

# T13 15:10~16:40 (90')

## Training lecture from JMA



- We will use the following data in this lecture. Are they available on your PC? If not, please let us know!

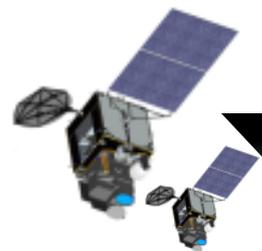
1. GMSLPD
2. T2302\_MAWAR\_20230525\_26
3. sheveluch
4. QuickGuide\_to\_SATAID.pdf

# Practical Training on the Utilization of Himawari-9 Imagery Using SATAID



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04 November 2023



2014 *Himawari-8*

2016 *Himawari-9*

# Contents



- **Overview of Himawari-9 and introduction to SATAID and RGB image**
- **Hands-on training on basic SATAID functions and displaying RGBs**
  - Introduction of basic operations of SATAID
- **Break (10minutes)**
  - Case1 : Typhoon MAWAR (T2302) approaching Pacific Islands
  - Case2 : Volcanic eruption of Sheveluch, Russia

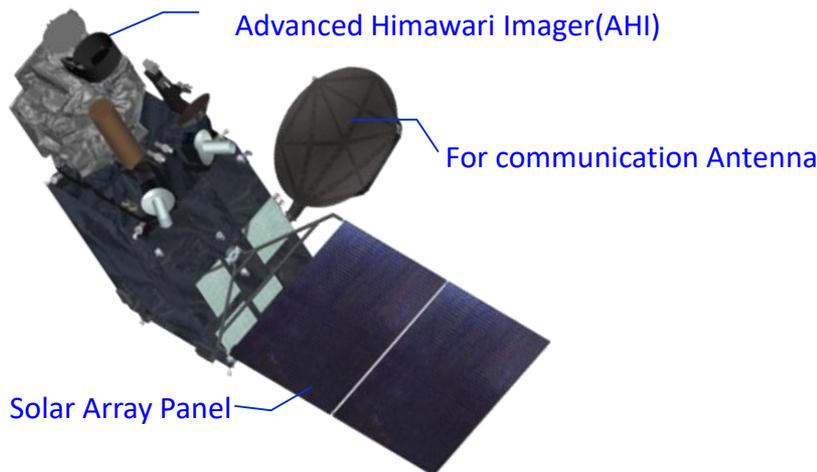
# Overview of Himawari-8, 9



## ★Himawari-8, 9 Operation Plan

Satellite	FY																					
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	
Himawari-8						Launch ▲																
Himawari-9																						

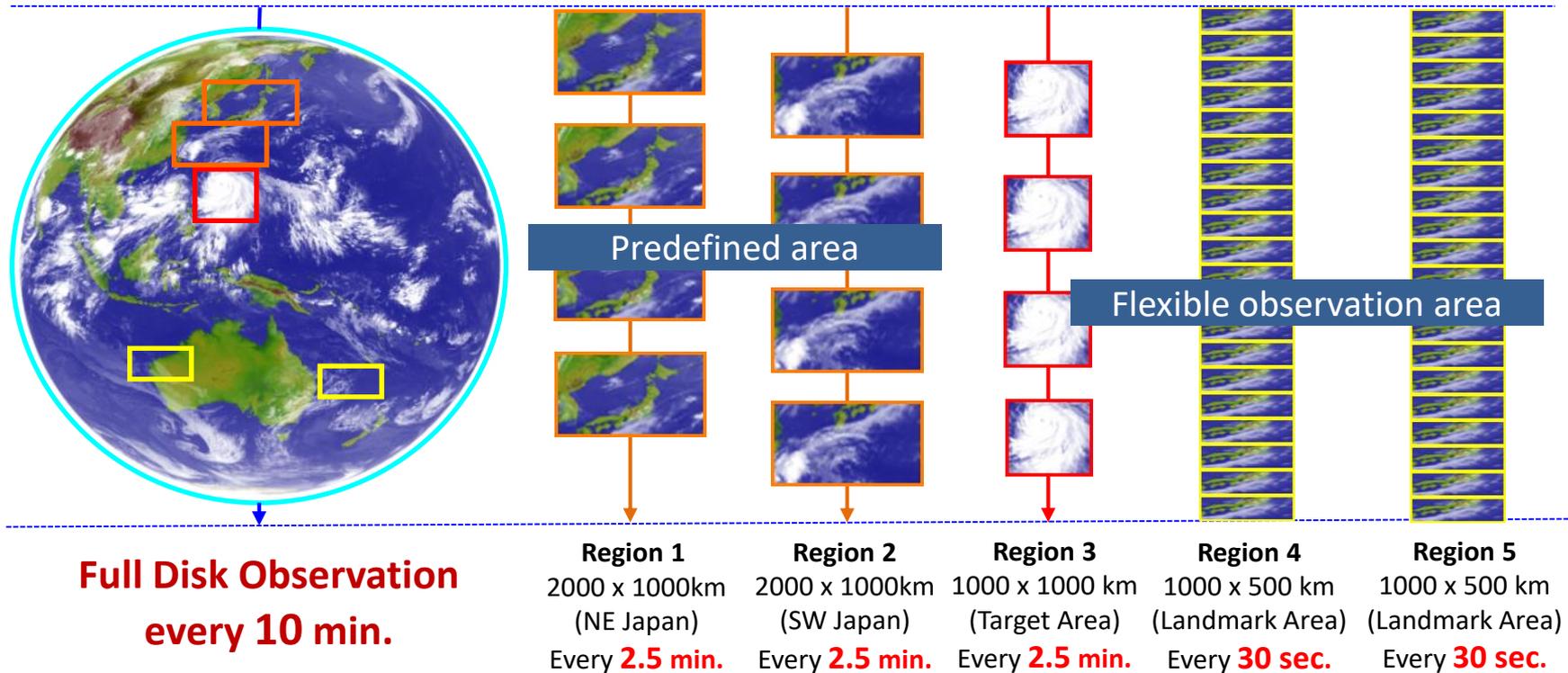
## ★Satellite conceptual diagram



## ★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-9 observation (10 minutes Repeat Cycle)

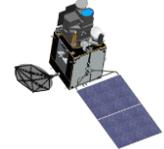


- AHI (Advanced Himawari Imager) on Himawari-9 has the ability of various scans during 10 minutes Full Disk observation.
- AHI can flexibly change the scan area of “Target Area” for observation of phenomena such as **typhoons** and active volcanoes.



# AHI Spectral Bands

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



Band		Spatial Resolution	Central Wavelength	Physical Properties
1	Visible (VIS)	1 km	0.47 $\mu\text{m}$	vegetation, aerosol
2			0.51 $\mu\text{m}$	vegetation, aerosol
3		0.5 km	0.64 $\mu\text{m}$	Vegetation, low cloud, fog
4	Near Infrared (NIR)	1 km	0.86 $\mu\text{m}$	vegetation, aerosol
5		2 km	1.6 $\mu\text{m}$	cloud phase/particle size
6			2.3 $\mu\text{m}$	cloud particle size
7	Infrared (IR)	2 km	3.9 $\mu\text{m}$	low cloud, fog, forest fire
8			6.2 $\mu\text{m}$	upper-level moisture
9			6.9 $\mu\text{m}$	mid- and upper-level moisture
10			7.3 $\mu\text{m}$	mid-level moisture
11			8.6 $\mu\text{m}$	cloud phase, SO <sub>2</sub>
12			9.6 $\mu\text{m}$	Ozone content
13			10.4 $\mu\text{m}$	cloud imagery, information of cloud top
14			11.2 $\mu\text{m}$	cloud imagery, sea surface temperature
15			12.4 $\mu\text{m}$	cloud imagery, sea surface temperature
16	13.3 $\mu\text{m}$	cloud top height		

