10UTC

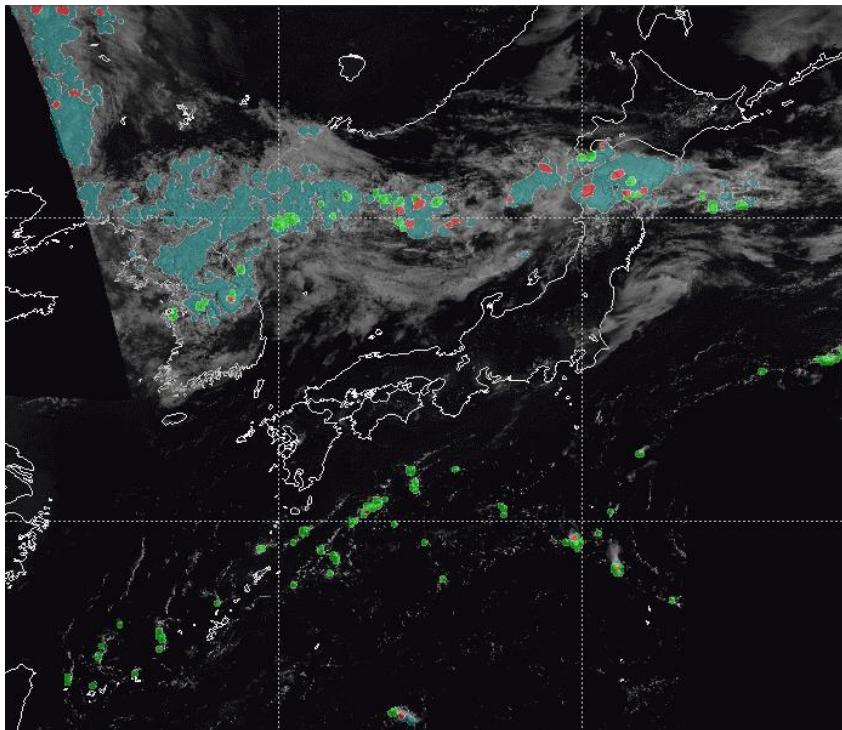
Himawari products for typhoon monitoring



- Rapidly Developing Cumulus Area (RDCA)
- High-resolution Cloud Analysis Information (HCAI)
- Water Vapor RGB
- Atmospheric Motion Vectors (AMVs)

Rapidly Developing Cumulus Area(RDCA)

- RDCA product detects rapidly developing cumulus with thunder and area of disturbance to occur in near future.



Rapidly Developing Cumulus Area (RDCA)

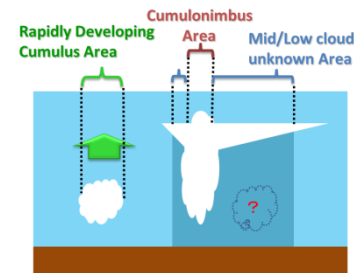
- ✓ Developing cumulus
- ✓ Current/Future disturbance is expected

Cumulonimbus Area

- ✓ A round top, except for anvil cirrus
- ✓ Strong upward flow is expected

Mid/Low Cloud Unknown Area

- ✓ Anvil cirrus
- ✓ Anvil cirrus hides clouds below

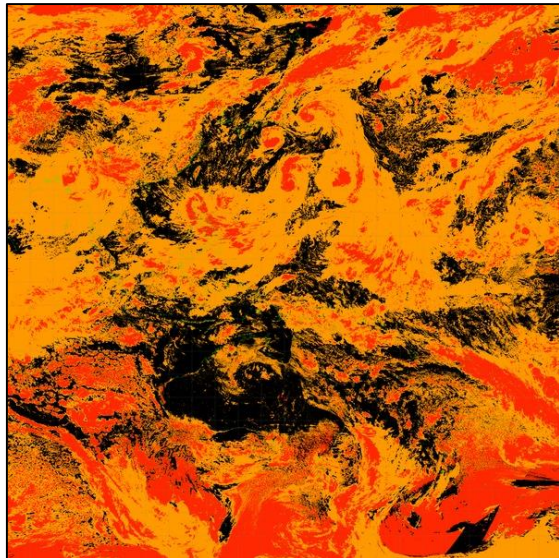


High-resolution Cloud Analysis Information (HCAI)

