

# Practical Training on the utilization of Himawari-8,9 Imagery using **SATAID**



Taro HANDA

Meteorological Satellite Center / Japan Meteorological Agency

AOMSUC-12

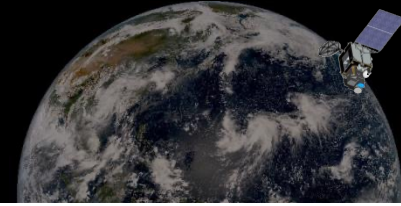
11<sup>th</sup> November 2022

*2014 Himawari-8*

*2016 Himawari-9*



# Contents

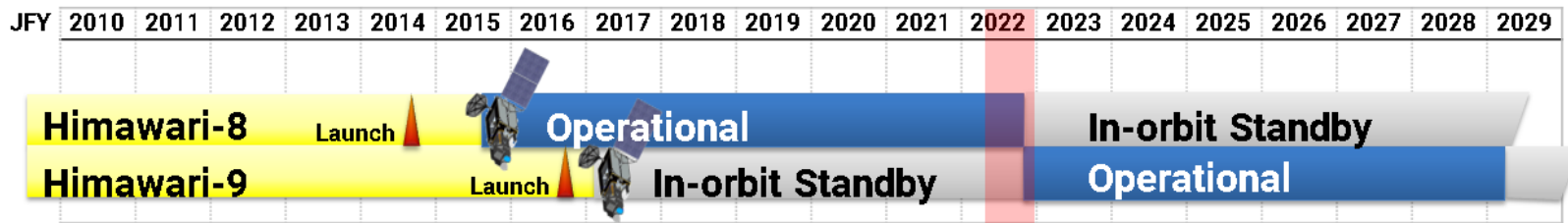


- **Practical Training on the utilization of Himawari-8, 9 Imagery using SATAID **HANDA Taro****
  - Overview of Himawari-8/9, RGB composite imagery and RGB quick guides
  - How to display RGB composite imageries etc. using SATAID.
- **Introduction to Himawari-8 imagery applications with case studies**
  - Case1 : Huge Volcanic eruption in Tonga **NAIKI Shiho**
  - Case2 : Typhoon Nanmadol (T2214) **SAITO Kotaro**

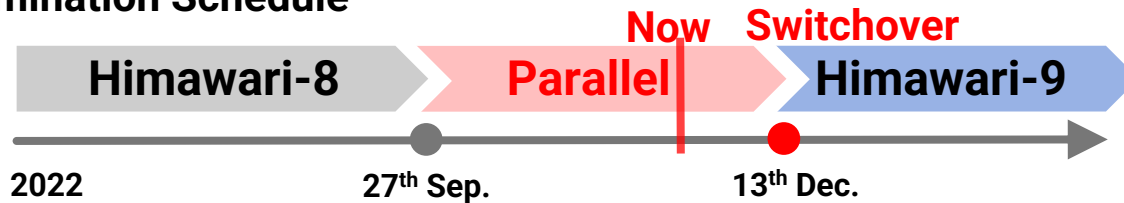
# Overview of Himawari-8, 9



## ★ Himawari-8, 9 Operation Plan



## Dissemination Schedule



## ★ Satellite conceptual diagram

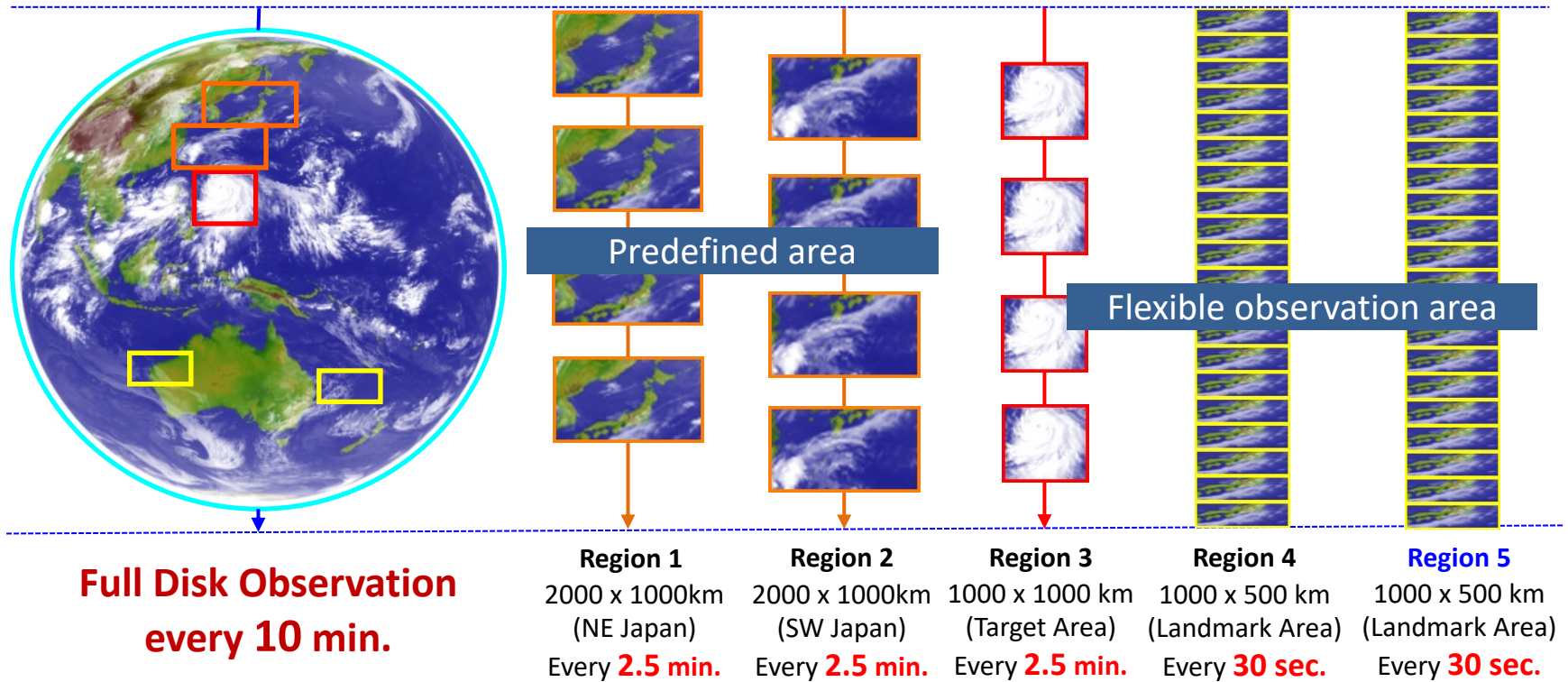


## ★ Satellite spec

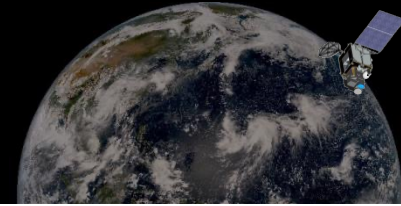
Total length	Approx. 8m
Weight	Approx. 3,500kg (including fuel) Approx. 1,300kg (only main unit)
Initial generated power	Approx. 2.6kW
Design lifetime	Over 15 years (main unit) Over 8 years (observation functions)



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



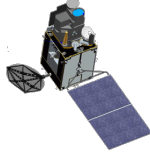
- AHI (Advanced Himawari Imager) on Himawari-8 has the ability of various scans during 10 minutes Full Disk observation.
- AHI can flexibly change the scan range of **“Target Area”** for observation of phenomena such as **typhoons** and **active volcanoes**.
- Lunar observation: performed using Landmark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



# AHI Spectral Bands

## (5 bands -> 16bands)

### Himawari-8/9 Imager (AHI; Advanced Himawari Imager)



cf. MTSAT-2 Bands



VIS  
0.68 μm

IR4  
3.7 μm

IR3  
6.8 μm

IR1  
10.8 μm

IR2  
12.0 μm

Band	Spatial Resolution	Central Wavelength	Physical Properties
1	1 km	0.47 μm	vegetation, aerosol
2		0.51 μm	vegetation, aerosol
3		0.5 km	0.64 μm
4	1 km	0.86 μm	vegetation, aerosol
5	2 km	1.6 μm	cloud phase/particle size
6		2.3 μm	cloud particle size
7		2 km	3.9 μm
8	6.2 μm		upper-level moisture
9	6.9 μm		mid- and upper-level moisture
10	7.3 μm		mid-level moisture
11	8.6 μm		cloud phase, SO <sub>2</sub>
12	9.6 μm		Ozone content
13	10.4 μm		cloud imagery, information of cloud top
14	11.2 μm		cloud imagery, sea surface temperature
15	12.4 μm		cloud imagery, sea surface temperature
16	13.3 μm		cloud top height

3 Visible Bands

Addition of NIR Bands

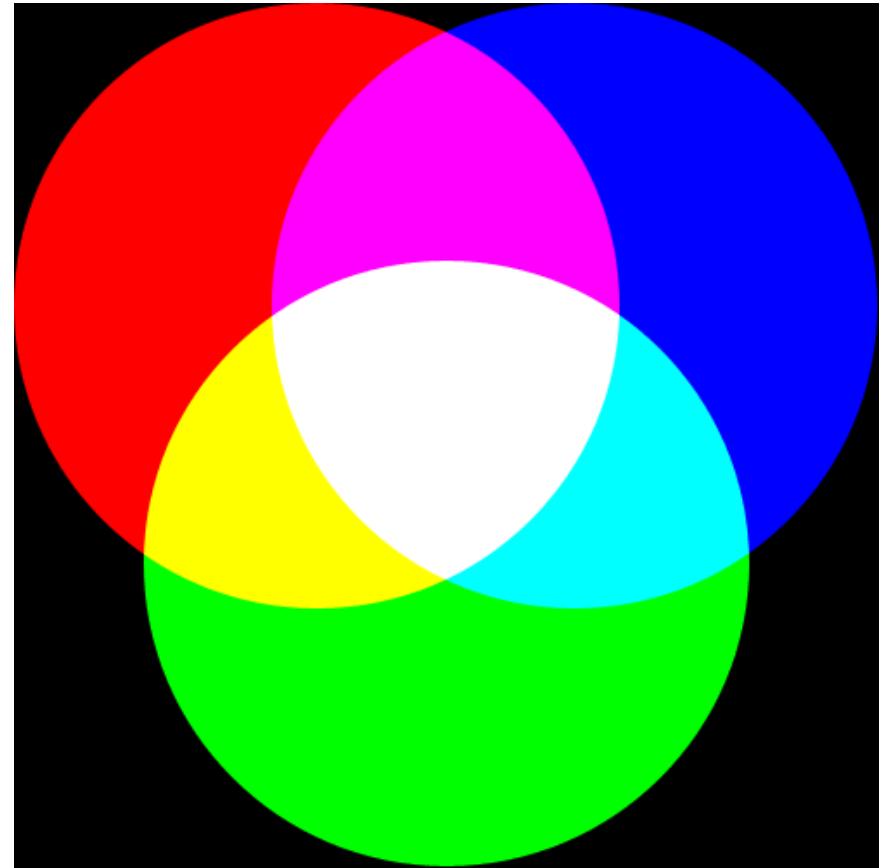
Increase of WV Bands

Increase of TIR Bands

# What's RGB?



- Red (R), green (G) and blue (B), which are the three primary colors of light, constitute color space expressing additive color composite
- RGB compositing is a technique to display a color using this property of the three primary colors of light