**3 Visible Bands**

**NIR Bands**

**WV Bands**

**VIR Bands**



cf. MTSAT-2 Bands

VIS  
0.68  $\mu\text{m}$

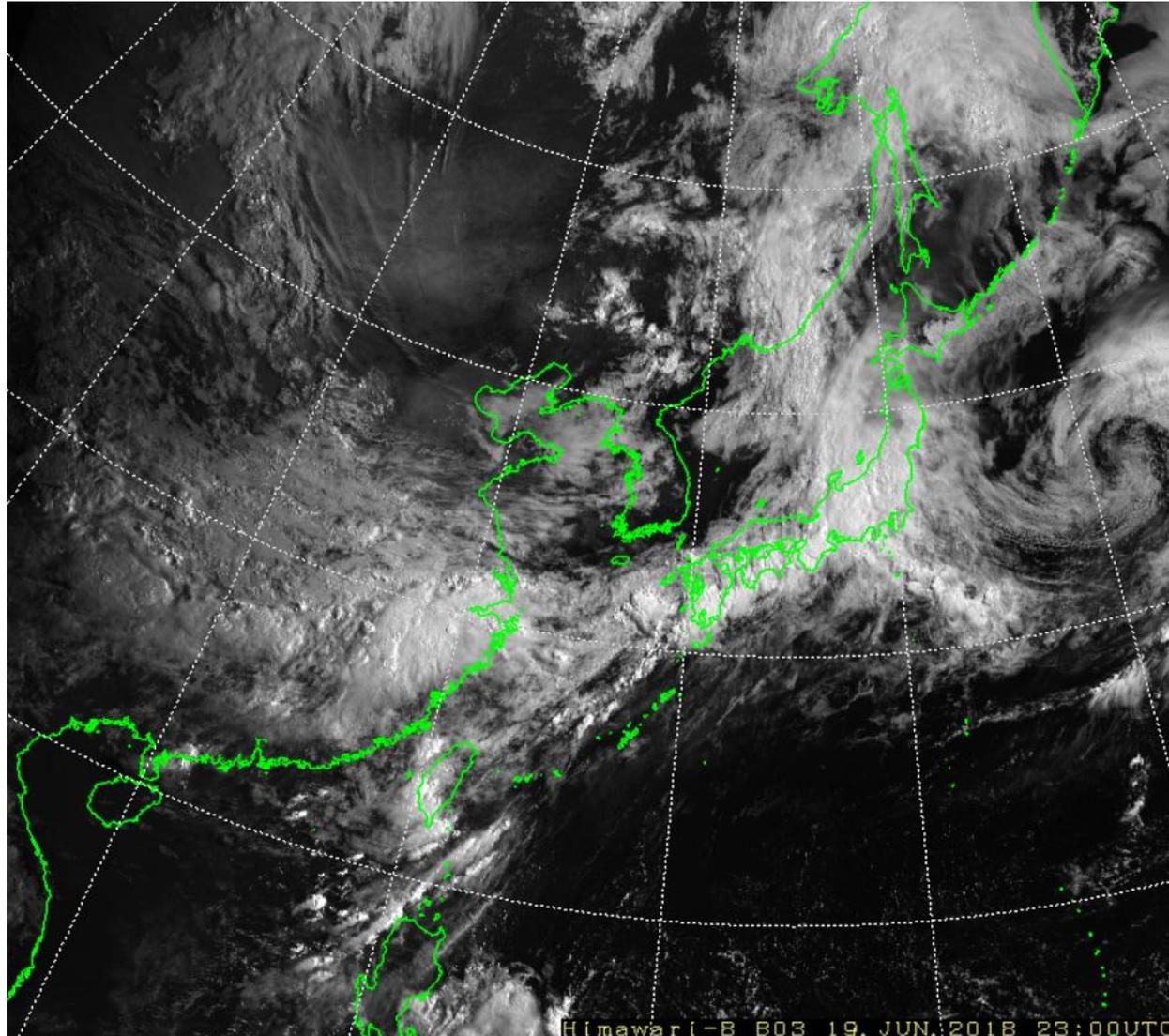
IR4  
3.7  $\mu\text{m}$

IR3  
6.8  $\mu\text{m}$

IR1  
10.8  $\mu\text{m}$

IR2  
12.0  $\mu\text{m}$

# Visible band (B03, 0.64 $\mu\text{m}$ )

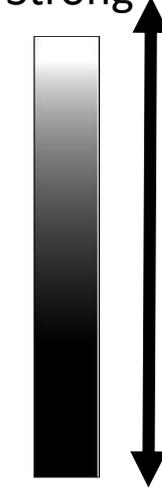


Reflection Strong

Thick cloud

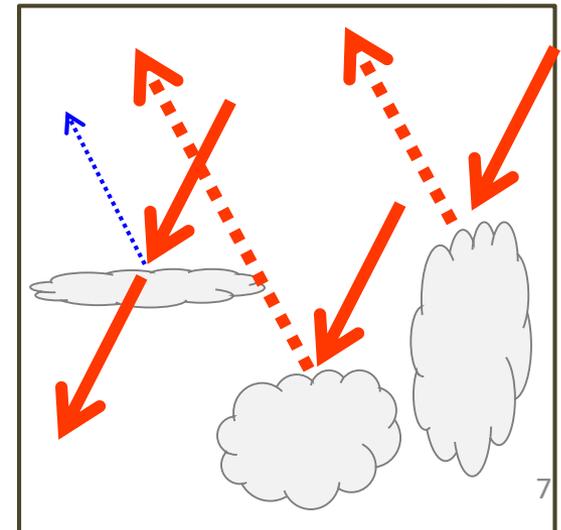
Thin cloud

Sea surface



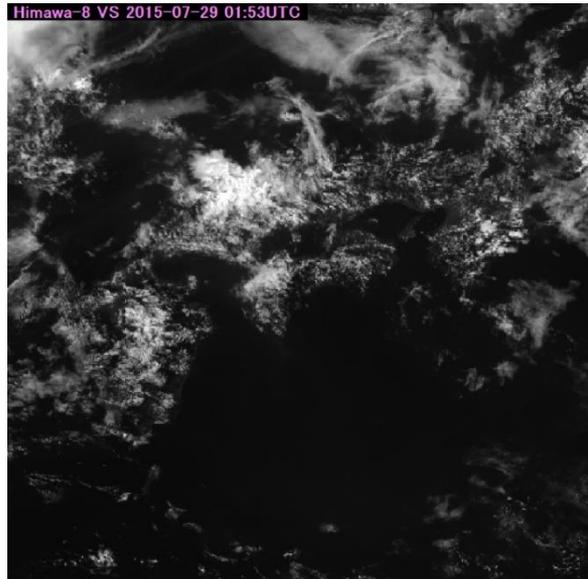
Weak

sunlight

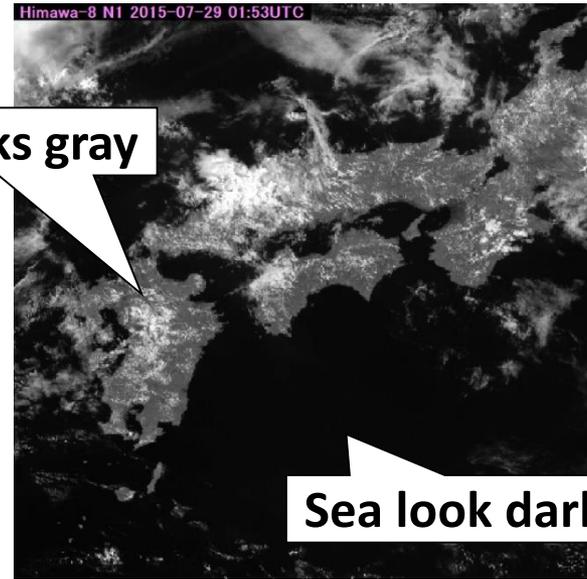


# Near-Infrared band (B04, 0.86 $\mu\text{m}$ )

Visible band (B03, 0.64  $\mu\text{m}$ )



Near-Infrared band (B04, 0.86  $\mu\text{m}$ )

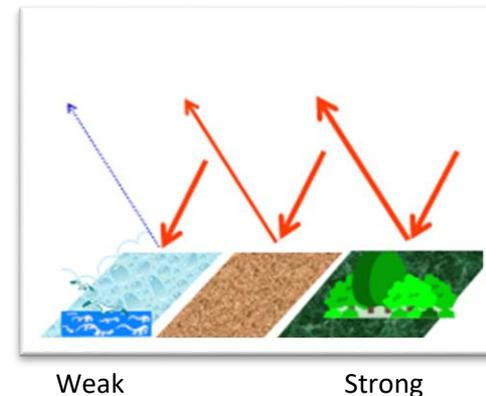


## B03

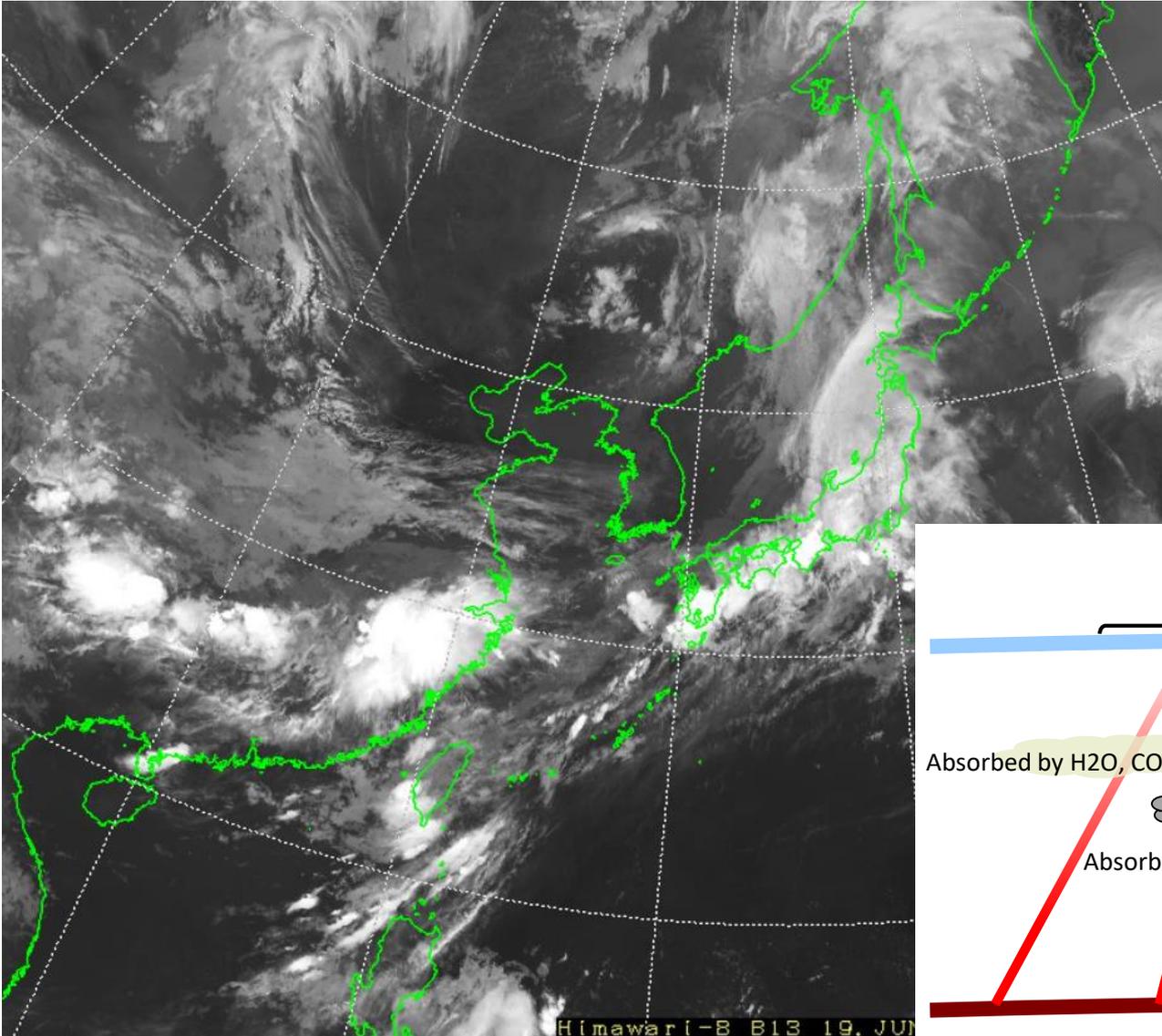
There is no significant difference in reflectance among vegetation, soil, and water surface.

## B04

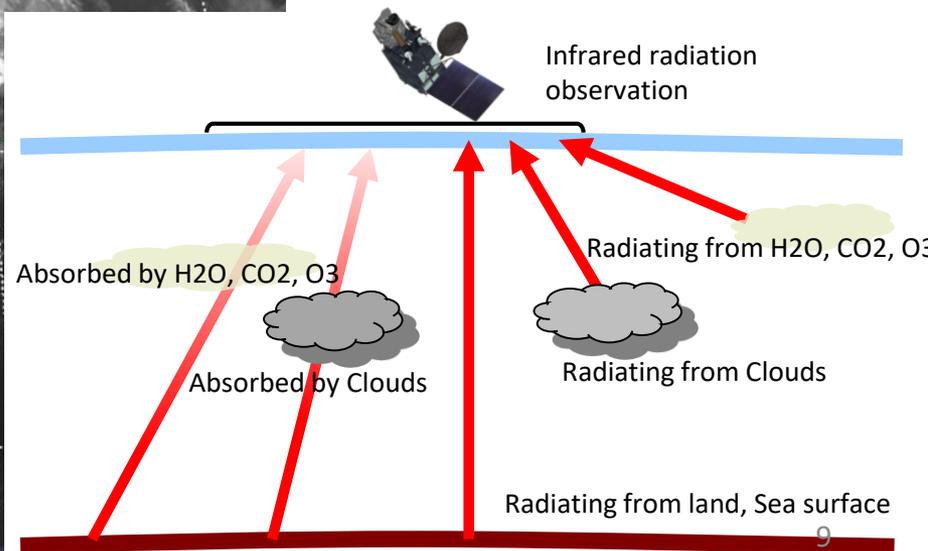
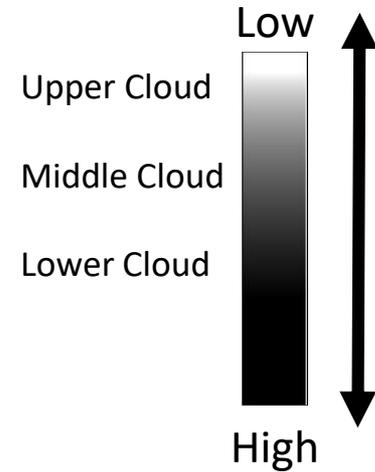
Reflectance of soil and vegetation is larger than that of water surface.