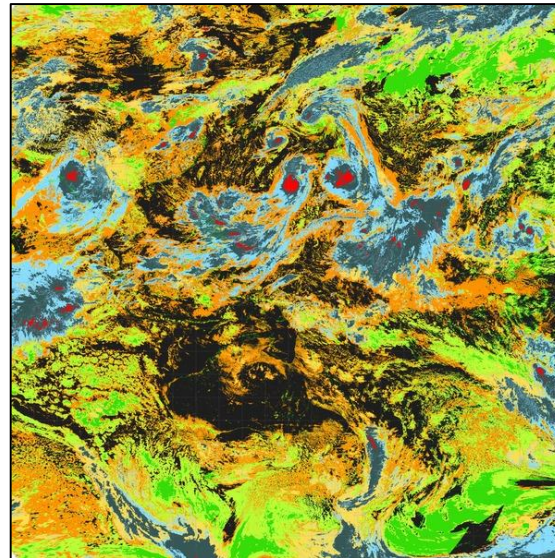


- Cloud mask, type and top height (0.02 degree latitude/longitude grids)
- Currently, MSC provides selected area data to Hong Kong, Indonesia, Kiribati, Malaysia, Mongolia, Myanmar, Singapore, Tonga and Viet Nam via the Internet.

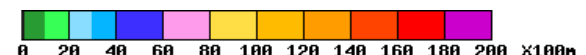
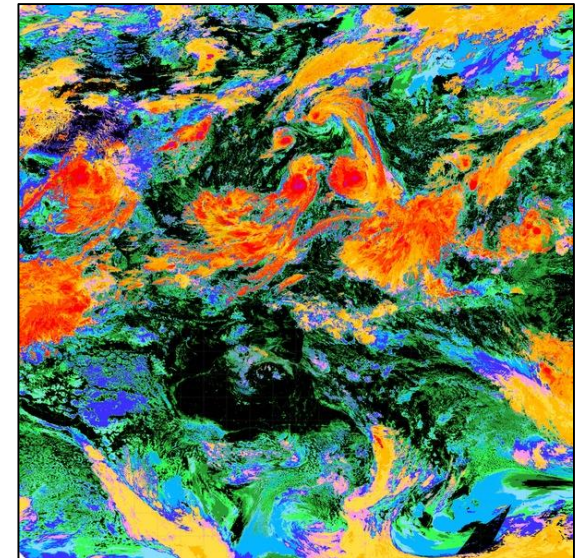
Cloud Mask