three primary colors RGB



# Application to Satellite Imageries

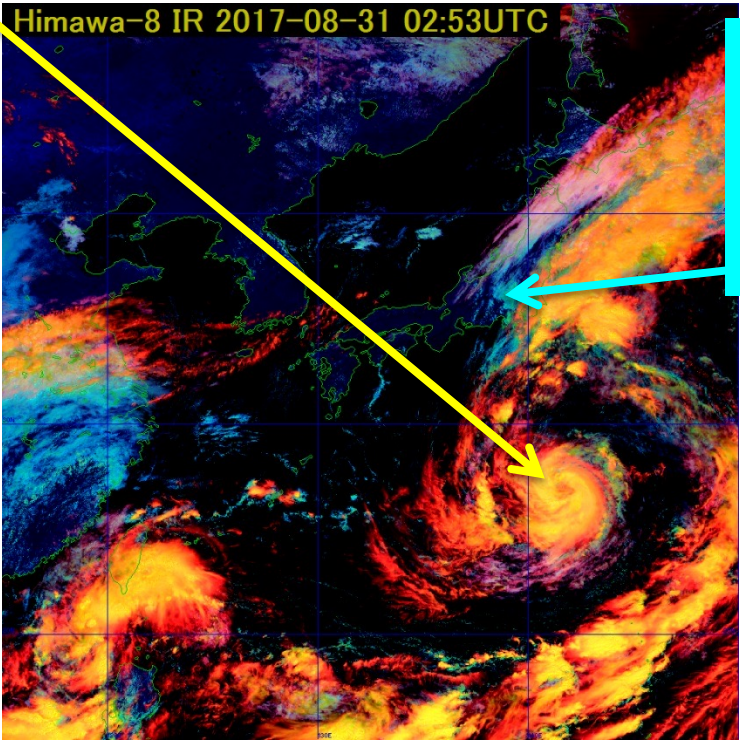
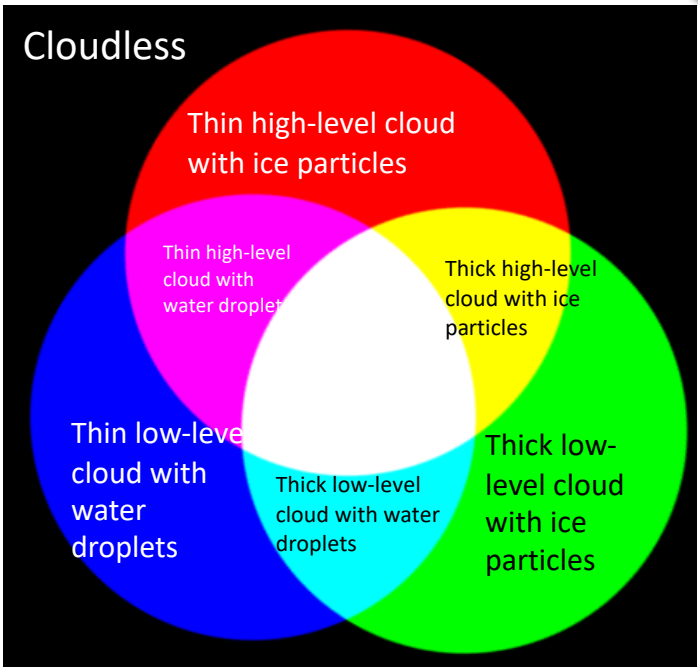
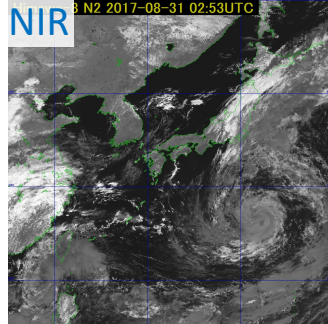
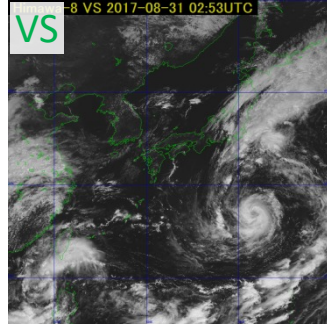
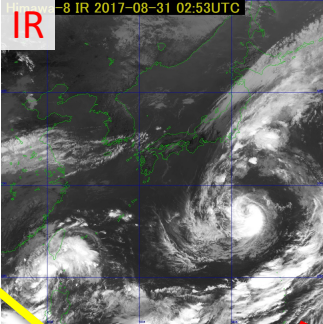
## RGB composite

Thick and high cloud (Cb) areas appear yellow!

“High” cloud

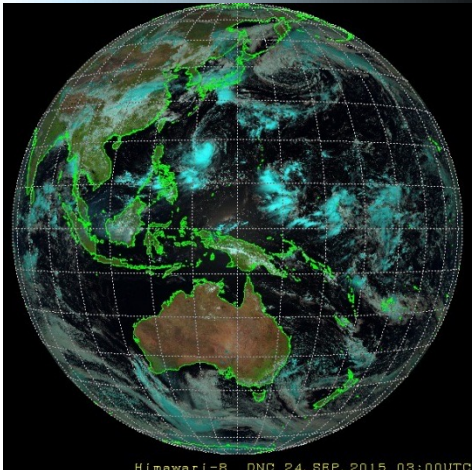
“Thick” cloud

“Ice” cloud

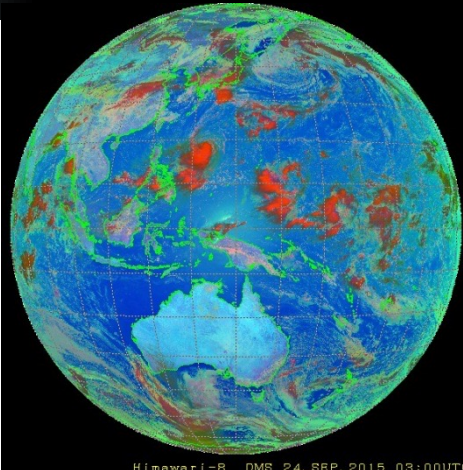


If you want to focus on the low level clouds, look at cyan area.

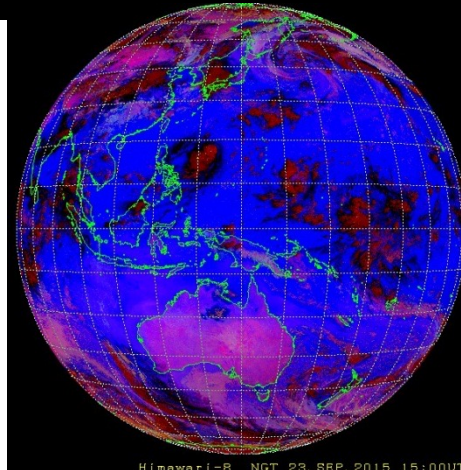
# Well-known RGBs from Himawari-8



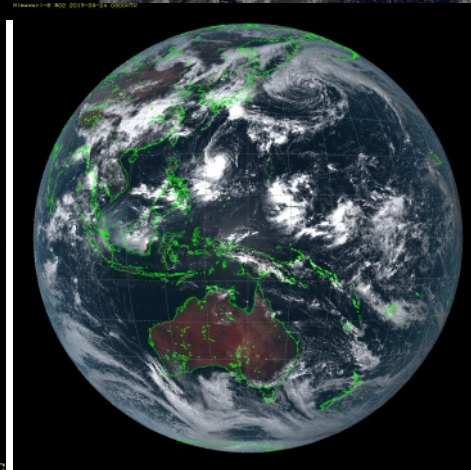
Day Natural Colors



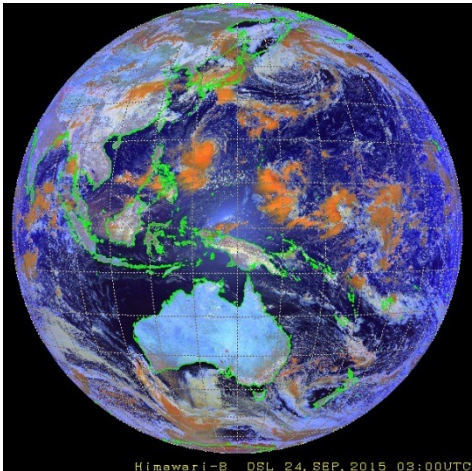
Day Microphysics



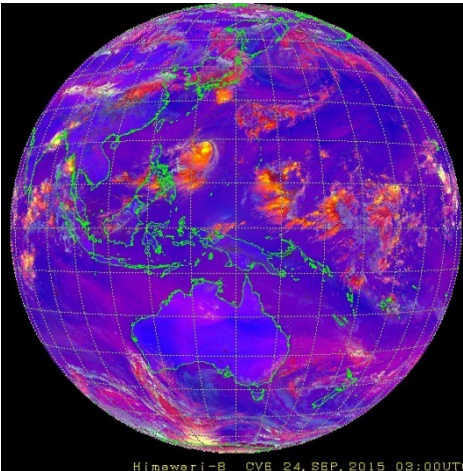
Night Microphysics



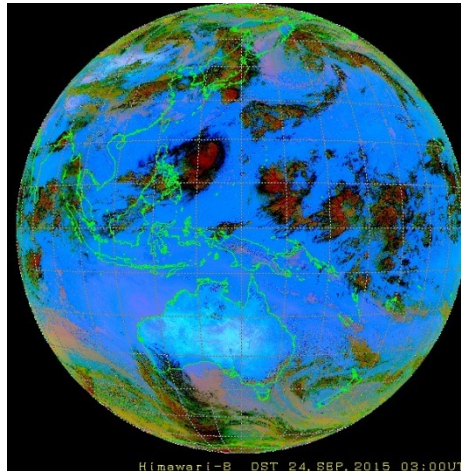
True Color



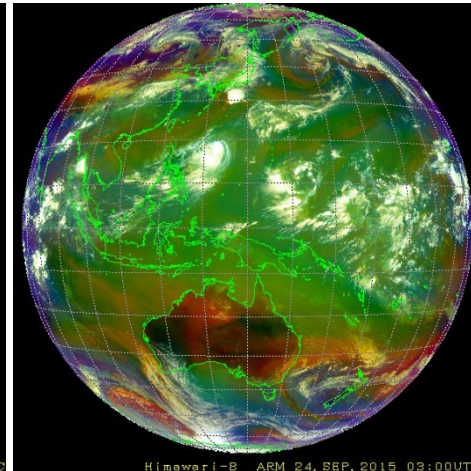
Day Snow-Fog



Day Convective Storm



Dust



Airmass



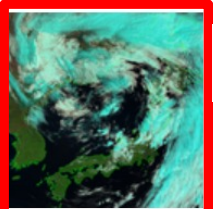


# RGB Quick Guides

## Himawari RGB Quick Guides

Click on an RGB name or image to download the relevant content.

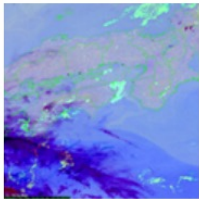
### WMO-recommended schemes



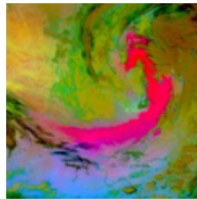
Natural Colors



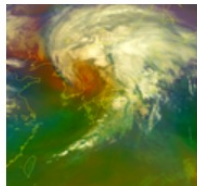
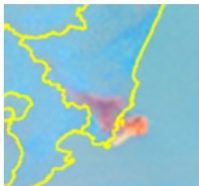
Day Snow-Fog



Night Microphysics



Dust



RGB Quick Guide Web page in MSC Website

Ver.1.0

Meteorological Satellite Center (MSC) of JMA

## Himawari Natural Color RGB Quick Guide

**Main applications:** Determination of surface characteristics (snow, vegetation, bare soil) and ice/water clouds

**Benefits:**

- Facilitation of determination between high-level ice clouds and low-level water clouds
- Facilitation of intuitive surface characteristic identification (green vegetation, brown bare soil, blue snow/ice)

**Limitations:**

- Available for daytime only
- Similarity between the color of high-level ice cloud and snow-/ice-covered surfaces
- Issues with cyan areas sometimes containing both ice and water clouds with large droplets due to low B05(1.6μm) signal contribution

Typhoon Noru with Natural Color RGB display at 02:38 UTC on 4 August 2017

This image shows Typhoon Noru (T1705) approaching southwestern Japan. A detailed structure with whitish low-level clouds (indicated by the red arrow) is seen inside the eyewall.