# Infrared band (B13, 10.4 $\mu\text{m}$ )

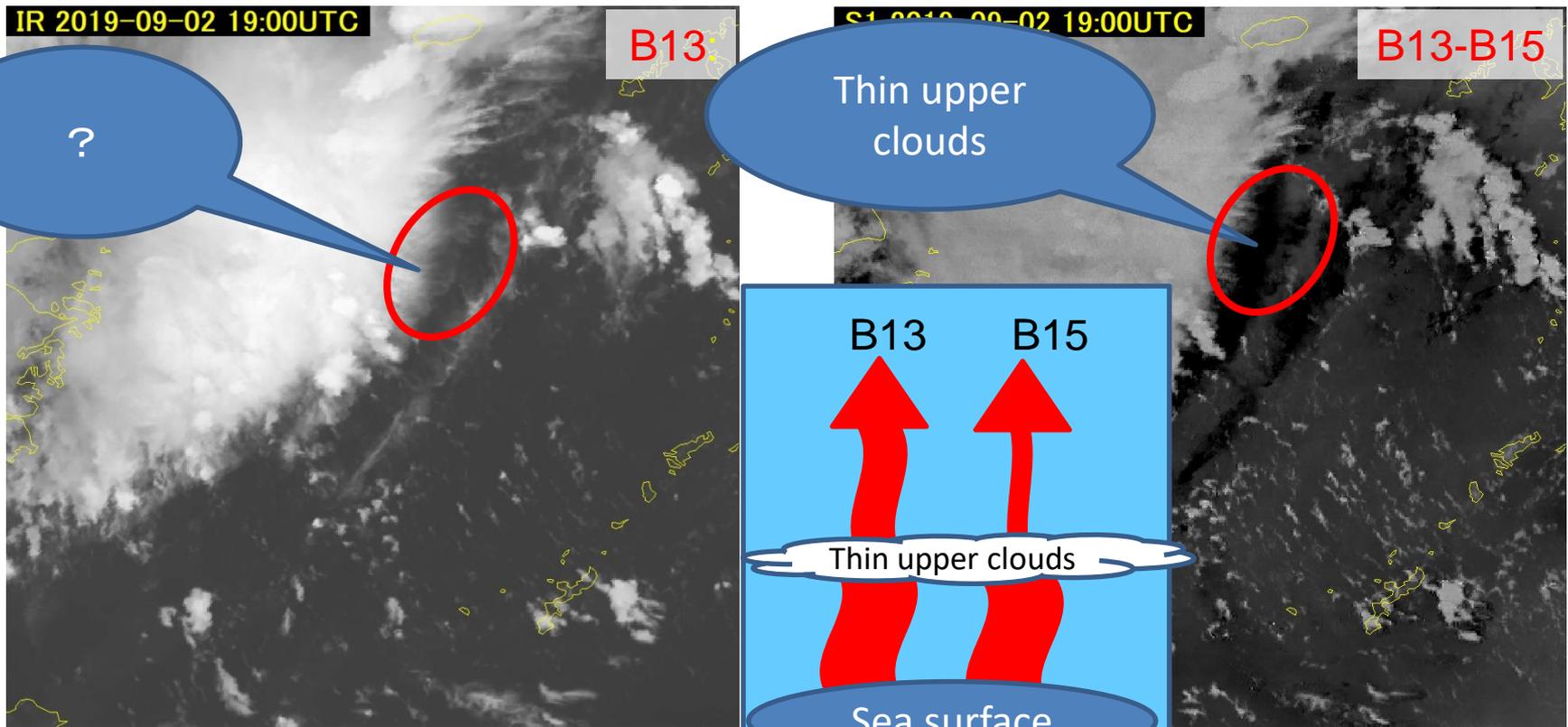


Brightness Temperature



# Differential imagery of B13 – B15

- Subtract the brightness temperatures of B15 from B13.



Brightness temperature High  $\longleftrightarrow$  Low

$T(B13) - T(B15)$  Positive  $\longleftrightarrow$  Negative

# Too many bands!

- 16 bands' images contain a lot of information about

- Cloud thickness, top temperature
- Cloud particle size, cloud phase (ice/liquid)
- Humidity
- Volcanic ash
- Vegetation
- etc.

- **Solution -> RGB image**

- Can illustrate multiple information on one image.
- Can be composed by simple process.
- "SATAID" can compose RGB image easily.

B01(V1)  
0.47[ $\mu\text{m}$ ]

B02(V2)  
0.51[ $\mu\text{m}$ ]

B03(V3)  
0.64[ $\mu\text{m}$ ]

B04(N1)  
0.86[ $\mu\text{m}$ ]

B05(N2)  
1.6[ $\mu\text{m}$ ]

B06(N3)  
2.3[ $\mu\text{m}$ ]

B07(I4)  
3.9[ $\mu\text{m}$ ]

B08(V4)  
5.0[ $\mu\text{m}$ ]

B09(W2)  
6.9[ $\mu\text{m}$ ]

B10(W3)  
7.3[ $\mu\text{m}$ ]

B11(M1)  
8.6[ $\mu\text{m}$ ]

B12(O3)  
9.6[ $\mu\text{m}$ ]

B13(IR)  
10.4[ $\mu\text{m}$ ]

B14(L2)  
11.2[ $\mu\text{m}$ ]

B15(I2)  
12.4[ $\mu\text{m}$ ]

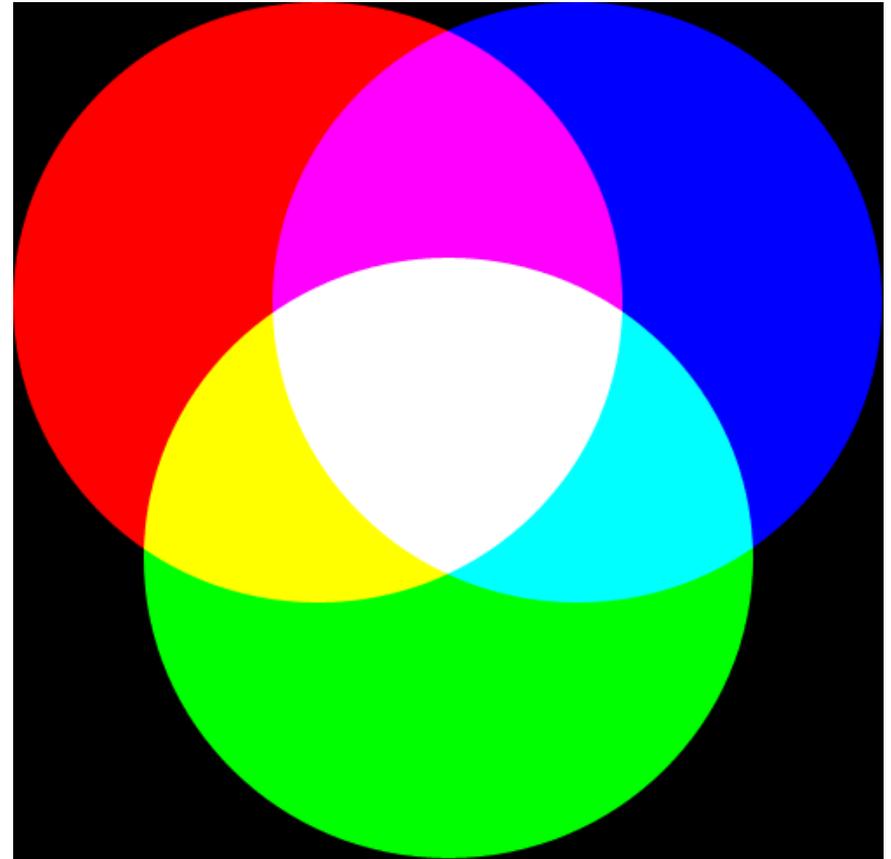
B16(CO)  
13.5[ $\mu\text{m}$ ]

11/16  
00:00

# 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

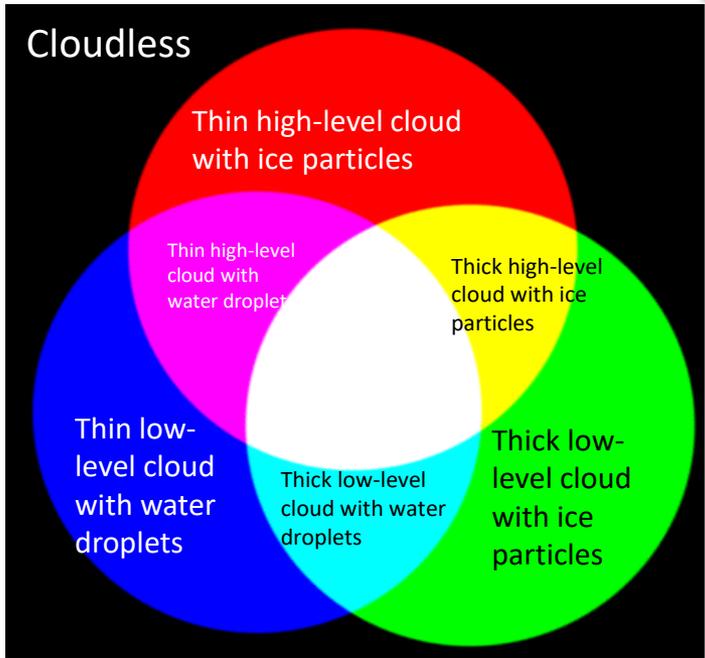


three primary colors RGB

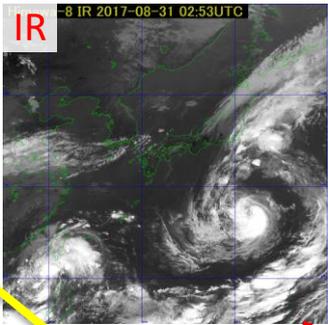
# Application to Satellite Imageries

## RGB composite

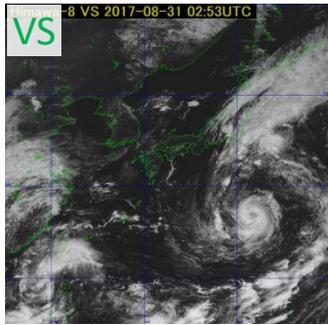
Thick and high cloud (Cb) areas appear yellow!