Cloud Type



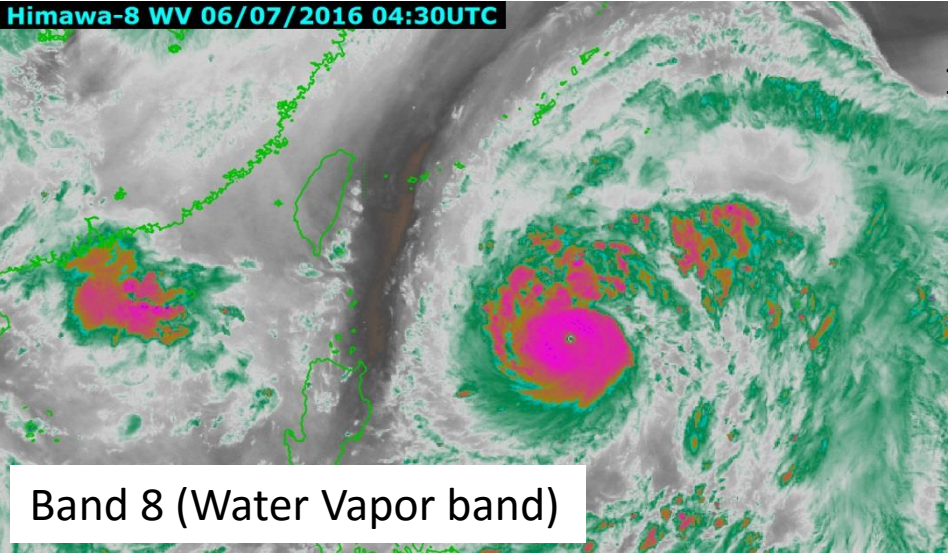
Cloud Top Height



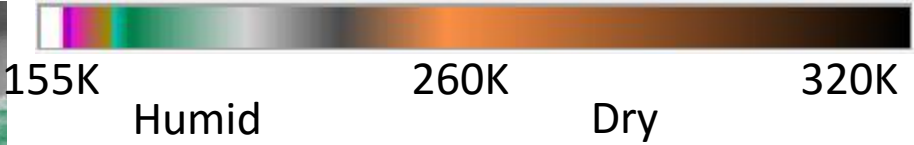


Water Vapor RGB

Himawa-8 WV 06/07/2016 04:30UTC



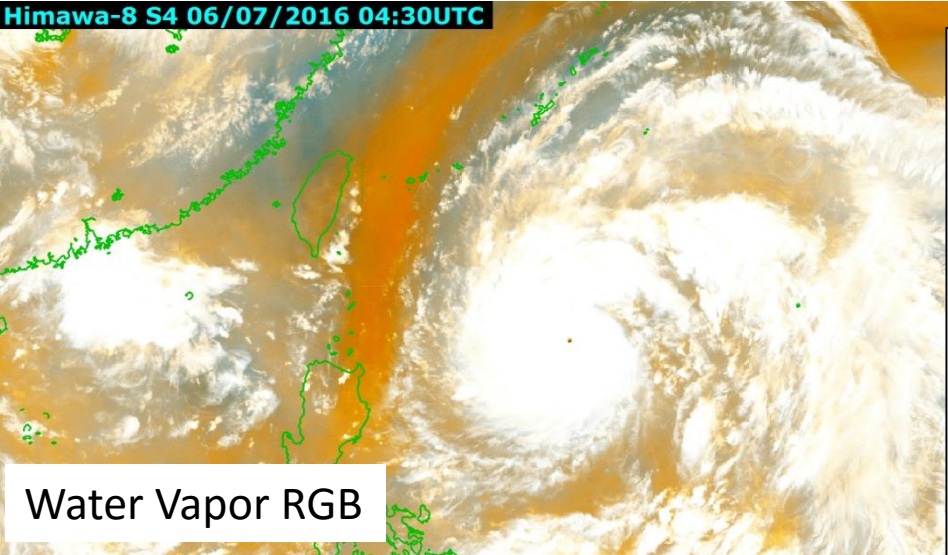
Band 8 (Water Vapor band)



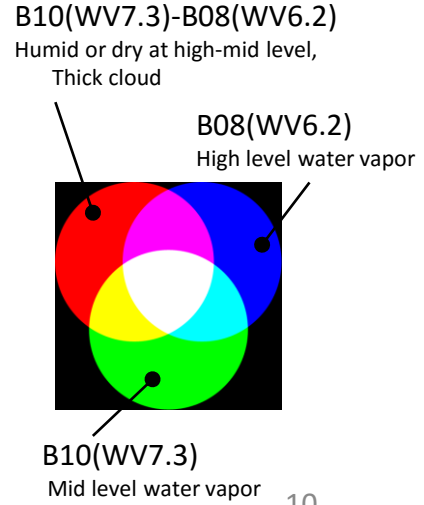
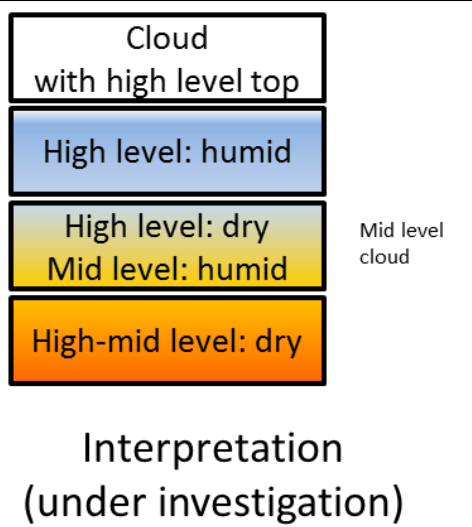
Colorized WV image is useful to grasp the water vapor distribution of upper level.

While Water Vapor RGB has information of lower level water vapor distribution (e.g. different moisture profile).