Low-level clouds, including fog, drifting to southeastern Australia (21:00 UTC, 17 November 2017)

- A  : bare ground or desert
- B  : vegetation
- C  : thick low-level cloud
- D  : thick high-level cloud
- E  : ocean

RGB composition with recommended thresholds and related specifications for Natural Color RGB

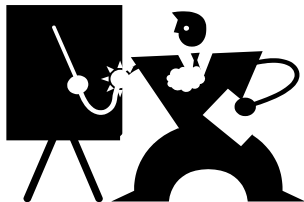
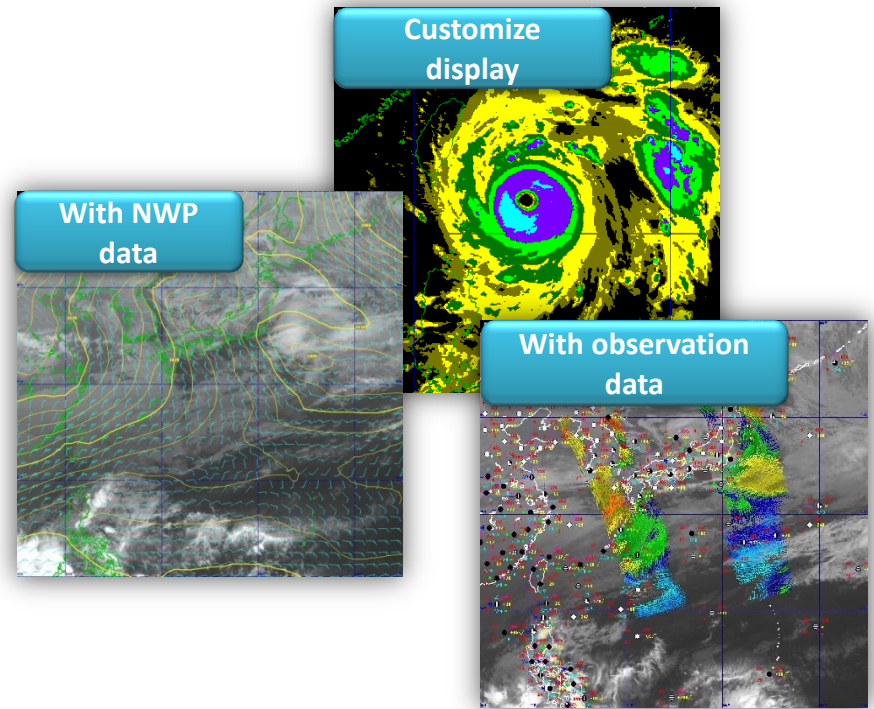
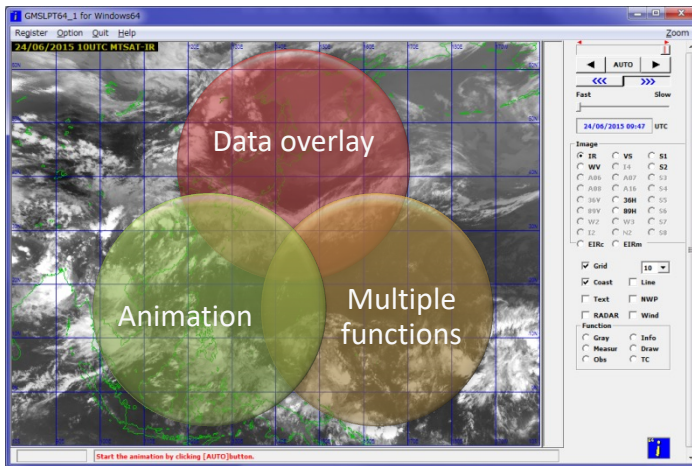
Color	AHI bands	Central wave length [μm]	Min [%]	Max [%]	Gamma	Physical relation to	Smaller contribution to signal of	Larger contribution to signal of
Red	B05	1.6	0%	99%	1.0	Cloud phase Snow and ice	Ice clouds Snow-covered land/sea ice	Water clouds
Green	B04	0.86	0%	102%	0.95	Cloud optical thickness Green vegetation	Thin clouds	Thick clouds Snow-covered land Vegetation

Detailed data is displayed



# What is SATAID?

SATAID (**SAT**ellite **A**nimation and **I**nteractive **D**iagnosis) is a sophisticated display software visualizing meteorological information in multiple dimensions (spatial and temporal), which assists forecasters to analyze and monitor continually weather parameters and phenomena for better meteorological services.



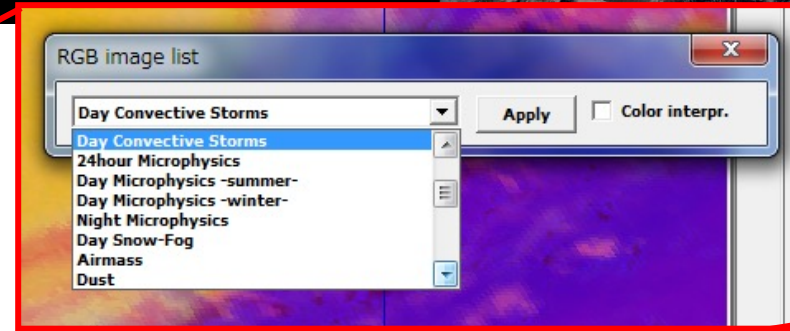
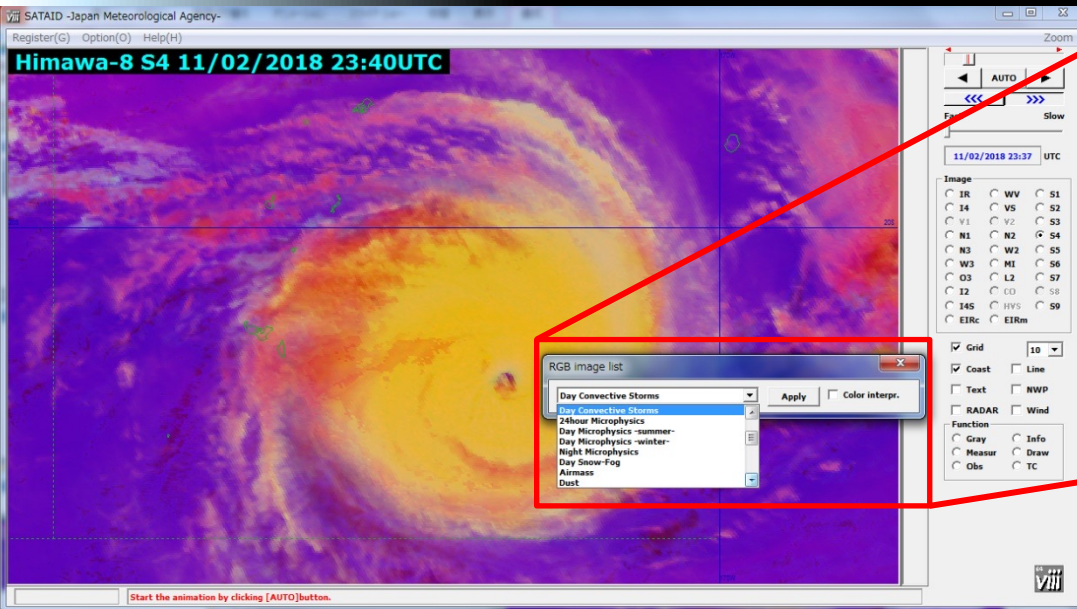
**More efficiently  
and accurately!**

# What can we do by using SATAID?



- With SATAID, you can ...
  - **Display (and overlay) satellite imagery and NWP data**  
(and various observations i.e. SYNOP, SHIP, TEMP, Radar, Wind Profiler, ASCAT etc. if its format prepared)
  - **Use many functions**  
vertical cross-sectional chart, time-series chart, digital data output to CSV file.....
  - **Save as a file including a package of all data**  
your drawings and comments, which will be useful for trainings and case study archives
  - **Analyze position and intensity of tropical cyclones**

# RGB composite imagery on SATAID

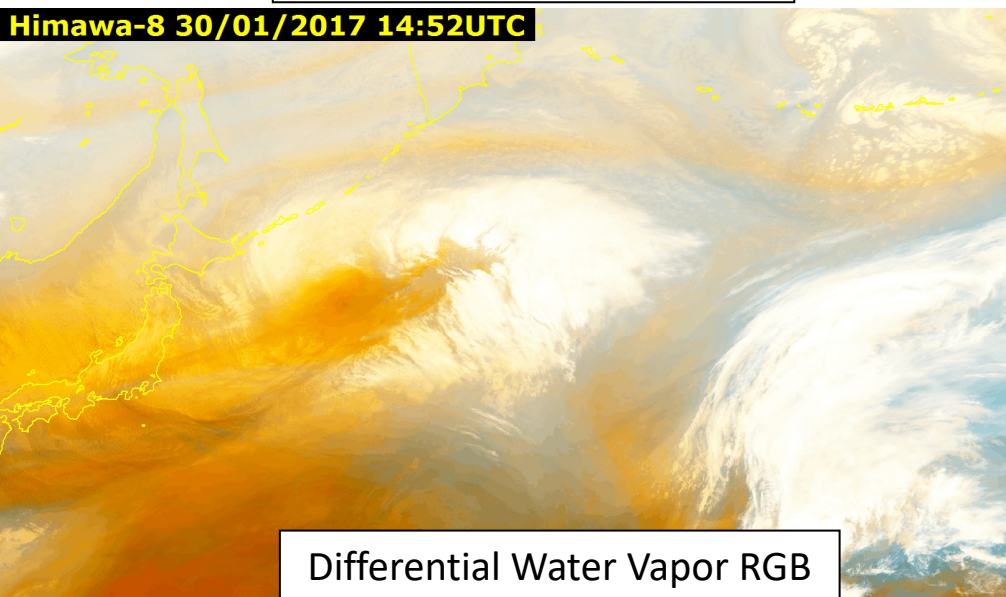
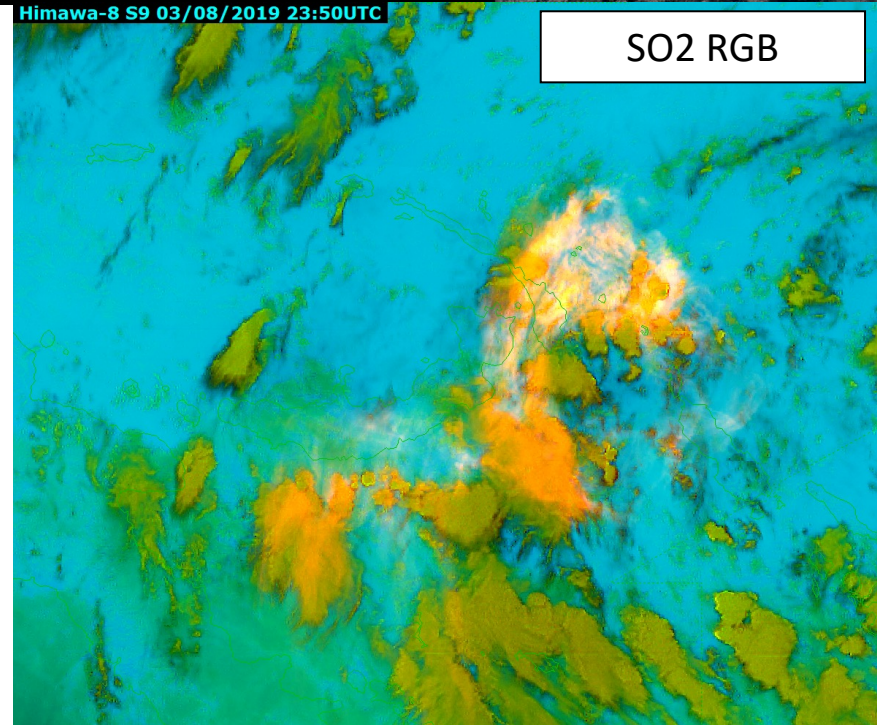
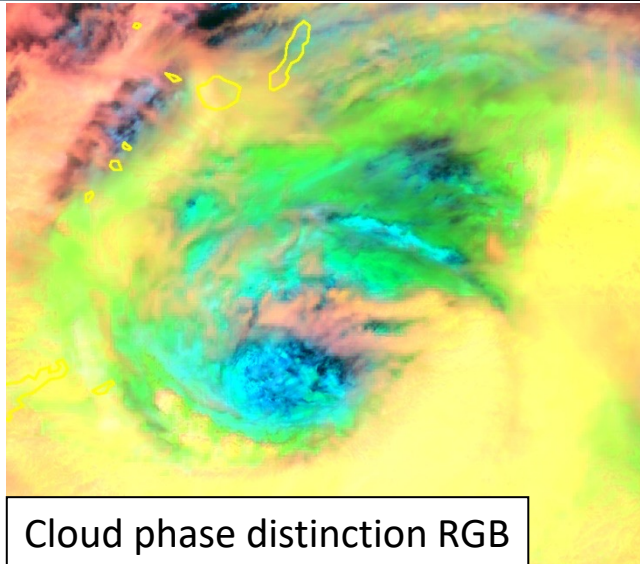