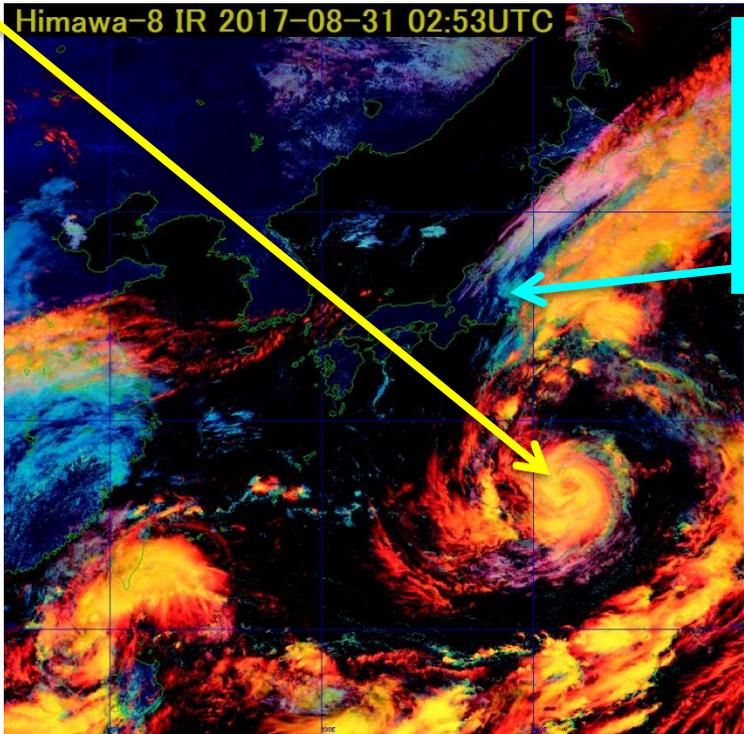
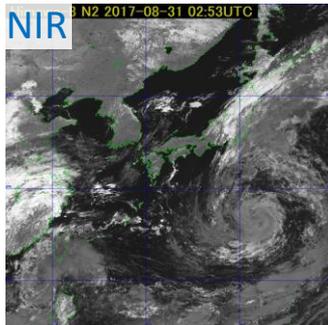
“High” cloud



“Thick” cloud

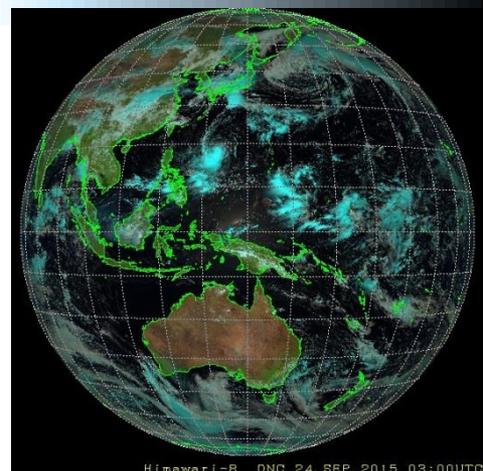


“Ice” cloud

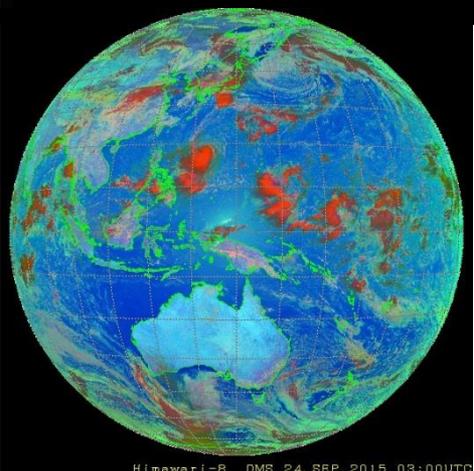


If you want to focus on the low level clouds, look at cyan area.

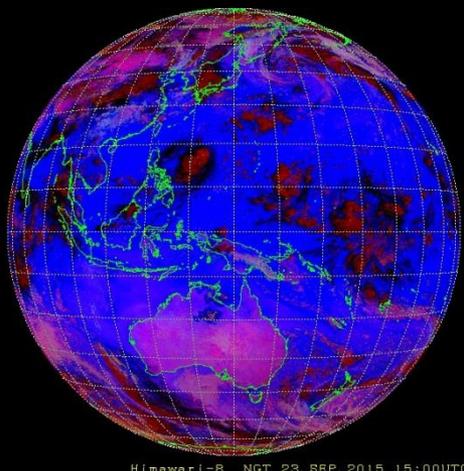
# Well-known RGBs from Himawari-9



Day Natural Colors



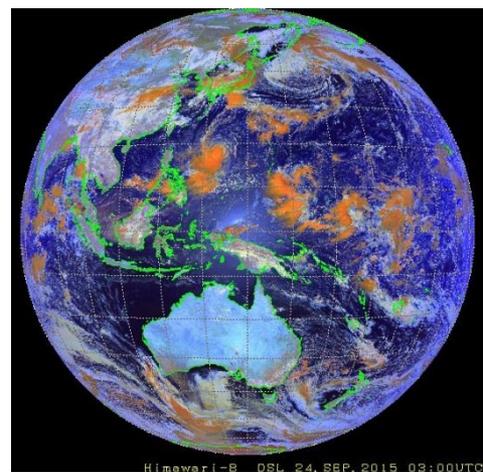
Day Microphysics



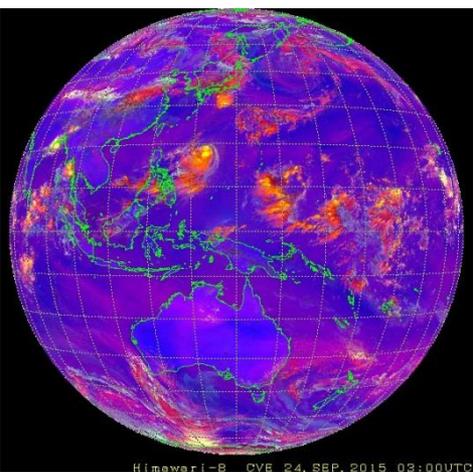
Night Microphysics



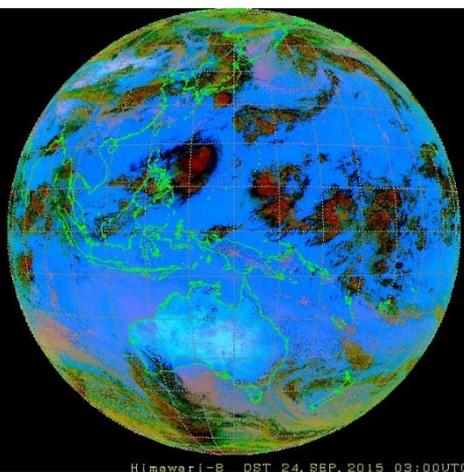
True Color



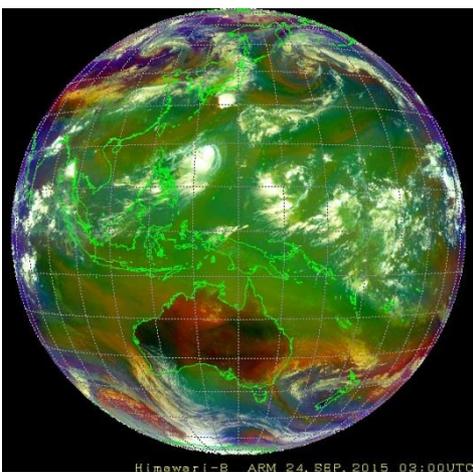
Day Snow-Fog



Day Convective Storm



Dust



Airmass

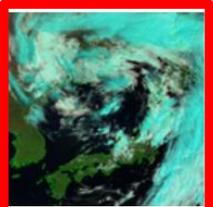


# RGB Quick Guides

## Himawari RGB Quick Guides

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

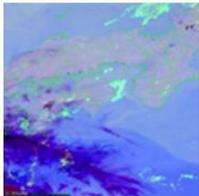
### WMO-recommended schemes



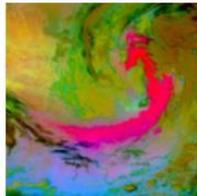
Natural Colors



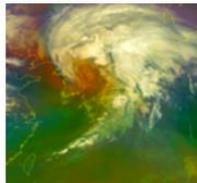
Day Snow-Fog



Night Microphysics



Dust



RGB Quick Guide Web page in MSC Website

Meteorological Satellite Center (MSC) of JMA Ver.1.0

## Himawari Natural Color RGB Quick Guide

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

**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.

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

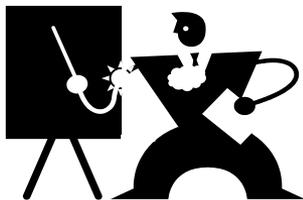
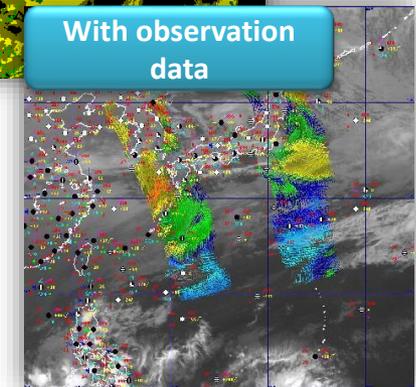
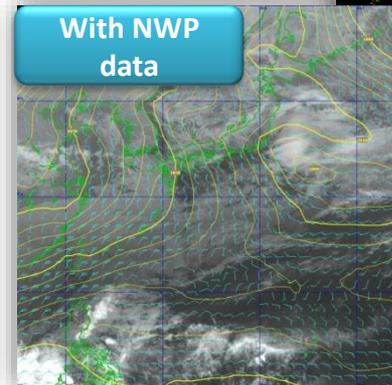
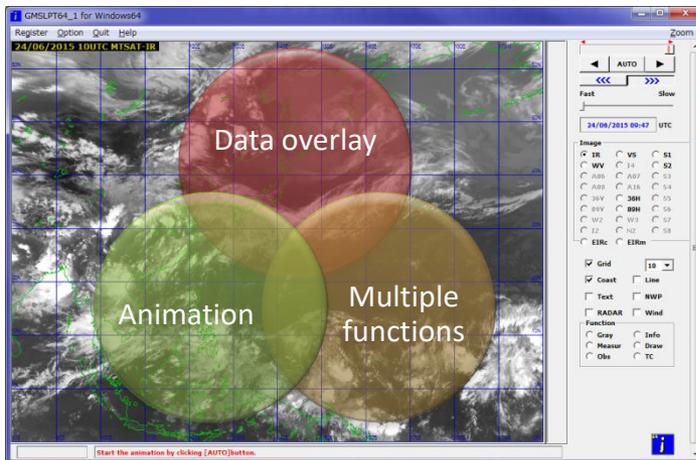
Color	AHI bands	Central wave length [μm]	Min [%]	Max [%]	Gamma	Physical relation to	Smaller contribution to signal of	Larger contribution to signal of
Red	B05	1.6	0%	99%	1.0	Cloud phase Snow and ice Cloud optical thickness	Ice clouds Snow-covered land/sea ice	Water clouds
Green	B04	0.86	0%	102%	0.95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