Himawa-8 S4 06/07/2016 04:30UTC



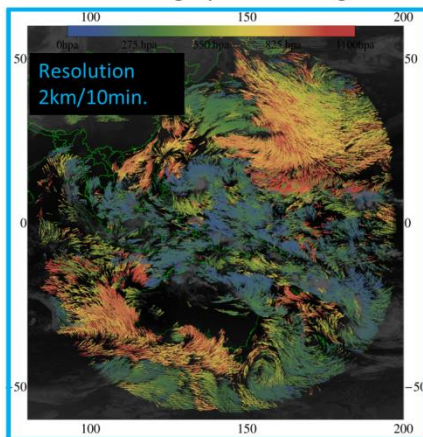
Water Vapor RGB



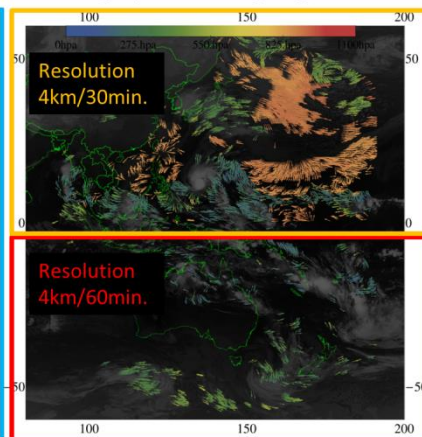
Atmospheric Motion Vectors (AMVs)

AMV is a satellite-derived product that is to estimate the altitude and motion vector of clouds from satellite imagery. It will be used for typhoon analysis, and be used as initial value by numerical forecast.

Himawari-8 AMVs derived from Himawari-8 imagery with new algorithm

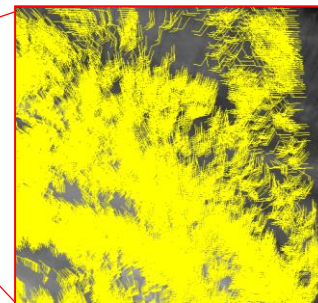
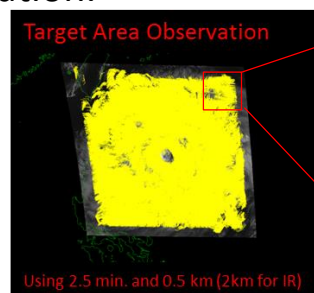
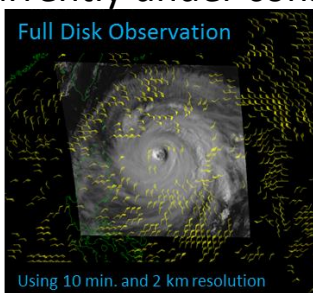


MTSAT-2 AMVs derived from MTSAT-2 imagery and heritage algorithm



- In the past, AMV was calculated from the difference of images at 30-minute intervals in northern hemisphere using MTSAT-2.
- In southern hemisphere, calculated by images at 60-minute intervals.
- Now, AMV is calculated by using Himawari-8 full disk observation at 10-minute intervals.
- As not only temporal but also spatial resolution is higher than MTSAT-2, detection numbers of AMVs is increasing.

Calculation of AMVs using target area observation is currently under consideration.



- Improvement to temporal and spatial resolution.
- Detection of lower layer.
- Particularly, the data of the lower layer may be used for estimating the area of windstorm or strong wind.

Data distribution/dissemination methods



Two Ways of Himawari-8/9 Imagery Dissemination/Distribution

HimawariCast via Communication Satellite

- JMA's Baseline for Imagery Dissemination
- 14 bands (1 Vis. And 13 IR) every 10 minutes for Full Disk
- Coarse Spatial Resolution as of MTSAT HRIT compatible
- Meteorological data and products in SATAID format
- No Pass Code for Receiving

HimawariCloud via the Internet

- Full Specification (temporal and spatial) of Imagery
- Himawari Standard Format
- HRIT files(same as the ones disseminated via HimawariCast)

Data distribution/dissemination methods

Himawari-8/9

Communication Satellite (CS)

raw data

HimawariCast
service

HRIT files,
SATAID files

CS Operator

All imagery
(full data)