RGB recipe data

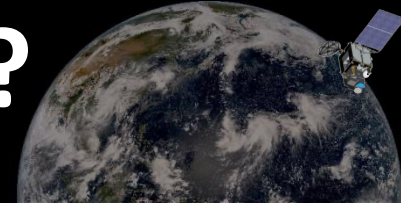
Title	ImageR	ImageG	ImageB	MinR	MaxR	MinG	MaxG	MinB	MaxB	GammaR	GammaG	GammaB
Tropical Day Convecti...	S4(W3-...	S2(I4-I...	S7(N2-...	-5.0	36.0	-1.0	76.0	-0.8	0.25	1.0	0.33	0.95
Tropical Airmass	S3(IR-...	S6(IR-...	WV	-4.7	25.8	-25.5	31.2	190.2	242.6	1.0	0.5	1.0
Tropical Night Microp...	S1(IR-12)	S2(I4-IR)	IR-	-3.0	7.5	-2.2	2.9	273.3	300.1	1.0	1.3	1.0
True Color	V5	V2	V1	0	1	0	1	0	1	1.0	1.0	1.0
Day Natural Colors	N2	N1	V5	0	0.99	0	1.02	0	1	1.0	0.95	1.0
Day Convective Storms	S4(W3-...	S2(I4-I...	S7(N2-...	-5.0	36.0	-1.0	61.0	-0.75	0.25	1.0	0.5	1.0
24hour Microphysics	S1(IR-12)	S5(IR-...	IR-	-3.0	7.5	0.8	5.8	248.6	303.2	1.0	1.3	1.0
Day Microphysics -su...	N1	145	IR-	0	1.02	0.02	0.82	203.5	303.2	0.95	2.6	1.0
Day Microphysics -wi...	N1	145	IR-	0	1.02	0.02	0.38	203.5	303.2	0.95	1.8	1.0
Night Microphysics	S1(IR-12)	S2(I4-IR)	IR-	-3.0	7.5	-7.0	2.9	243.7	293.2	1.0	1.0	1.0
Day Snow-Fog	N1	N2	I4S	0	1.02	0	0.68	0.02	0.45	1.6	1.7	1.95
Airmass	S4(W3-...	S6(IR-...	WV	0	25.8	-4.3	41.5	208	242.6	1.0	1.0	1.0
Dust	S1(IR-12)	S5(IR-...	IR-	-3.0	7.5	0.9	12.5	261.5	289.2	1.0	2.5	1.0
Ash	S1(IR-12)	S5(IR-...	IR-	-3.0	7.5	-1.6	4.9	243.6	303.2	1.0	1.2	1.0
[new]Simple Water ...	IR	WV	W3	202.29	278.96	214.66	242.67	245.12	261.03	10	5.5	5.5
[new]Differential W...	S4(W3-...	W3	WV	-3	30	213.15	278.15	208.50	243.90	3.5	2.5	2.5
[new]Cloud Phase Di...	IR	V5	N2	219.619	280.6707	-0.0346	0.7792	0.0119	0.5932	1.0	1.0	1.0
[new]Day Cloud Phase	N2	N3	V5	0.0	0.5	0.0	0.5	0.0	1.0	1.0	1.0	1.0
[new]New Day Micro...	N1	N3	IR-	0.0	1.0	0.0	0.5	200	300	1.0	1.0	1.0
[new]Fire Detection	V1	N3	L2	0.1	0.95	0.0	0.5	158.15	323.15	1.0	1.0	1.0
[new]Fire Power/Te...	I4-	N3	N2	273	350	0.0	0.5	0.0	0.5	1.0	1.0	1.0
[new]NaturalFireColor	I4-	N1	V5	287.02	425.26	0.0	1.0	0.0	1.0	1.0	1.0	1.0
[new]CIRA's Natural...	N3	N1	V5	0.0	1.0	0.0	1.0	0.0	1.0	1.0	1.0	1.0
[new]Simple Fire & S...	I4-	V5	IR	287.02	425.26	0.05	0.70	230.30	302.71	1.0	1.0	1.0
[new]SO2	S9(W2-...	S5(IR-...	IR-	-6	5	-4	5	243	303	1.0	1.2	1.0
[new]Deep Clouds/D...	S3(IR-...	V5	IR-	-5	35	0.7	1.0	243.6	292.6	1.0	1.0	1.0

- SATAID can show RGB imagery easily by using RGB image list dropdown menu.
- Select the name of RGB imagery -> Apply
- The RGB list file can edit and you can add new RGB recipe.

# JMA original RGB recipes



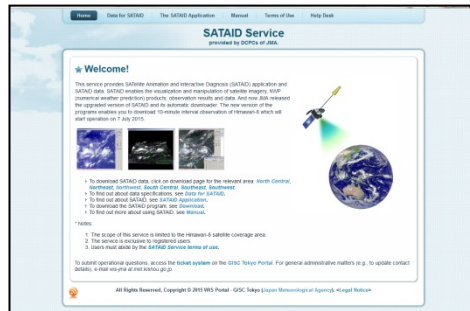
- RGB list file for SATAID includes some JMA original RGB recipes



# How can we get SATAID?

## WIS Website

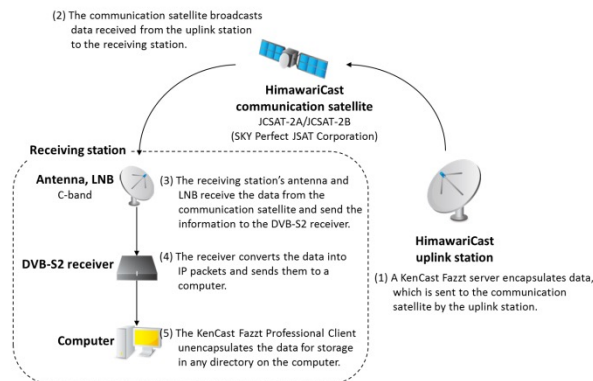
<http://www.wis-jma.go.jp/cms/sataid/>



- Internet Environment is required
- 5 channels are available every 10 minutes
- ID and Password are required  
(*wis-jma at met.kishou.go.jp*)

## Himawari-Cast

[http://www.data.jma.go.jp/mscweb/en/himawari89/himawari\\_cast/himawari\\_cast.html](http://www.data.jma.go.jp/mscweb/en/himawari89/himawari_cast/himawari_cast.html)



- Dedicated antenna and computers are required
- 14 channels are available every 10 minutes

# Hands-on training on basic SATAID functions and displaying RGBs / ASWind data



It's time to practice using main SATAID functions in order to get used to its basic operations!

Then let's take a look these case studies by SATAID modules.

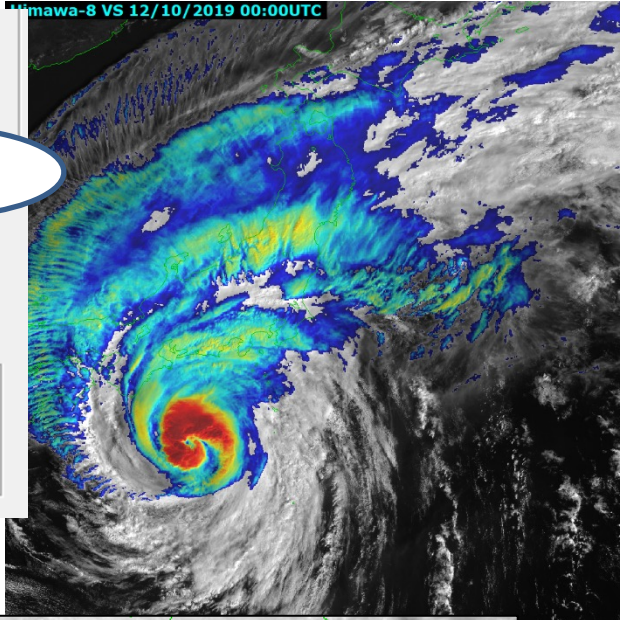
## 1. Typhoon Hagibis (T1919) approaching Japan

- 12 October, 2019 00:00 UTC – 18:30 UTC

## 2. Flood in Papua New Guinea

- 22 September, 2019 00:00 UTC– 23 September, 2019 18:30 UTC

# Overview of SATAID case study modules

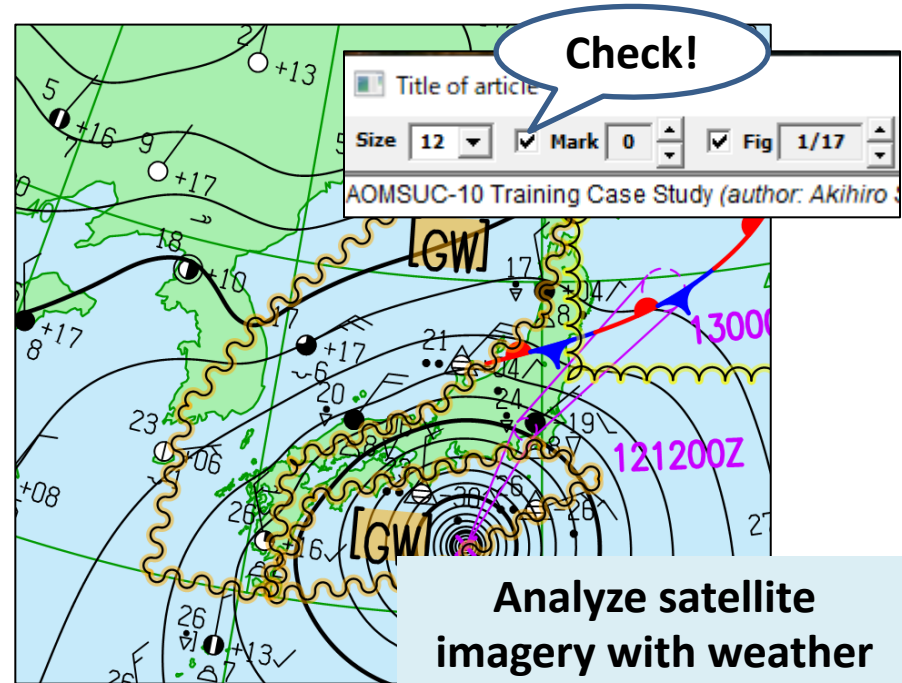


O3    L2    S7  
 I2    CO    S8  
 I4S    HVS    S9  
 EIRc    EIRm

**Text**

NWP  
 Wind

**Function**  
 Gray    Info  
 Measur    Draw  
 Obs    TC



Size  Mark  Fig   
 AOMSUC-10 Training Case Study (author: Akihiro)

Analyze satellite imagery with weather chart, observation data and so on.

When you click on the "AUTO" button in the operation panel or press the [Space] key while a satellite image is being displayed, the "AUTO" button turns to the button and animation starts.

When you click on the "STOP" button in the operation panel or press the [Space] key while animation is being displayed, the "STOP" button turns to the "AUTO" button and the animation stops.

Clicking on the ">>>" button in the operation panel or pressing the [->] arrow key while animation is being displayed shows animating images in normal sequence. Clicking on the "<<<" button or pressing the [-<] arrow button while animation is being displayed shows animating images in reverse sequence.

If you want to display figures, check Fig check box on top of this window.

- 1.1. Animation #fig.1
- 1.2. Image and Zooming #fig.2, fig.3, fig.4
- 1.3. NWP data #fig.5, fig.6
- 1.4. RADAR data
- 1.5. RGB composite imagery #fig.7, fig.8
- 1.6. ASWind data #fig.9

2. Let's take a look this case study briefly.

- 2.1. Weather chart (ASAS) #fig.10, fig.11, fig.12, fig.13  
"Drawing function" is available as you like.
- 2.2. Drawing #1 #fig.14, fig.15
- 2.3. Drawing #2 #fig.16, fig.17

Text displaying with brief explanations.

Animation makes easy to analyze satellite imagery.