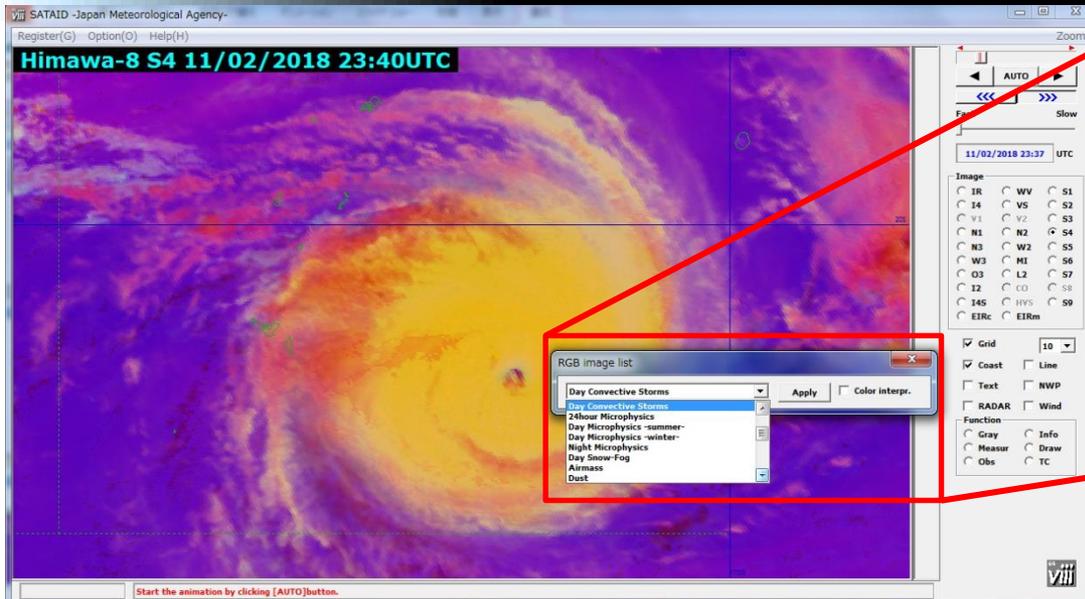
**More efficiently  
and accurately!**

# 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 image list

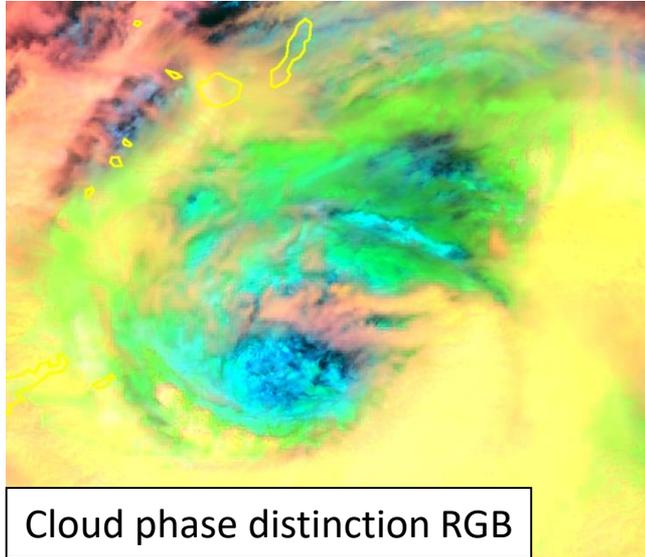
Day Convective Storms Apply  Color interpr.

- Day Convective Storms
- 24hour Microphysics
- Day Microphysics -summer-
- Day Microphysics -winter-
- Night Microphysics
- Day Snow-Fog
- Airmass
- Dust

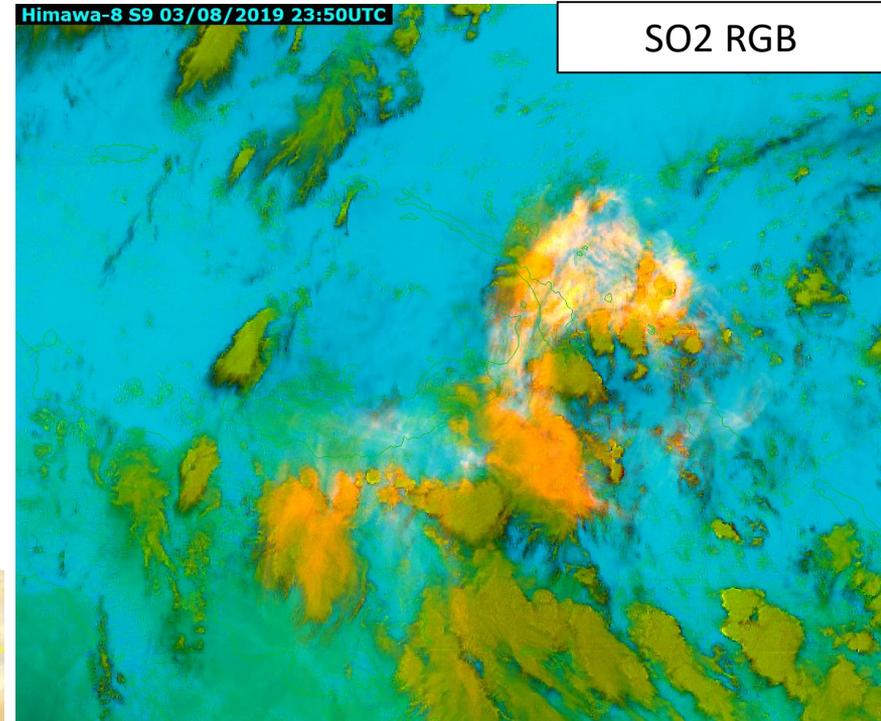
Title	ImageR	ImageG	ImageB	MinR	MaxR	MinG	MaxG	MinB	MaxB	GammaR	GammaG	GammaB
Tropical Day Convecti...	S4(W3-...	S2(I4-I...	S7(N2-...	-5.0	36.0	-1.0	76.0	-0.8	0.25	1.0	0.33	0.95
Tropical Airmass	S3(IR-...	S6(IR-...	WV	-4.7	25.8	-25.5	31.2	190.2	242.6	1.0	0.5	1.0
Tropical Night Microp...	S1(IR-I2)	S2(I4-IR)	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-I2)	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	I45	IR-	0	1.02	0.02	0.82	203.5	303.2	0.95	2.6	1.0
Day Microphysics -wi...	N1	I45	IR-	0	1.02	0.02	0.38	203.5	303.2	0.95	1.8	1.0
Night Microphysics	S1(IR-I2)	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	I45	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-I2)	S5(IR-...	IR-	-3.0	7.5	0.9	12.5	261.5	289.2	1.0	2.5	1.0
Ash	S1(IR-I2)	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
- You can edit the RGB list file and add new RGB recipe.

# RGB Recipes Developed by JMA



Cloud phase distinction RGB



SO2 RGB

Himawa-8 S9 03/08/2019 23:50UTC



Differential Water Vapor RGB

Himawa-8 30/01/2017 14:52UTC

- RGB list file for SATAID includes some RGB recipes developed by JMA



# How can we get SATAID?

## WIS Website

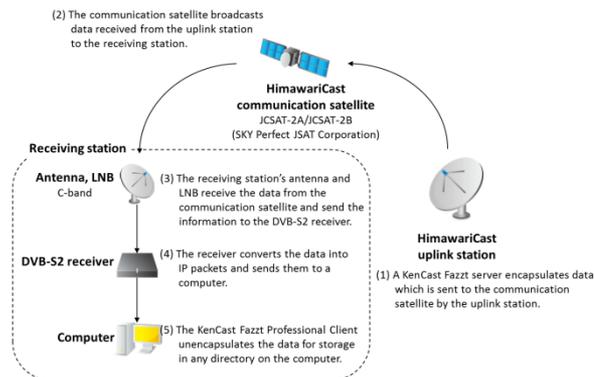
<https://www.wis-jma.go.jp/cms/sataid/>



- 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

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



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

# Summary so far



- **Himawari-8, 9 Overview**

Himawari-8, 9 make Full Disk observation every 10 minutes and Region observation every 2 and a half minutes. The number of observed bands is 16, and a variety of information can be obtained. These are useful for disaster prevention and so on.

- **RGB Composite**

To get important information efficiently, RGB composites were developed. RGB images can be created by a simple process of image compositing. Various information is derivable by one RGB image.

- **SATAID**

SATAID has a variety of functions and easily display satellite images, RGB composites and other meteorological data.

# Hands-on training on basic SATAID functions and displaying RGBs



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

- Introduction of basic operations of SATAID
- Case studies
  1. Typhoon Mawar (T2302) approaching Pacific Islands
    - 25 May, 2023 12:00 UTC – 26 May, 2023 12:30 UTC
  2. Volcanic eruption of Sheveluch, Russia
    - 10 April, 2023 12:00 UTC – 11 April, 2023 18:30 UTC