Internet

HimawariCloud
service

NMHSs

Users



C-band antenna



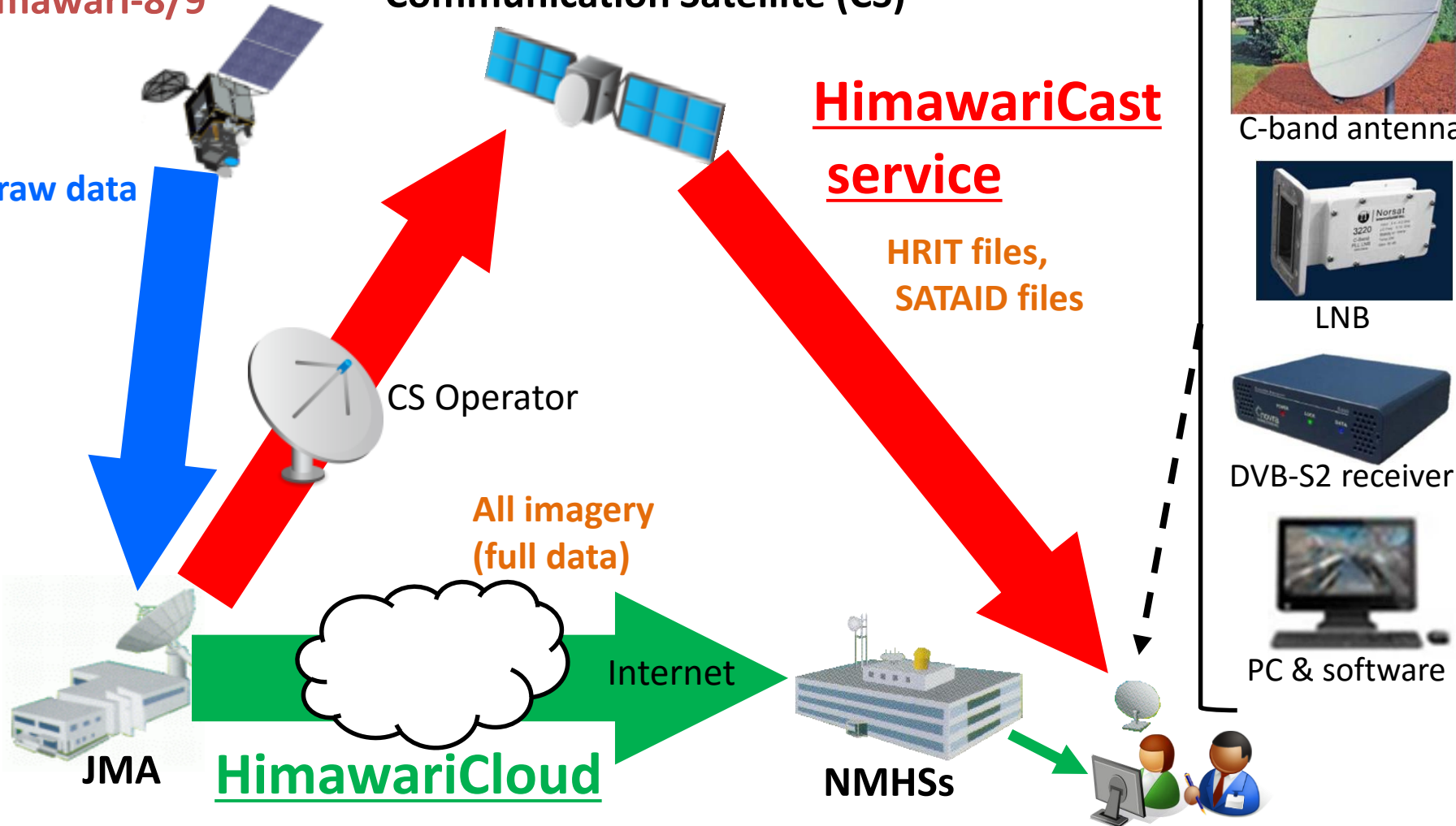
LNB



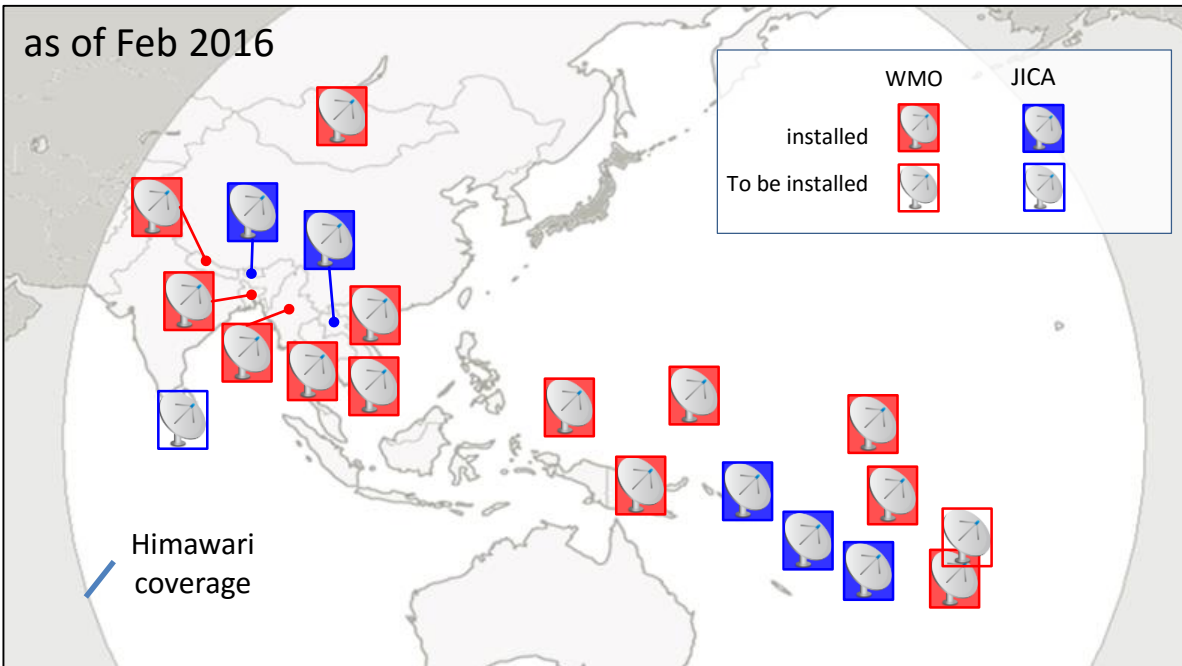
DVB-S2 receiver



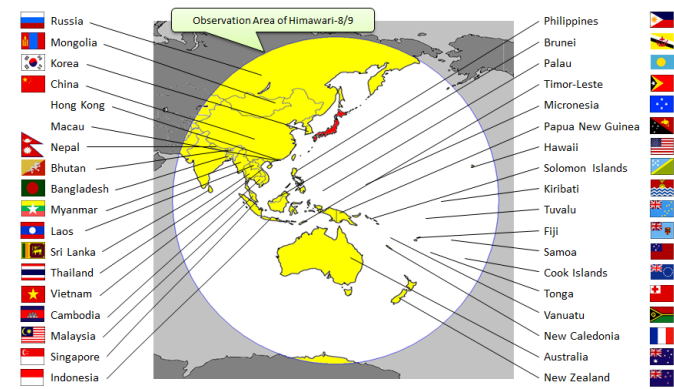
PC & software



Cooperation on HimawariCast installation



Himawari users in Asia/Pacific region



- HimawariCast system is intended to ensure reception of Himawari imagery for the use in operational meteorological services even in an unstable Internet environment or even in the case of Internet failure.
- A set of HimawariCast receiving system has been installed (or will be installed) to almost 20 NMHSs in RA II and RA V through the WMO/JMA project or JICA's project.



Training Seminars on HimawariCast System

- **Training seminars for individual NMHSs**

- JMA dispatches experts to each NMHS after the installation of HimawariCast receiving system.
- Training seminars include...
 - Basics of satellite imagery analysis
 - Utilization of Himawari-8's 16 bands
 - Analysis training using the SATAID software ... and so on.
- Feedbacks from NMHSs help to improve JMA services.