Zoom

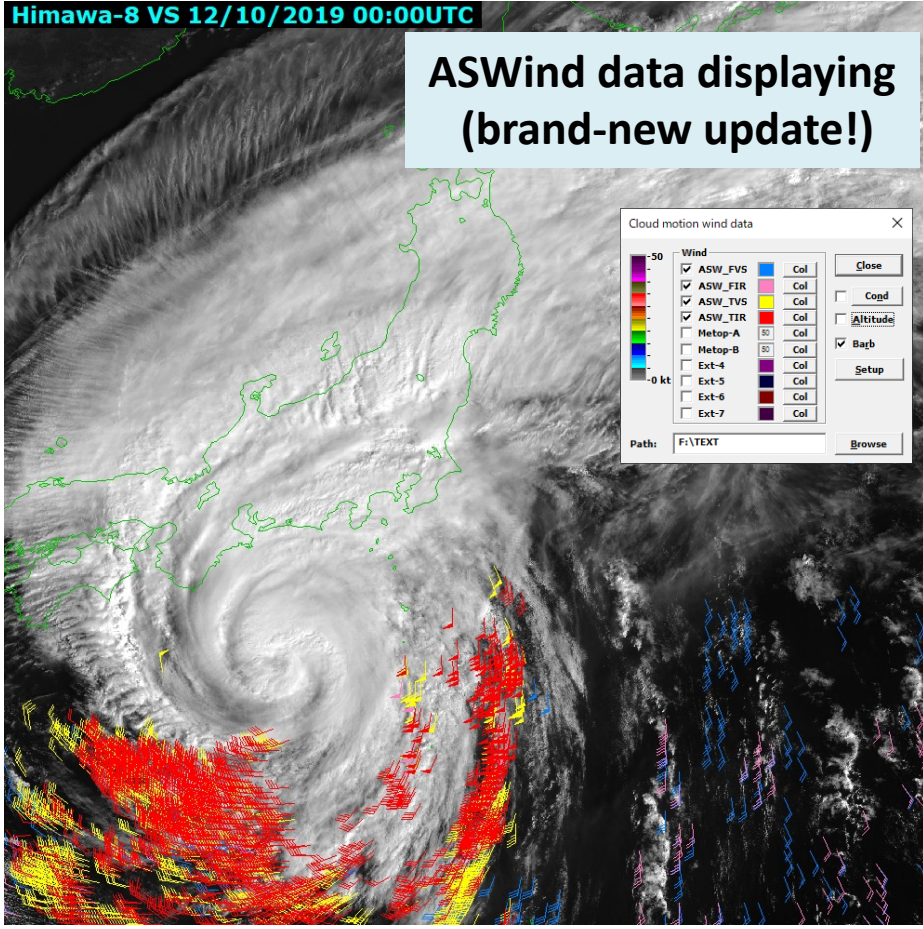


# Overview of Case 1 Typhoon Hagibis (T1919) approaching Japan



Himawa-8 VS 12/10/2019 00:00UTC

ASWind data displaying  
(brand-new update!)



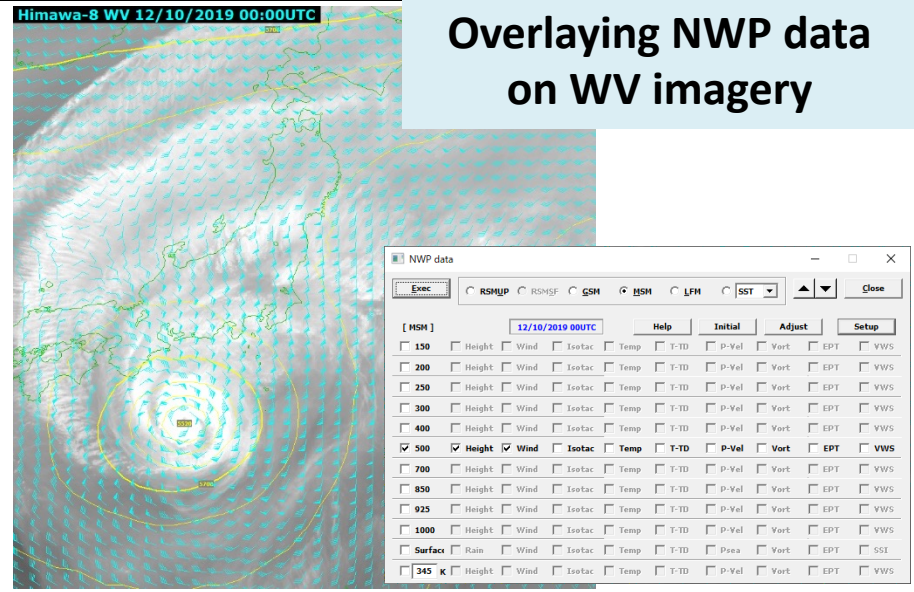
Cloud motion wind data

Wind	Col	Close
<input checked="" type="checkbox"/> ASW_FVS	Col	
<input checked="" type="checkbox"/> ASW_FIR	Col	
<input checked="" type="checkbox"/> ASW_TVS	Col	
<input checked="" type="checkbox"/> ASW_TIR	Col	
<input type="checkbox"/> Metop-A	Col	
<input type="checkbox"/> Metop-B	Col	
<input type="checkbox"/> Ext-4	Col	
<input type="checkbox"/> Ext-5	Col	
<input type="checkbox"/> Ext-6	Col	
<input type="checkbox"/> Ext-7	Col	

Path: F:\TEXT    Browse

Himawa-8 WV 12/10/2019 00:00UTC

Overlaying NWP data  
on WV imagery



NWP data

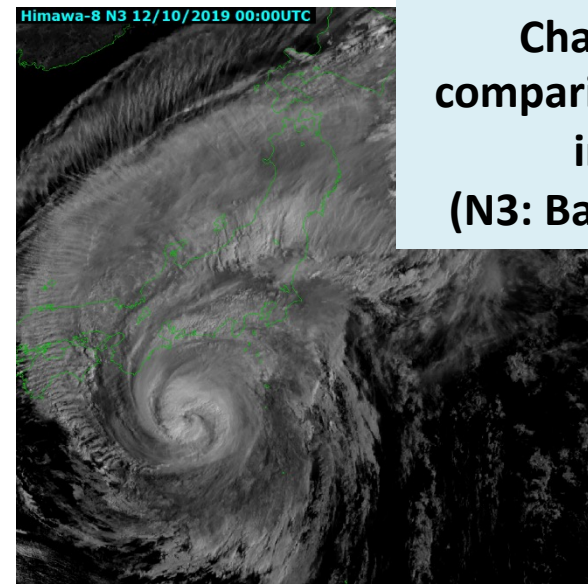
Exec    RSMJP    RSMSP    GSM    HSH    LFH    SST    Close

[ HSH ]    12/10/2019 00:00UTC    Help    Initial    Adjust    Setup

150	Height	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	VWS
200	Height	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	VWS
250	Height	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	VWS
300	Height	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	VWS
400	Height	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	VWS
<input checked="" type="checkbox"/> 500	<input checked="" type="checkbox"/> Height	<input checked="" type="checkbox"/> Wind	<input checked="" type="checkbox"/> Isotac	<input checked="" type="checkbox"/> Temp	<input checked="" type="checkbox"/> T-TD	<input checked="" type="checkbox"/> P-Yel	<input checked="" type="checkbox"/> Vort	<input checked="" type="checkbox"/> EPT	<input checked="" type="checkbox"/> VWS
700	Height	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	VWS
850	Height	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	VWS
925	Height	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	VWS
1000	Height	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	VWS
Surface	Rain	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	SSI
345 k	Height	Wind	Isotac	Temp	T-TD	P-Yel	Vort	EPT	VWS

Himawa-8 N3 12/10/2019 00:00UTC

Changing and  
comparing multi band  
imagery  
(N3: Band 6, 2.3 μm)



Let's have a familiarity with the  
SATAID basic operations!

# Overview of Case 1

## Typhoon Hagibis (T1919) approaching Japan



SATAID -Japan Meteorological Agency-

Register(G) Option(O) Help(H)

### Himawa-8 VS 12/10/2019 0

一時停止 00:00:00 領域の選択 オーディオ ポインターの録画

Zoom

AUTO

Fast Slow

12/10/2019 03:22 UTC

Image

<input type="radio"/> IR	<input type="radio"/> WV	<input type="radio"/> S1
<input type="radio"/> I4	<input checked="" type="radio"/> VS	<input type="radio"/> S2
<input type="radio"/> V1	<input type="radio"/> V2	<input type="radio"/> S3
<input type="radio"/> N1	<input type="radio"/> N2	<input type="radio"/> S4
<input type="radio"/> N3	<input type="radio"/> W2	<input type="radio"/> S5
<input type="radio"/> W3	<input type="radio"/> MI	<input type="radio"/> S6
<input type="radio"/> O3	<input type="radio"/> L2	<input type="radio"/> S7
<input type="radio"/> I2	<input type="radio"/> CO	<input type="radio"/> S8
<input type="radio"/> I4S	<input type="radio"/> HVS	<input type="radio"/> S9
<input type="radio"/> EIRc	<input type="radio"/> EIRm	

Grid

Coast  Line

Text  NWP

RADAR  Wind

Function

<input type="radio"/> Gray	<input type="radio"/> Info
<input type="radio"/> Measur	<input type="radio"/> Draw
<input type="radio"/> Obs	<input type="radio"/> TC

Start the animation by clicking [AUTO]button.



# Overview of Case 1

## Typhoon Hagibis (T1919) approaching Japan

SATAID -Japan Meteorological Agency-

Register(G) Option(O) Help(H)

**Himawa-8 VS 12/10/2019 03:30UTC**

Zoom

Fast Slow

12/10/2019 03:22 UTC

Image

<input type="radio"/> IR	<input type="radio"/> WV	<input type="radio"/> S1
<input type="radio"/> I4	<input checked="" type="radio"/> VS	<input type="radio"/> S2
<input type="radio"/> V1	<input type="radio"/> V2	<input type="radio"/> S3
<input type="radio"/> N1	<input type="radio"/> N2	<input type="radio"/> S4
<input type="radio"/> N3	<input type="radio"/> W2	<input type="radio"/> S5
<input type="radio"/> W3	<input type="radio"/> MI	<input type="radio"/> S6
<input type="radio"/> O3	<input type="radio"/> L2	<input type="radio"/> S7
<input type="radio"/> I2	<input type="radio"/> CO	<input type="radio"/> S8
<input type="radio"/> I4S	<input type="radio"/> HVS	<input type="radio"/> S9
<input type="radio"/> EIRc	<input type="radio"/> EIRm	

Grid 10

Coast  Line

Text  NWP

RADAR  Wind

Function

<input type="radio"/> Gray	<input type="radio"/> Info
<input type="radio"/> Measur	<input type="radio"/> Draw
<input type="radio"/> Obs	<input type="radio"/> TC

Typhoon Hagibis (T1919) approaching Japan

Size 12 Mark 0 Fig 0/0 About Voice Close

AOMSUC-10 Training Case Study (author: Akihiro SHIMIZU, JMA)

**Typhoon Hagibis (T1919) approaching Japan**

- Let's try to check main SATAID functions just to be familiar with basic operations. The short explanations for each functions and data can be displayed by clicking respective items. If you want to display figures, check "Fig" check box on top of this window.
  - [Animation](#) #fig.1
  - [Image](#) and Zooming #fig.2, fig.3, fig.4
  - [NWP data](#) #fig.5, fig.6
  - [RADAR data](#)
  - [RGB composite imagery](#) #fig.7, fig.8
  - [ASWind data](#) #fig.9
- Let's take a look this case study briefly.
  - Weather chart (ASAS) #fig.10, fig.11, fig.12, fig.13

# Overview of Case 1

## Typhoon Hagibis (T1919) approaching Japan



SATAID -Japan Meteorological Agency-

Register(G) Option(O) Help(H)

### Himawa-8 VS 12/10/2019 0

12/10/2019 03:22 UTC

Image

<input type="radio"/> IR	<input type="radio"/> WV	<input type="radio"/> S1
<input type="radio"/> I4	<input checked="" type="radio"/> VS	<input type="radio"/> S2
<input type="radio"/> V1	<input type="radio"/> V2	<input type="radio"/> S3
<input type="radio"/> N1	<input type="radio"/> N2	<input type="radio"/> S4
<input type="radio"/> N3	<input type="radio"/> W2	<input type="radio"/> S5
<input type="radio"/> W3	<input type="radio"/> MI	<input type="radio"/> S6
<input type="radio"/> O3	<input type="radio"/> L2	<input type="radio"/> S7
<input type="radio"/> I2	<input type="radio"/> CO	<input type="radio"/> S8
<input type="radio"/> I4S	<input type="radio"/> HVS	<input type="radio"/> S9
<input type="radio"/> EIRc	<input type="radio"/> EIRm	

Grid    10

Coast     Line

Text     NWP

RADAR     Wind

Function

<input type="radio"/> Gray	<input type="radio"/> Info
<input type="radio"/> Measur	<input type="radio"/> Draw
<input type="radio"/> Obs	<input type="radio"/> TC