# Running SATAID and Opening Files



## ◆ Method 1

1. Select "Register"

2. Click "Files"

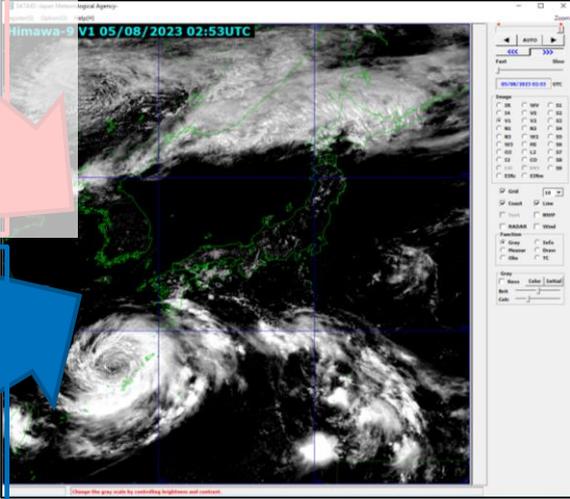
3. Select SATAID files

4. Click "Open"

## ◆ Method 2

1. Select SATAID files

2. Drag to SATAID





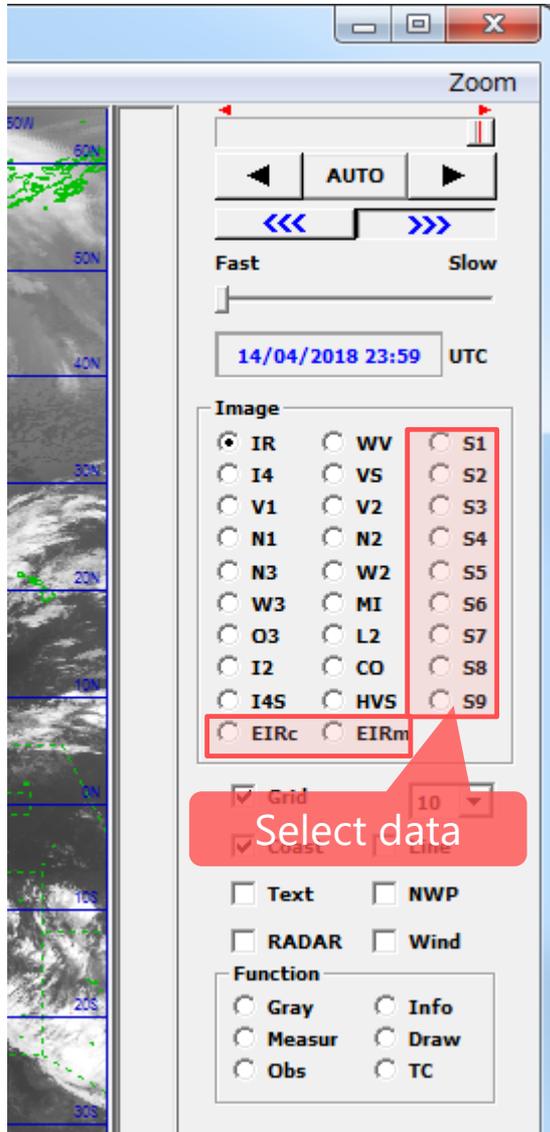
# Selecting Satellite Images

Band		Wavelength [μm]	Himawari Cloud*	Himawari Cast*	WIS*
V1	Visible	0.46	○ (1 km)		
V2		0.51	○ (1 km)		
VS		0.64	○ (0.5 km)	○ (1 km)	○ (4 km)
N1	Near Infrared	0.86	○ (1 km)	○ (4 km)	
N2		1.6	○ (2 km)	○ (4 km)	
N3		2.3	○ (2 km)	○ (4 km)	
I4	Infrared	3.9	○ (2 km)	○ (2 or 4 km)	○ (4 km)
WV		6.2	○ (2 km)	○ (4 km)	○ (4 km)
W2		7.0	○ (2 km)	○ (4 km)	
W3		7.3	○ (2 km)	○ (4 km)	
MI		8.6	○ (2 km)	○ (4 km)	
O3		9.6	○ (2 km)	○ (4 km)	
IR		10.4	○ (2 km)	○ (4 km)	○ (4 km)
L2		11.2	○ (2 km)	○ (4 km)	
I2		12.3	○ (2 km)	○ (4 km)	○ (4 km)
CO		13.3	○ (2 km)	○ (4 km)	

\*( ): spatial resolution



# Selecting Satellite Images



## ◆ Differential Images

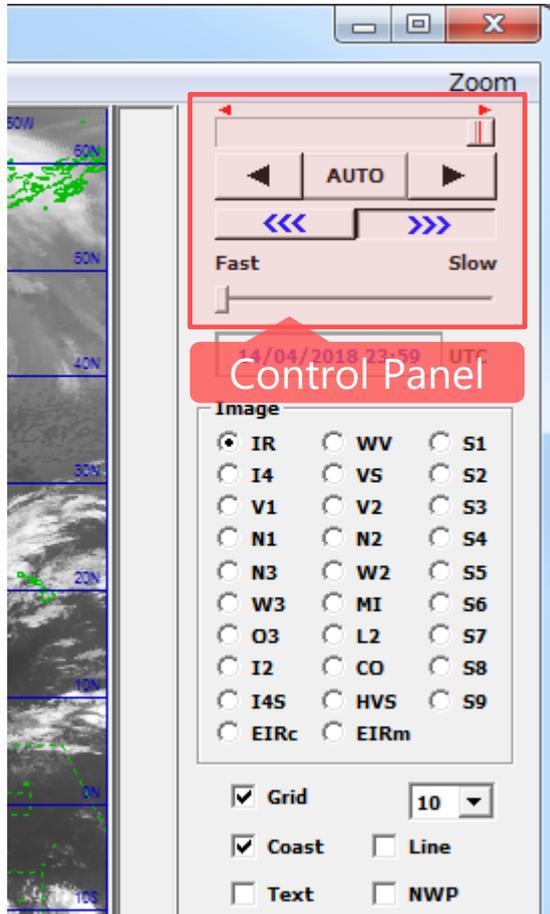
- **S1: Differential images 1 (IR – I2)**
- **S2: Differential images 2 (I4 – IR)**
- **S3: Differential images 3 (IR-WV)**
- etc...

## ◆ Enhanced Images

- **EIRc: Colored enhanced infrared images**
- **EIRm: Monochrome enhanced infrared images**



# Controlling animation



Drag to change animation duration (first/last image).

Start/Stop Animation.



Display previous image.



Display next image.



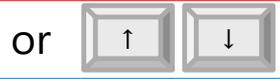
Play in reverse sequence.



Play in normal sequence.



Adjust animation speed.



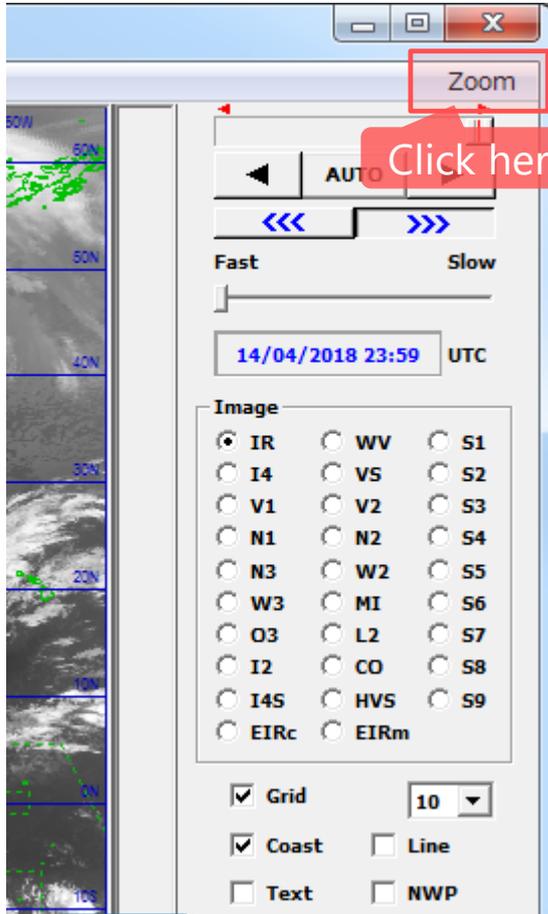
## Tips

" " + or

: Specify current image as the first/last image of animation.



# Zooming In/Out



## ◆ Method 1

- **Display enlarged area.**  
Click [Zoom] button and drag area.
- **Return to whole image.**  
Click [Normal] button.

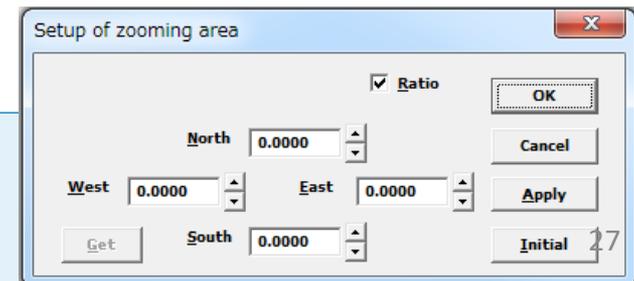
## ◆ Method 2

- **Zoom in:**  +  +  **Left-Click**
- **Zoom out:**  +  +  **Right-Click**

### Tips

Areas can be digitally designated with longitude/latitude information.

 +  + [Zoom]



# Displaying Coast/Grid Lines



Checkbox activation with [Ctrl] pressed: **larger font for latitude/longitude figures**  
 Checkbox activation with [Shift] pressed: **with background color for latitude/longitude figures**  
 Checkbox activation with [Ctrl] + [Shift] pressed: **larger font with background color**

14/04/2018 23:59 UTC

Image

- IR
- I4
- V1
- N1
- N3
- W3
- O3
- I2
- I4S
- EIRc
- WV
- VS
- V2
- N2
- W2
- MI
- L2
- CO
- HVS
- EIRm
- S1
- S2
- S3
- S4
- S5
- S6
- S7
- S8
- S9

Grid  Line

Coast  NWP

Text  RADAR Wind

Function

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

Check!

Grid 10

Select latitude/longitude intervals.

Himawa-8 IR 14/04/2018 03:00UTC

Himawa-8 IR 14/04/2018 03:00UTC

[Map element] can be selected from the [Option] menu to add rivers/lakes/borders, etc.

Check!

Coast

The colors of these lines can be changed using [Line color] in the [Option] menu. <sup>28</sup>



# Adjusting Gradation

## ◆ Method 1

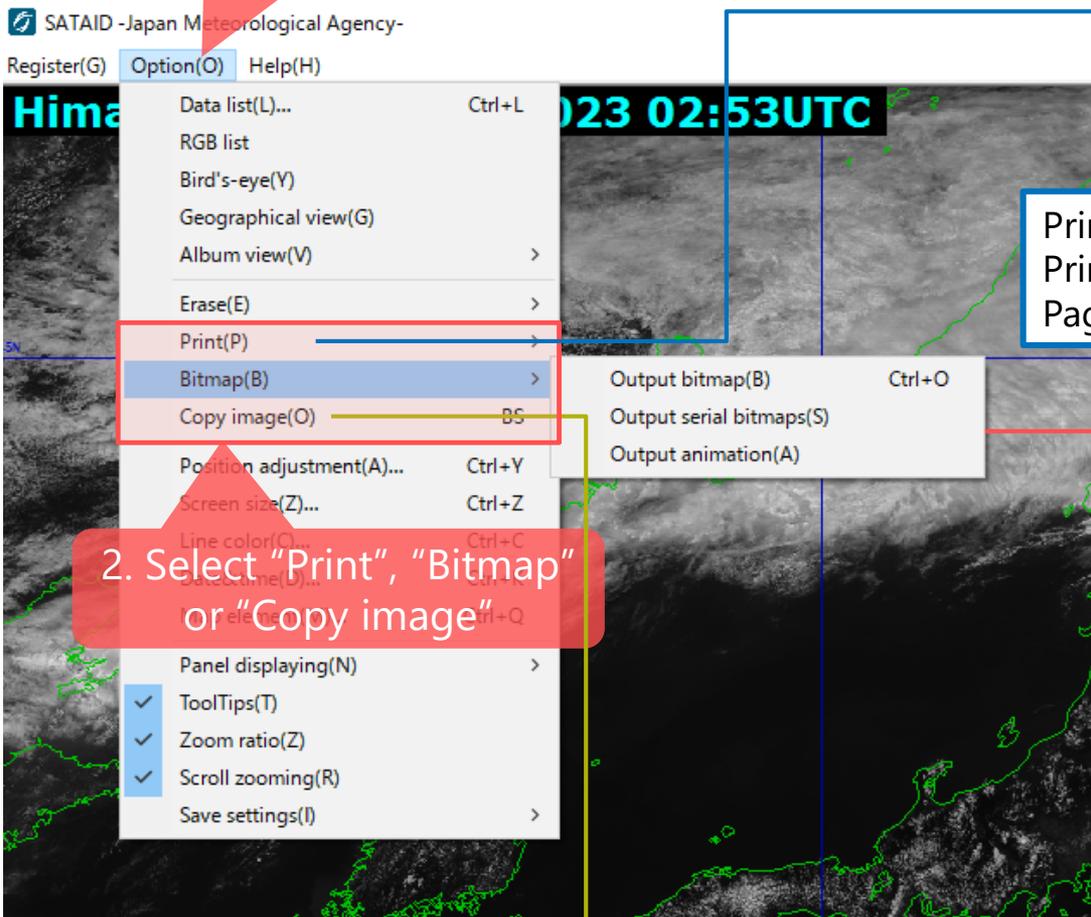
1. Adjust brightness.
2. Change contrast.
3. Reset grayscale.