2015.11	Thailand
2015.11	Cambodia
2015.12	Vietnam
2015.12	Myanmar
2015.12	Malaysia
2015.12	Bangladesh
2016.1	Tuvalu
2016.2	Philippines
2016.4	Micronesia
2016.4	Palau
2016.6	Bhutan
2016.9	Fiji
2016.9	Vanuatu
2016.11	Papua New Guinea
2016.11	Mongolia
2016.12	Solomon Islands
2017.1	Tonga
2017.1	Kiribati
2017.3	Nepal



Change of Communication Satellite for HimawariCast

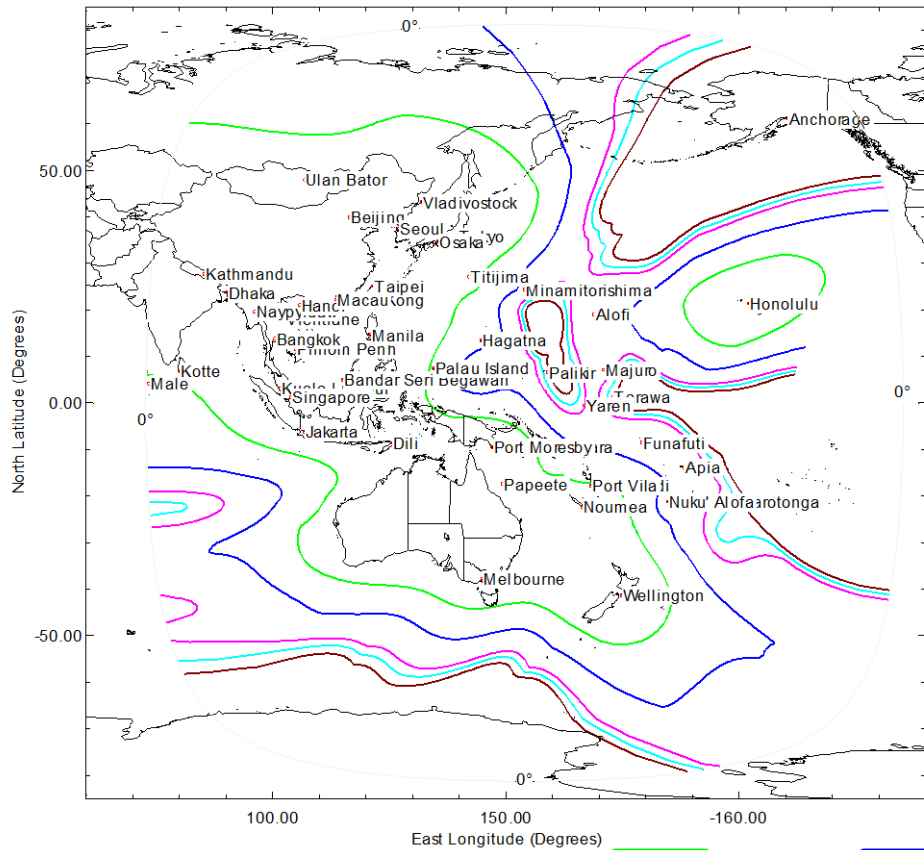


Communication satellite was changed in Jul. 2016

JCSAT-2A

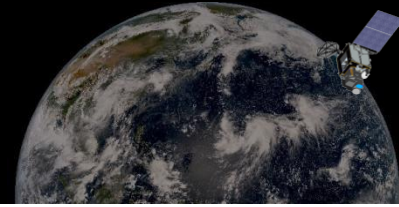


JCSAT-2B



Diameter of antenna needed: 1.8 m 2.4 m 3.8 m 4.5 m 5.0 m

Summary and Future Plan



- Himawari-8 has greatly improved observation ability of the resolution on space, time and spectrum compared to MTSAT-2.
- As a result of the installation of HimawariCast, the environment of data usage has been almost improved.
- JMA would like to:
 - develop more products and actively distribute useful products to the Members of Typhoon Committee in order to maximize effective use of Himawari data.
 - make products based on the requirement of the Members.
 - support to make product which is tailored to circumstances of each country through joint development as necessary.
 - contribute to the promotion of the use of products by Members through training continuously.



Thanks for your attention.

JMA welcomes feedbacks from Typhoon Committee