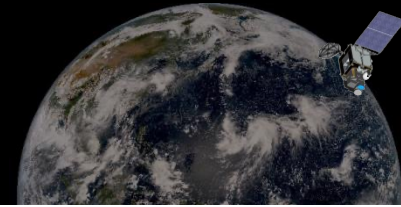
Typhoon Hagibis (T1919) approaching Japan

Size 12     Mark 0     Fig 0/0     About       

AOMSUC-10 Training Case Study (author: Akihiro SHIMIZU, JMA)

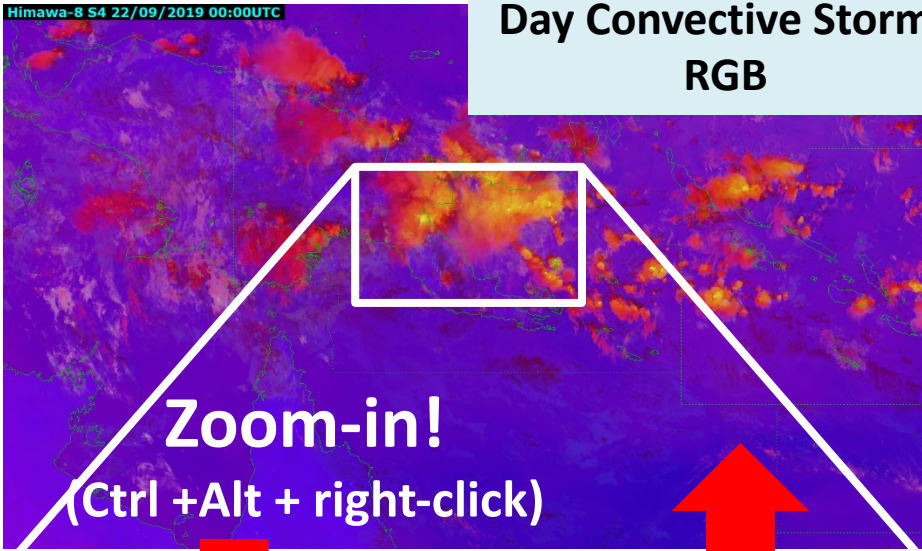
### Typhoon Hagibis (T1919) approaching Japan

- Let's try to check main SATAID functions just to be familiar with basic operations. The short explanations for each functions and data can be displayed by clicking respective items. If you want to display figures, check "Fig" check box on top of this window.
  - [Animation](#) #fig.1
  - [Image](#) and Zooming #fig.2, fig.3, fig4
  - [NWP data](#) #fig.5, fig6
  - [RADAR data](#)
  - [RGB composite imagery](#) #fig.7, fig.8
  - [ASWind data](#) #fig.9
- Let's take a look this case study briefly.
  - Weather chart (ASAS) #fig.10, fig.11, fig.12, fig.13

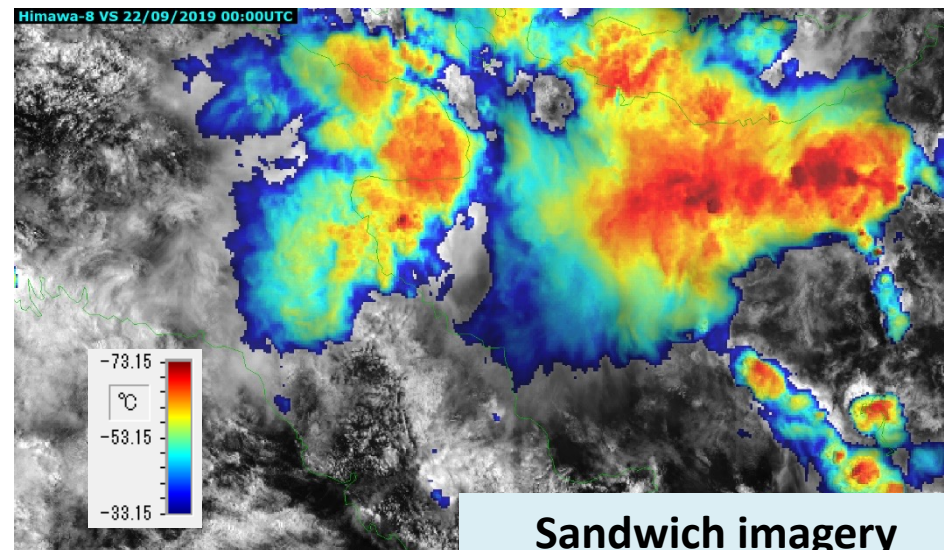
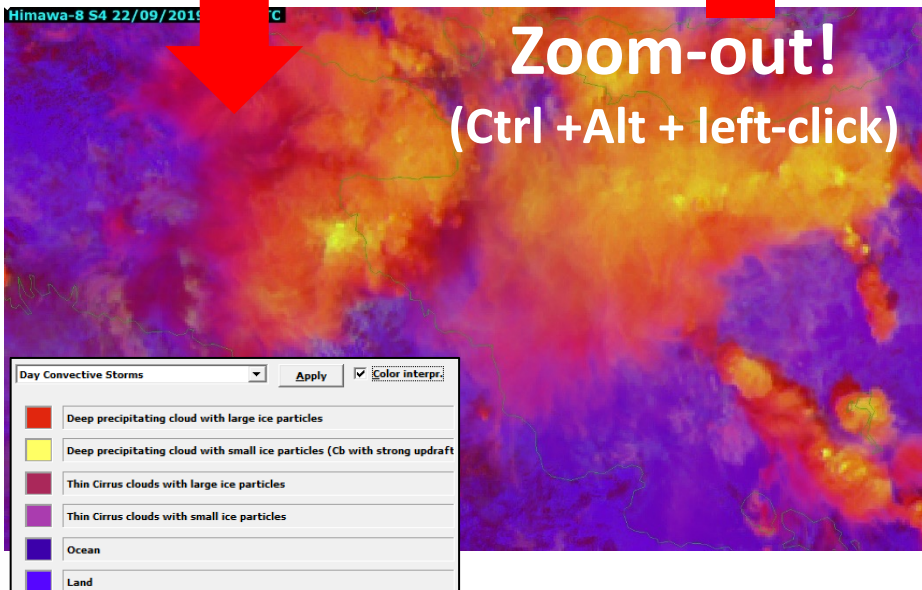


# Overview of Case 2 Flood in Papua New Guinea

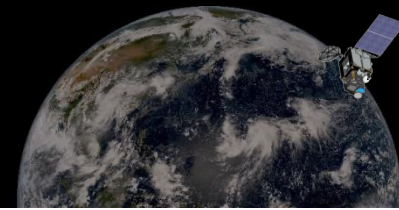
Day Convective Storms  
RGB



Focus on Cb clouds which brought heavy rain and flood.



Sandwich imagery



# Overview of Case 2 Flood in Papua New Guinea

SATAID -Japan Meteorological Agency-  
Register(G) Option(O) Help(H)

## Himawa-8 IR 22/09/2019 00:00UTC

Zoom

Fast Slow

21/09/2019 23:57 UTC

Image

- IR
- I4
- V1
- N1
- W3
- O3
- I2
- EIRc
- WV
- VS
- V2
- N2
- W2
- MI
- L2
- CO
- HVS
- S1
- S2
- S3
- S4
- S5
- S6
- S7
- S8
- S9
- EIRm

Grid 10

Coast  Line

Text  NWP

RADAR  Wind

Function

- Gray
- Measur
- Obs
- Info
- Draw
- TC

Start the animation by clicking [AUTO]button.

# Summary



- Himawari-8, 9 Overview

Himawari-8, 9 make Full Disk observations every 10 minutes and Region observations every 2 and a half minutes. From them, RGB composites can be made and these are useful for disaster prevention and so on.

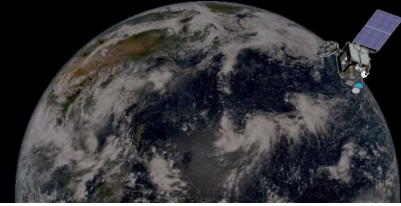
- RGB Composite

By progress of Himawari's observation, it has become possible to observe many bands. RGB Composites were developed to get important information easily.

- SATAID

JMA is developing SATAID that can display satellite imagery, other observations (ex.in-situ, radar), and NWP datasets at the same time.

# Summary



- SATAID can display RGB composite imagery by simple operation.
- SATAID can show WMO standard RGB recipes and JMA original recipes.
- We challenged hands-on practical training of RGB case studies by using SATAID.

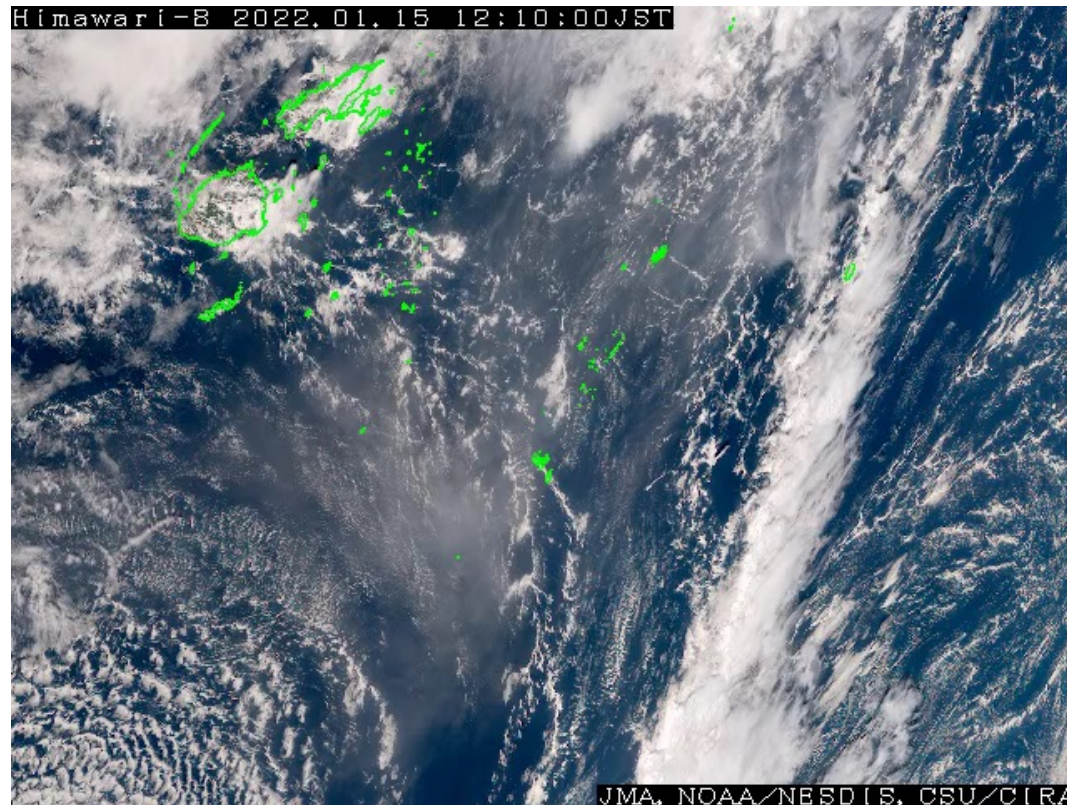




# Case1 : Huge Volcanic eruption in Tonga

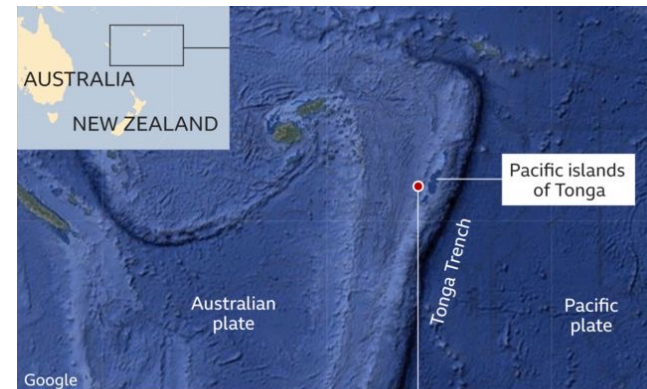


# Overview



On 15<sup>th</sup> January 2022 at about 04UTC, a huge eruption occurred at Hunga Tonga-Hunga Ha'apai volcano, a submarine volcano in Tonga. Tsunamis (tidal changes) were observed at distant locations as a result of this eruption.