## ◆ Method 2



# Outputting Images

1. Select "Option"



2. Select "Print", "Bitmap" or "Copy image"

- Print image(P)      Ctrl+P
- Print screen(S)    Ctrl+H
- Page setup(U)...    Ctrl+U

Print image: Output the current image to a printer  
 Print screen: Output the entire screen to a printer  
 Page setup: Set the margins of the printing paper

- Output bitmap(B)      Ctrl+O
- Output serial bitmaps(S)
- Output animation(A)

Output bitmap: Output the current image as a bitmap file etc.  
 Output serial bitmaps: Output all images as bitmap files  
 Output animation: Output images as a Gif animation etc.

Copy the current image to the clipboard



# Displaying NWP data

4. Click "Exec" to display

2. Select NWP model

Shrink/extend window

3. Select the desired elements

1. Check "NWP" to display a pop-up window

## Available NWP data

Symbol	Content	Unit
Height	Altitude	gpm
Wind	Wind barb	kt
Isotac	Isotach	kt
Temp	Air temperature	°C
T-TD	Dew-point depression	°C
P-Vel	Vertical p-velocity	hPa/h
Vort	Relative vorticity	10 <sup>-6</sup> /s
EPT	Equivalent potential temperature	K
VWS	Vertical wind shear	kt/1000ft
Rain	Precipitation (3 hours)	mm/3h
Psea	Sea level pressure	hPa
SSI	Showalter stability index	°C
RH	Relative humidity	%
Div	Horizontal divergency	10 <sup>-6</sup> /s
POT	Potential temperature	K
RiN	Richardson number	-
CAPE	Convective available potential energy	J/kg
PV	Potential vorticity	0.1PVU
Avor	Absolute vorticity	10 <sup>-6</sup> /s
AdvC	Temperature advection	10 <sup>-6</sup> /s/h
Vadv	Relative vorticity advection	0.1°C/h
SH	Specific humidity	0/1g/kg
EXT	Extra element (diff. between levels)	undefined

# Evaluation of brightness temperature



Normal

Fast Slow

13/04/2018 23:59 UTC

Image

<input checked="" type="radio"/> IR	<input type="radio"/> WV	<input type="radio"/> S1
<input type="radio"/> I4	<input 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

Text  NWP

RADAR  Wind

Function

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

Measure

<input checked="" type="radio"/> Brit	<input type="radio"/> Move
<input type="radio"/> Time	<input type="radio"/> Cross
<input type="radio"/> Contour	<input type="radio"/> Hist

1. Click "Measur"

2. Click "Brit"

SATAID -Japan Meteorological Agency-

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

## Himawa-8 IR 14/04/2018 00:00UTC

Click on the image

Brightness ...

13/04/2018 23:52UTC

Pos. : 40.3200N 135.0400E

Bri. : -60.3°C (205hPa) (38844ft)

Srf Win (kt) : SSE 12.5

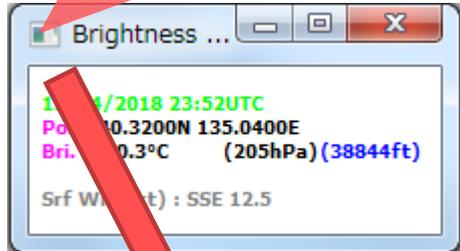
60.8000N 99.4400E Select a point by clicking for measurement.

When NWP data are displayed, estimated altitudes will be shown.

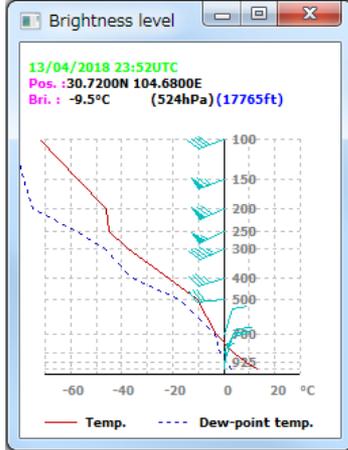


# Display of NWP data

Click the upper-left of the window when NWP data are displayed

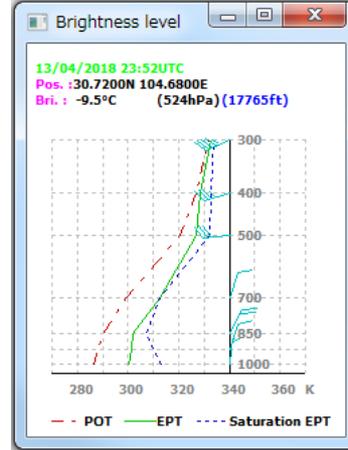


Vert.1 (Air temp.)



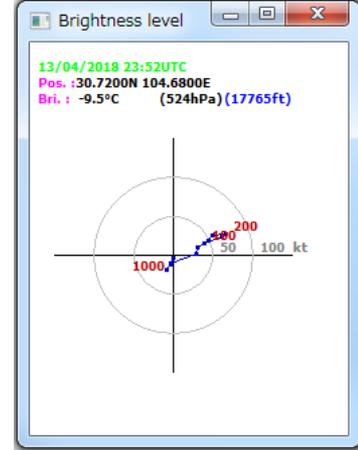
Wind, temperature and dew-point temperature

Vert.2 (Potential temp.)



Wind, potential temperature, equivalent potential temperature and saturated equivalent potential temperature

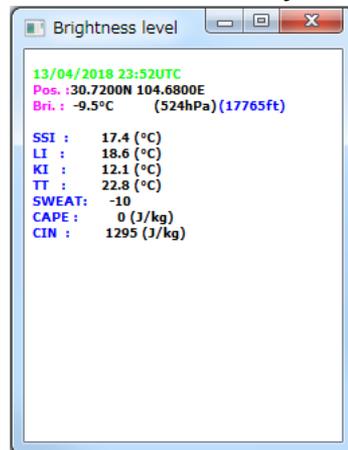
Vert.3 (wind)



Wind hodograph or scorer number

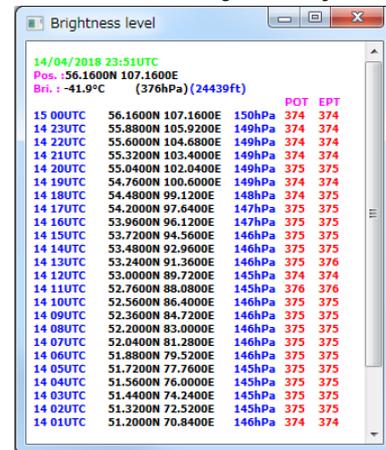
Print	Ctrl+P
Bitmap	Ctrl+O
Copy	BS
Kelvin	Ctrl+K
Sync view	Ctrl+Y
Parallax	Ctrl+L
Vert.1(Temp)	
Vert.2(Pote)	
Vert.3(Wind)	
Vert.4(Stab)	
Vert.5(Traj)	

Vert.4 (Stability)



SSI, KI, CAPE and CIN

Vert.5 (Trajectory)



Trajectories with positions, altitudes, potential temperature and equivalent potential temperature changed over time when all heights in "NWP data" window are checked.



# Parallax

Click the upper-left of the window when NWP data are displayed

Brightness ...

13/04/2018 23:52UTC  
 Pos.: 10.3200N 135.0400E  
 Bri.: 0.3°C (205hPa) (38844ft)  
 Srf Win (kt) : SSE 12.5

- Print Ctrl+P
- Bitmap Ctrl+O
- Copy BS
- Kelvin Ctrl+K
- Sync view Ctrl+Y
- Parallax Ctrl+L**
- Vert.1(Temp)
- Vert.2(Pote)
- Vert.3(Wind)
- Vert.4(Stab)
- Vert.5(Traj)

SATAID -Japan Meteorological Agency-

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

**Himawa-8 IR 14/04/2018 00:00UTC**

Click on the image

Actual cloud position calculated using cloud top height

Parallax vector is automatically calculated.

Brightness ...

13/04/2018 23:54UTC  
 Pos.: 7.5600N 73.2000E  
 Bri.: -75.7°C (124hPa) (50623ft)  
 Para.: 60.7km 93° ( E)  
 Srf Win (kt) : E 5.6

14.8800N 79.4400E Select a point by clicking for measurement.

Normal

Fast Slow

13/04/2018 23:59 UTC

Image

- IR  WV  S1
- I4  VS  S2
- V1  V2  S3
- N1  N2  S4
- N3  W2  S5
- W3  MI  S6
- O3  L2  S7
- I2  CO  S8
- I4S  HVS  S9
- EIRc  EIRm

Grid 10

Coast  Line

Text  NWP

RADAR  Wind

Function

- Gray  Info
- Measur  Draw
- Obs  TC

Measure

- Brit  Move
- Time  Cross
- Contour  Hist

# Evaluation of Movement (Vector)



Normal

Fast Slow

13/04/2018 23:59 UTC

Image

- IR
- I4
- V1
- N1
- N3
- W3
- O3
- I2
- I4S
- EIRc
- WV
- V5
- 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
- Info
- Measur
- Draw
- Obs
- TC

Measure

- Brit
- Time
- Contour
- Move
- Cross
- Hist

SATAID -Japan Meteorological Agency-

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

Himawa-8 IR 14/04/2018 10:00UTC

Normal

AUTO

Fast Slow

14/04/2018 09:59 UTC

Image

- IR
- I4
- V1
- N1
- N3
- W3
- O3
- I2
- I4S
- EIRc
- WV
- V5
- V2
- N2
- W2
- MI
- L2
- CO
- HVS
- S1
- S2
- S3
- S4
- S5
- S6
- S7
- S8
- S9
- EIRm

Grid 10

Select the first point in the first image.

Change the time as desired.

SATAID -Japan Meteorological Agency-

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

Himawa-8 IR 14/04/2018 14:00UTC

Normal

AUTO

Fast Slow

14/04/2018 13:58 UTC

Image

- IR
- I4
- V1
- N1
- N3
- W3
- O3
- I2
- I4S
- EIRc
- WV
- V5
- V2
- N2
- W2
- MI
- L2
- CO
- HVS
- S1
- S2
- S3
- S4
- S5
- S6
- S7
- S8
- S9
- EIRm

Grid 10

41.9600N 135.5600E Select a 2nd point

Select the second point in the next image.

Movement vector is automatically calculated.

14/04/2018 09:53UTC

1st : 28.4000N 127.5600E

14/04/2018 13:53UTC

End : 28.6000N 129.4400E

Dist.: 185km ( 100NM)

Dire.: 83° ( E)

Speed: 25KT

Movement speed is also calculated.