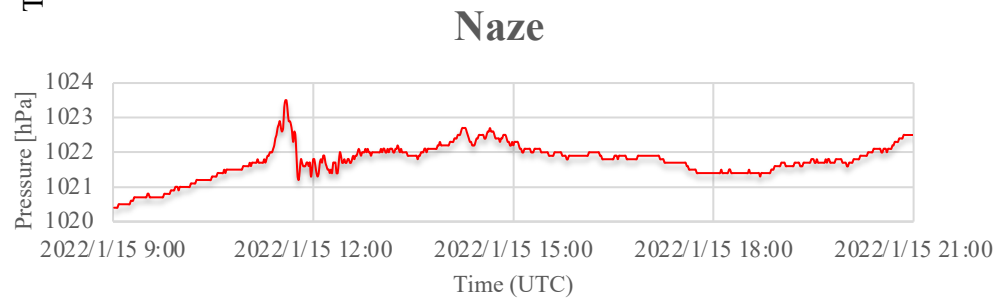
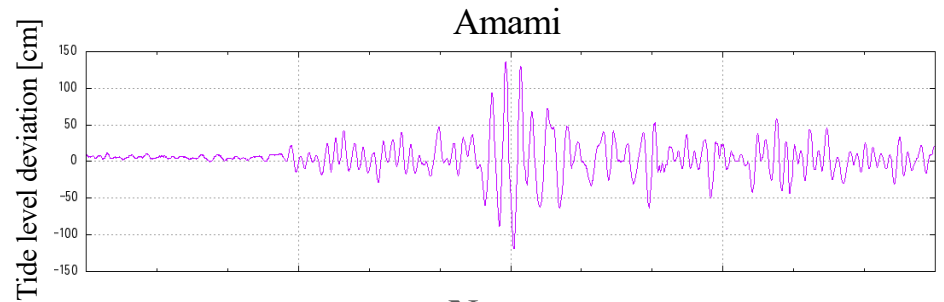
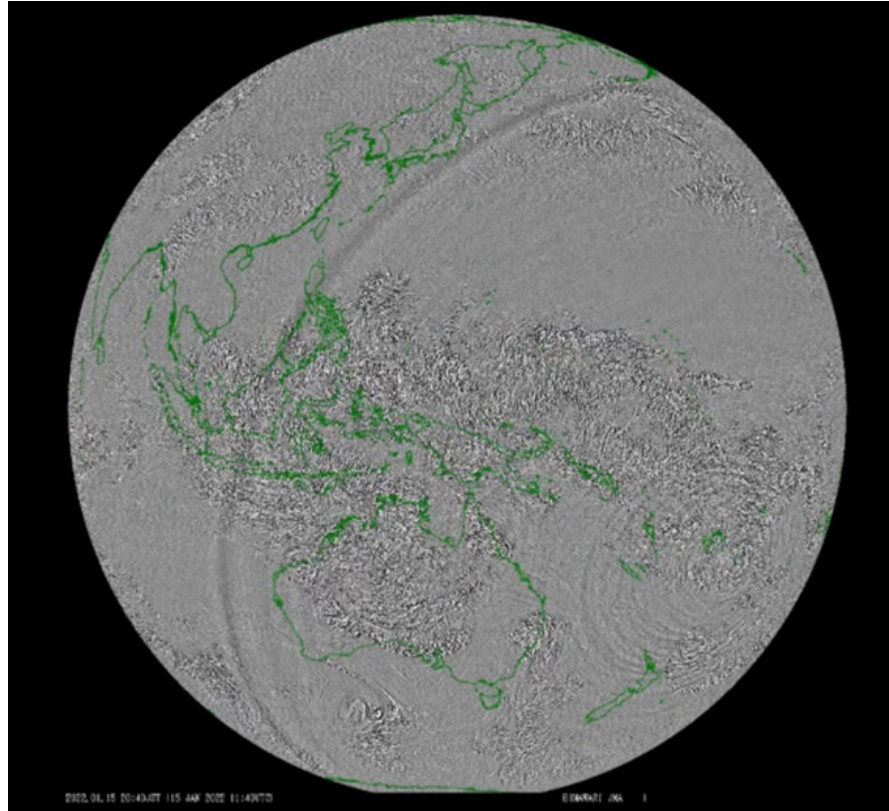
The left video is True Color Reproduction Image of Himawari-8 at the time of the eruption. (Band 13 at night time)







# Confirmed atmospheric waves and pressure changes

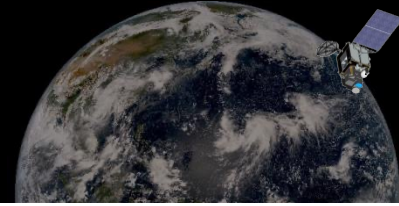


Tide level deviation (top) and pressure (bottom) at Amami-Oshima Island, Japan

Time of atmospheric wave passage and time of atmospheric pressure spike almost coincide.

The second time derivatives image of B10 (11:40UTC 15<sup>th</sup> January)

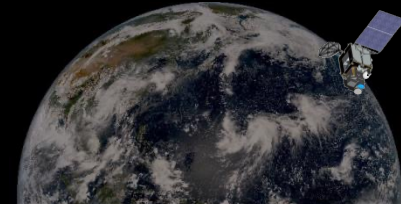
# Summary



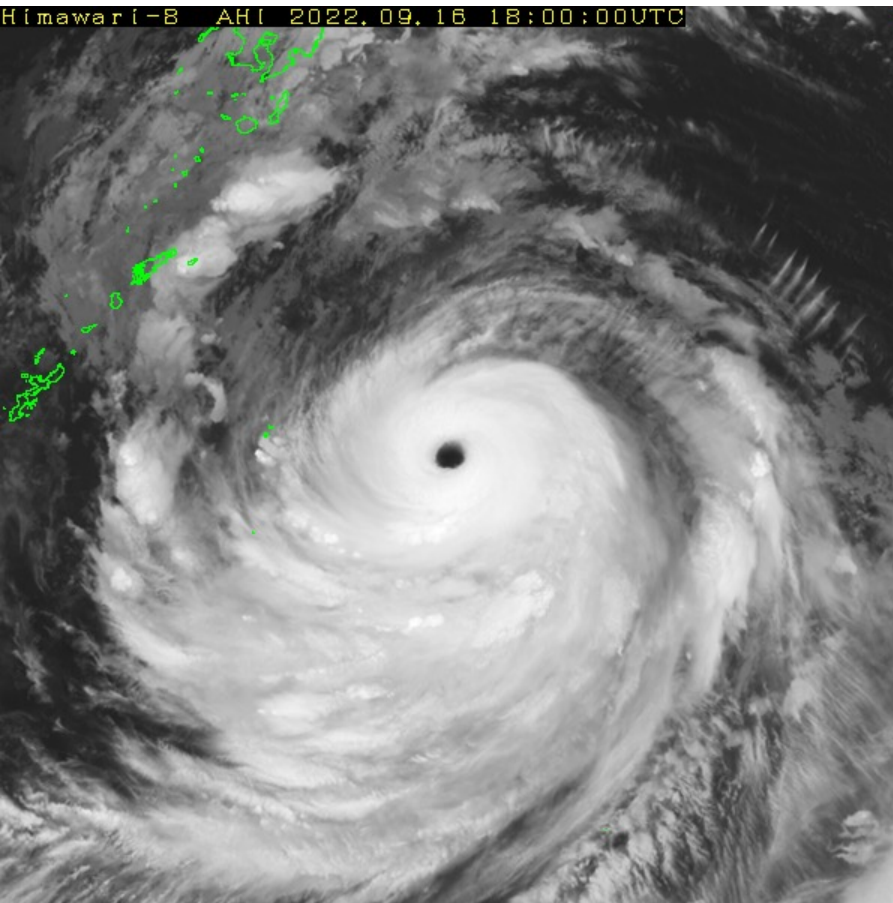
- The spread of the volcanic plume at the time of the eruption can be seen in detail from Himawari-8.
- The atmospheric wave generated by the eruption can be visualized by using water vapor images.
- It may also be necessary to understand such a phenomenon for a large-scale eruption such as this one.



# Case2 : Typhoon Nanmadol (T2214)



# Overview



Typhoon Nanmadol formed on 13<sup>th</sup> September at 18UTC over the sea south of Japan.

This typhoon developed rapidly from the 16<sup>th</sup> to the 17<sup>th</sup>.  
(16<sup>th</sup> 00UTC 950hPa -> 16<sup>th</sup> 18UTC 910hPa !)

10UTC 18<sup>th</sup> :

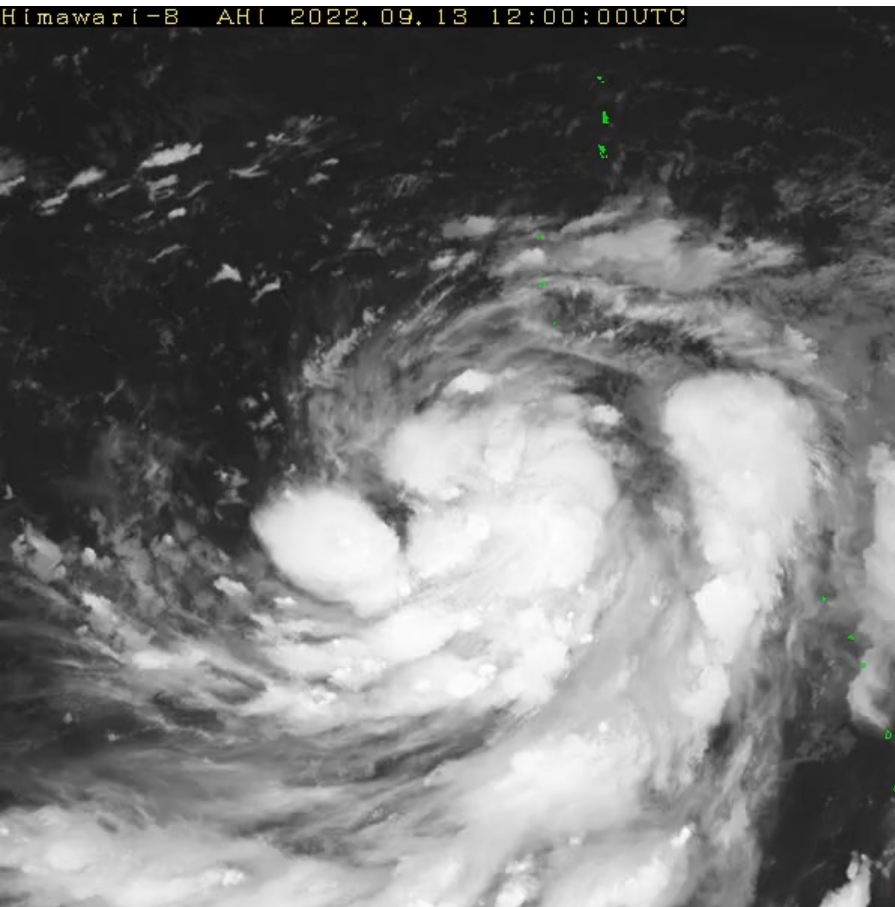
This typhoon made Landfall near Kagoshima city.  
(At this time, The central atmospheric pressure is 935hPa.)

00UTC 20<sup>th</sup> : This typhoon became an extratropical cyclone.

The left image is the image of the peak period 16<sup>th</sup> at 18UTC.  
At this time, the central atmospheric pressure was 910hPa  
and maximum wind speed was 55m/s.



# Formed stage



The video is an observation image of Himawari-8 before and after the typhoon formed.

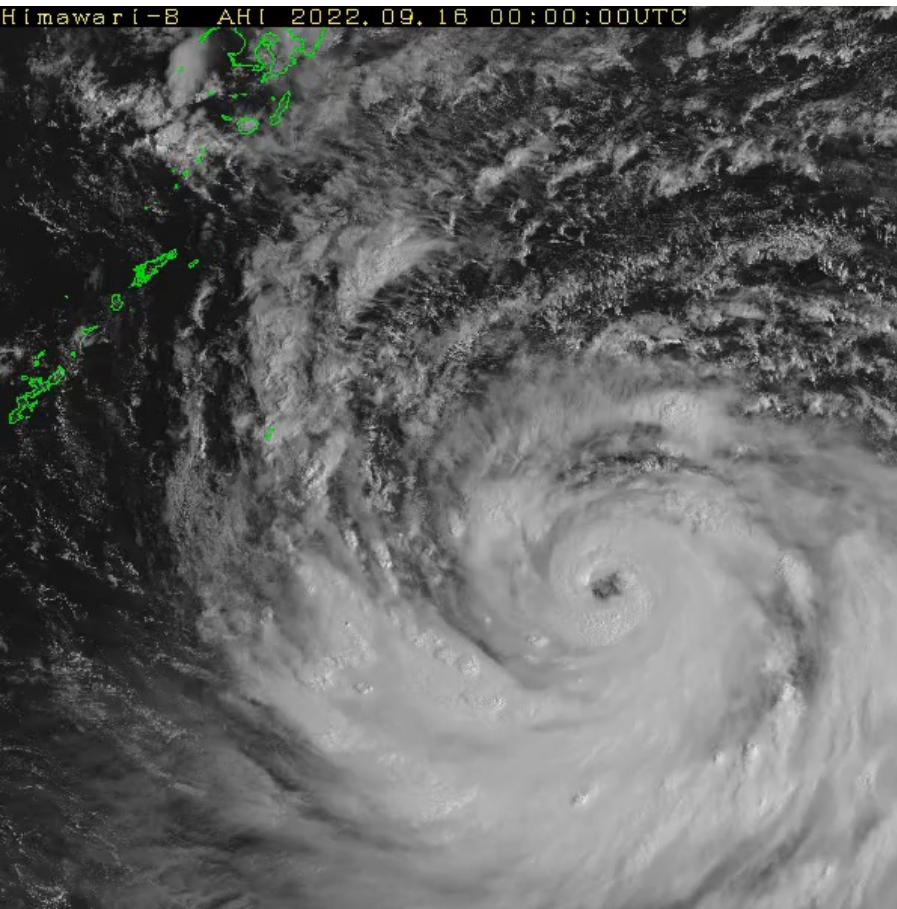
(12UTC 13<sup>th</sup> September – 06UTC 14<sup>th</sup> September)

Infrared images at night time, visible images during day time.

A band of convective clouds is gradually formed, and it can be confirmed that the swirling state becomes clear.



# Rapid developed stage



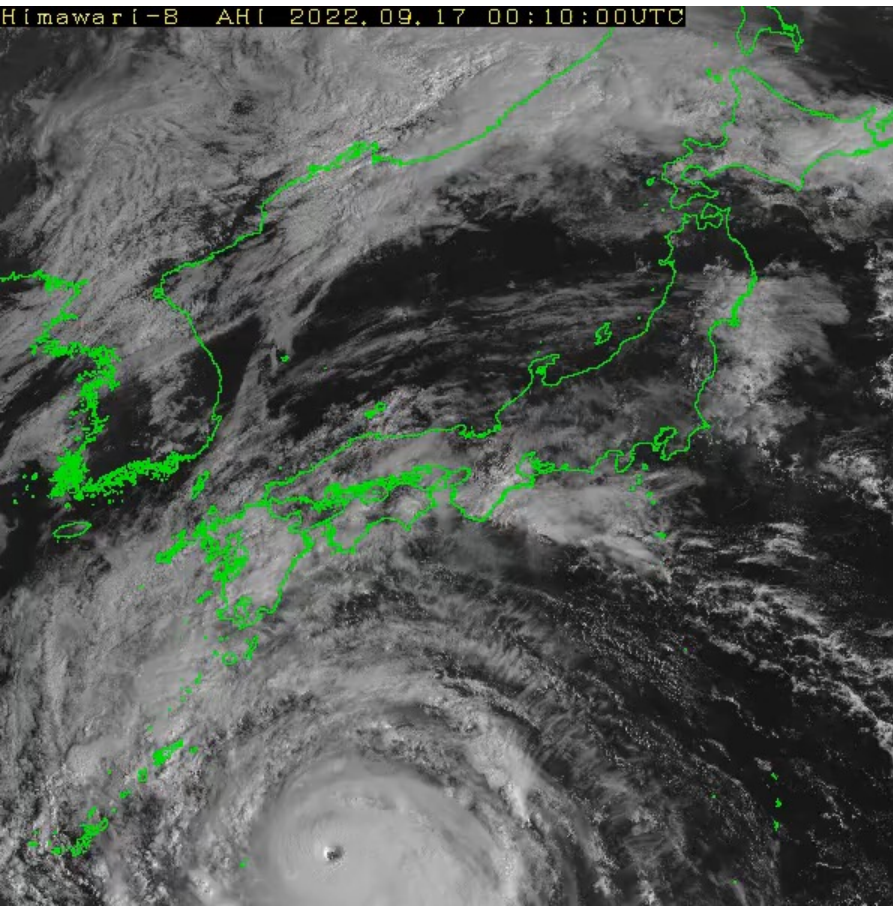
The video is an observation image of Himawari-8.  
(00UTC 16<sup>th</sup> September – 00UTC 17<sup>th</sup> September)  
Infrared images at night time, visible images during day time.

The central atmospheric pressure was 950hPa at 00UTC 16<sup>th</sup>.  
18 hours later, 910hPa at 18UTC 16<sup>th</sup>.  
The typhoon developed rapidly in 18 hours.

As it developed, the eye of typhoon Nanmadol  
changed from ragged eye to distinct small eye.

Infrared images of Himawari-8 show that  
the eyewall is cold and strongly developed.

# From landfall to decline



The video is an observation image of Himawari-8.  
(00UTC 17<sup>th</sup> September – 23UTC 19<sup>th</sup> September)

19UTC 18<sup>th</sup> :

Typhoon Nanmadol made landfall near Kagoshima city.  
(935hPa at this time, this is the lowest in the 2000s.)

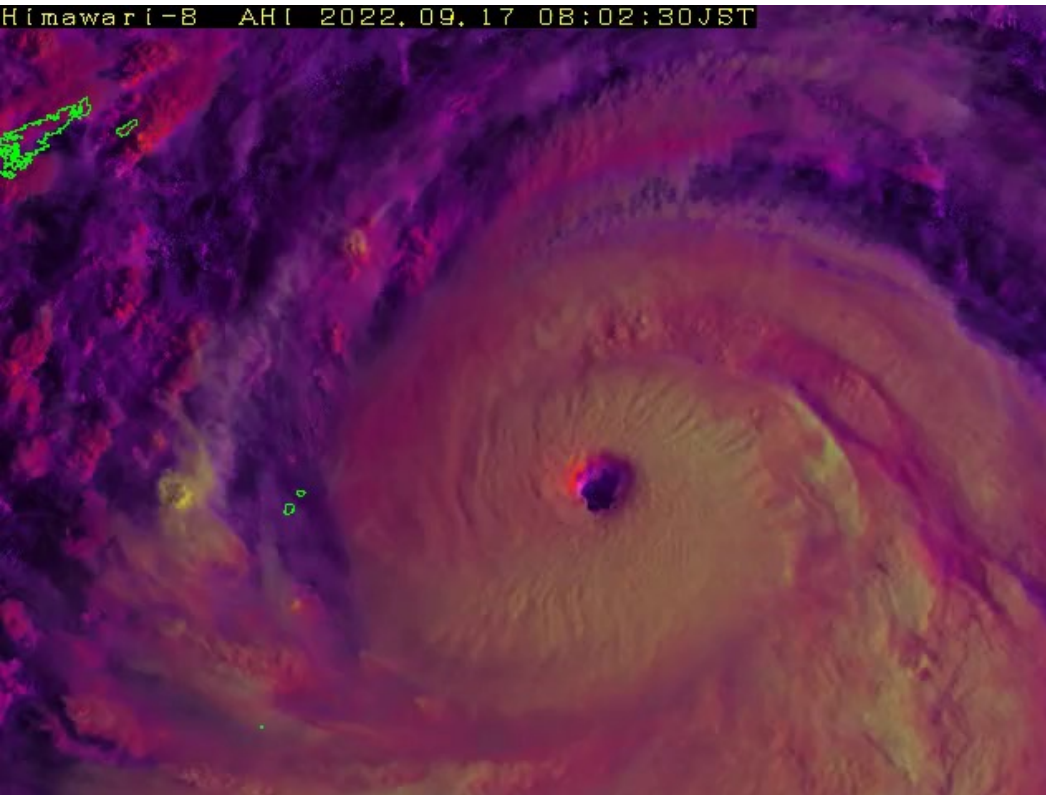
The total rainfall exceeded 1000 mm,  
and there were points where the maximum wind speed  
exceeded 50 m/s.

After landfall, the shape of the typhoon gradually collapsed  
and rapidly declined.

This typhoon became an extratropical cyclone at 00UTC 20<sup>th</sup>.



# RGB Composite imagery



This video is Day Convective Storms RGB + visible image.  
(23UTC 16th Sep. – 08UTC 17<sup>th</sup> Sep.)

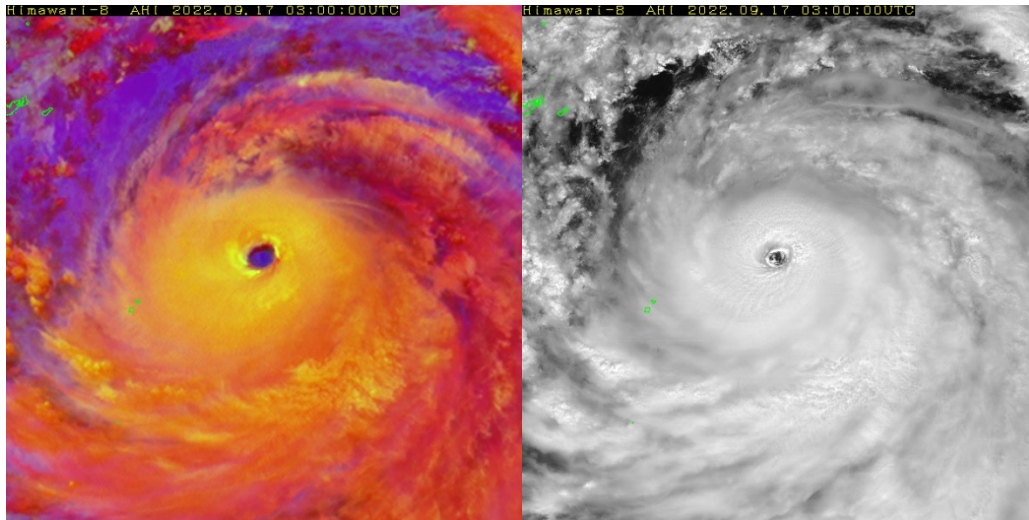
Using the technique described in the next slide,  
While preserving the hue of the RGB composite image keep high resolution.

It becomes easier to distinguish yellow cloud areas with strong updrafts.

Color interpretation for Day Convective Storms RGB	
Color	Interpretation
Red	Deep precipitating cloud (precipitation is not necessarily reaching the ground) - high-level cloud, large ice particles
Yellow	Deep precipitating cloud (Cb cloud with strong updrafts and severe weather)* - high-level cloud, small ice particles *or thick, high-level lee cloudiness with small ice particles
Purple	Thin cirrus cloud (large ice particles)
Light Purple	Thin cirrus cloud (small ice particles)
Dark Blue	Ocean
Light Blue	Land

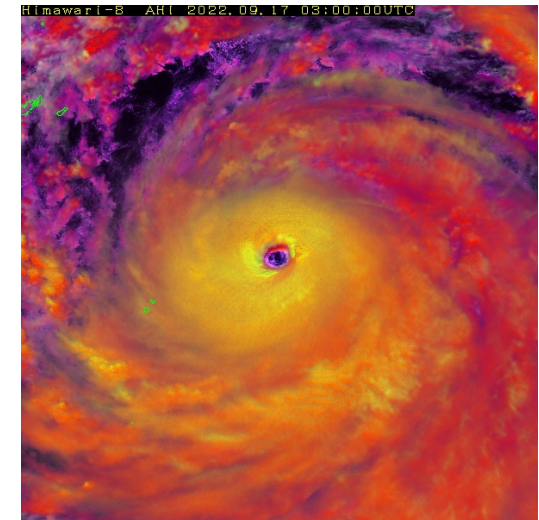
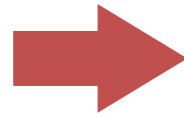


# RGB Composite imagery



Day Convective Storms RGB  
About 2km resolution

B03  
About 500m resolution



High resolution +  
Day Convective Storms RGB

Day Convective Storms RGB and B03  
(red,green,blue) -> (hue, saturation, brightness)  
  
(hue, saturation, brightness(B03))

(hue, saturation, brightness(B03)) -> (red, green, blue)  
high-resolution image while preserving the color of  
the Day Convective Storms RGB composite image.



**Thank you  
for your participation!**