2. Click "Move"

# Time-series of brightness temperature with NWP

Meteorological Satellite Center (MSC) of JMA



Normal

Fast Slow

13/04/2018 23:59 UTC

Image

- IR
- I4
- V1
- N1
- N3
- W3
- O3
- I2
- I4S
- EIRc
- WV
- VS
- V2
- N2
- W2
- MI
- L2
- CO
- HVS
- EIRm
- S1
- S2
- S3
- S4
- S5
- S6
- S7
- S8
- S9

Grid 10

Coast  Line

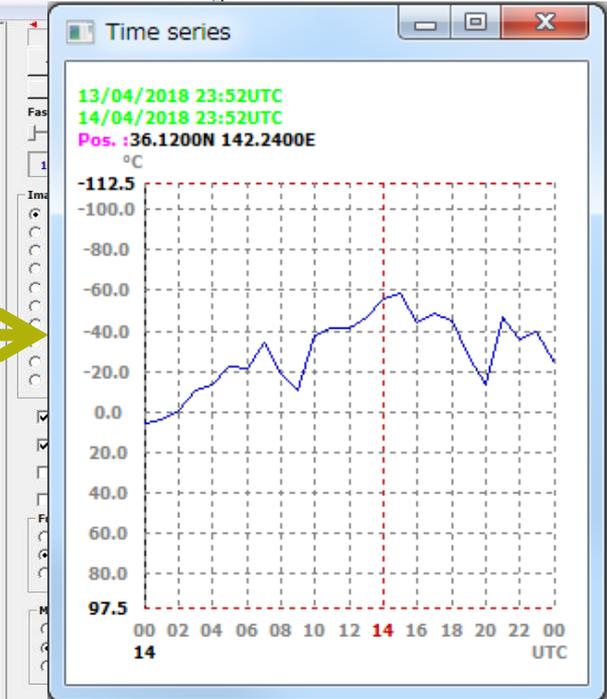
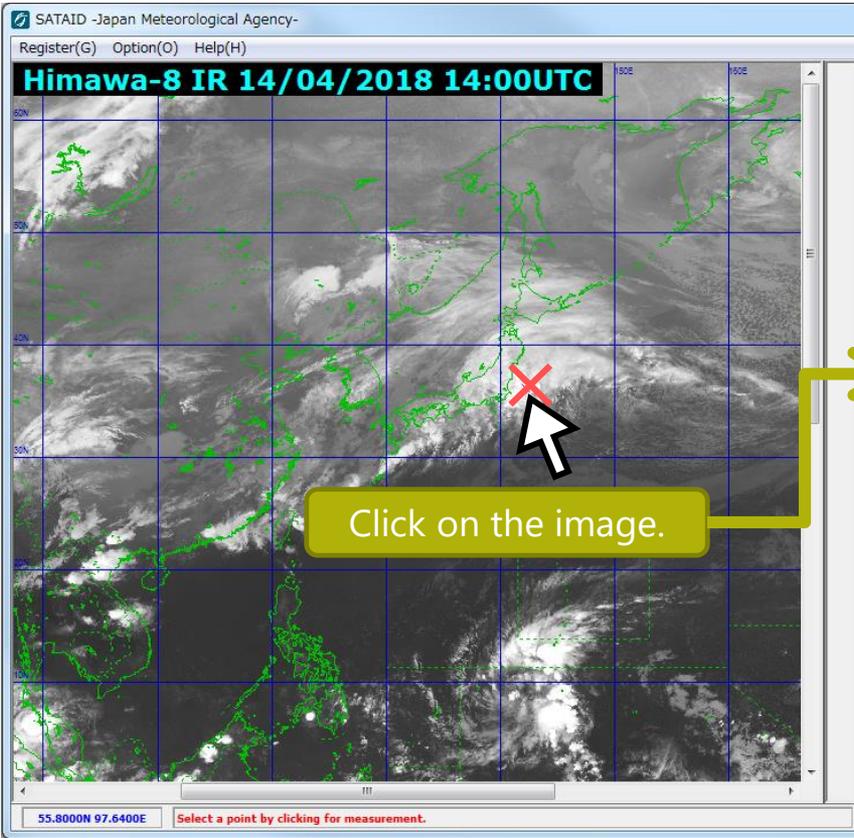
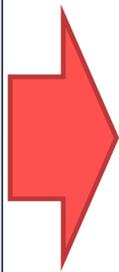
RADAR  Wind

Function

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

Measure

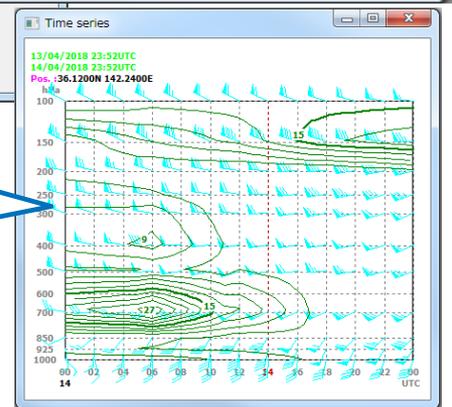
- Brit
- Contour
- Move
- Cross
- Hist



1. Click "Measur"

2. Click "Time"

When NWP data are displayed, a time-series graph of NWP data for the selected point will be shown.





# Cross-sectional Evaluation

Normal

Fast Slow

13/04/2018 23:59 UTC

Image

IR  WV  S1

I4  VS  S2

V1  V2  S3

N1  N2  S4

N3  W2  S5

W3  MI  S6

O3  L2  S7

I2  CO  S8

I4S  HVS  S9

EIRc  EIRm

Grid 10

Coast  Line

RADAR  Wind

Function

Gray  Info

Measur  Draw

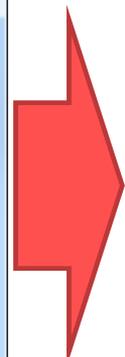
Obs  TC

Measure

Brit  Move

Time  Cross

Contour  Hist



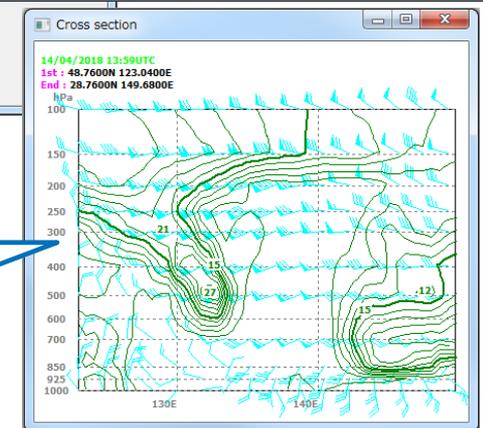
SATAID -Japan Meteorological Agency-

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

Himawa-8 IR 14/04/2018 14:00UTC

64.8800N 102.8000E Select a region by dragging for measurement.

Drag to define a cross section.



When NWP data is displayed, a cross-sectional graph of NWP data for the selected point will be shown.

1. Click "Measur"

2. Click "Cross"



# Isolines (Contours)

Normal

Fast Slow

13/04/2018 23:59 UTC

Image

- IR
- I4
- V1
- N1
- N3
- W3
- O3
- I2
- I4S
- EIRc
- WV
- VS
- V2
- N2
- W2
- MI
- L2
- CO
- HVS
- EIRm
- S1
- S2
- S3
- S4
- S5
- S6
- S7
- S8
- S9

Grid

Coast

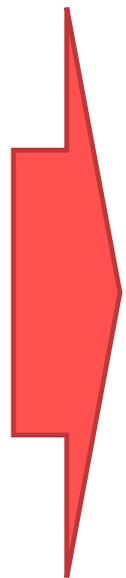
RADAR

Function

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

Measure

- Brit
- Time
- Contour
- Move
- Cross
- Hist



SATAID -Japan Meteorological Agency-

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

Himawa-8 IR 14/04/2018 14:00UTC

59.9200N 125.1200E

Select a region by dragging for measurement.

Normal

Fast Slow

Drag to specify a rectangular area

Contour line

14/04/2018 13:59UTC

1st : 53.2000N 121.8000E

End : 38.4400N 136.0400E

1. Click "Measur"

2. Click "Contour"



# Histograms

Normal

Fast Slow

13/04/2018 23:59 UTC

Image

- IR
- I4
- V1
- N1
- N3
- W3
- O3
- I2
- I4S
- EIRc
- WV
- VS
- V2
- N2
- W2
- MI
- L2
- CO
- HVS
- S1
- S2
- S3
- S4
- S5
- S6
- S7
- S8
- S9
- EIRm

Grid 10

Coast  Line

RADAR  Wind

Function

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

Measure

- Brit
- Time
- Contour
- Move
- Cross
- Hist

1. Click "Measur"

2. Click "Hist"

SATAID -Japan Meteorological Agency-

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

Himawa-8 IR 14/04/2018 14:00UTC

60.2000N 121.9600E Select a region by polygon and W-clicking for measurement.

Normal

Fast Slow

14/04/2018 13:59 UTC

Image

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

Double-click the last point

Click points on the display to specify a polygonal area

Histogram

14/04/2018 13:59UTC

Max. : -6.6°C (46.9200N 125.6000E) 6133ft

Min. : -50.8°C (46.4000N 124.7200E) 46968ft

Ave. : -31.4°C

Dev. : 13.2°C

Tot. : 12615

651

600

500

400

300

200

100

0

-50.8

-49.7°C( 5%)

-6.6°C

39



Break (10minutes)

# Hands-on training on basic SATAID functions and displaying RGBs



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

- Introduction of basic operations of SATAID
- Case studies
  1. Typhoon Mawar (T2302) approaching Pacific Islands
    - 25 May, 2023 12:00 UTC – 26 May, 2023 12:30 UTC
  2. Volcanic eruption of Sheveluch, Russia
    - 10 April, 2023 12:00 UTC – 11 April, 2023 18:30 UTC



# Overview of Case 1

## Typhoon Mawar (T2302) approaching Pacific Islands

SATAID - Japan Meteorological Agency-

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

**Himawa-9 VS 26/05/2023 00:00UTC**

The central pressure was 905 hPa and the max wind was 60 m/s (115 kt) at 00UTC on the 26<sup>th</sup>!

Zoom

Fast Slow

25/05/2023 23:54 UTC

Image

<input type="radio"/> IR	<input type="radio"/> WV	<input type="radio"/> S1
<input type="radio"/> 14	<input type="radio"/> V5	<input type="radio"/> S2
<input type="radio"/> W1	<input type="radio"/> W2	<input type="radio"/> S3
<input type="radio"/> W1	<input type="radio"/> W2	<input type="radio"/> S4
<input type="radio"/> W3	<input type="radio"/> W4	<input type="radio"/> S5
<input type="radio"/> W3	<input type="radio"/> W4	<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"/> I45	<input type="radio"/> HVS	<input type="radio"/> S9
<input type="radio"/> EIRc	<input type="radio"/> EIRm	

Grid  Line

Coast  NWP

Text  Wind

RADAR

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.

Typhoon Mawar formed in the Caroline Islands at 06UTC on 20<sup>th</sup> May 2023.

This typhoon progressed northwestward while developing over the Mariana Islands and passed near Guam on the 24<sup>th</sup>.

Then this typhoon progressed westward east of the Philippines and approached Japan.

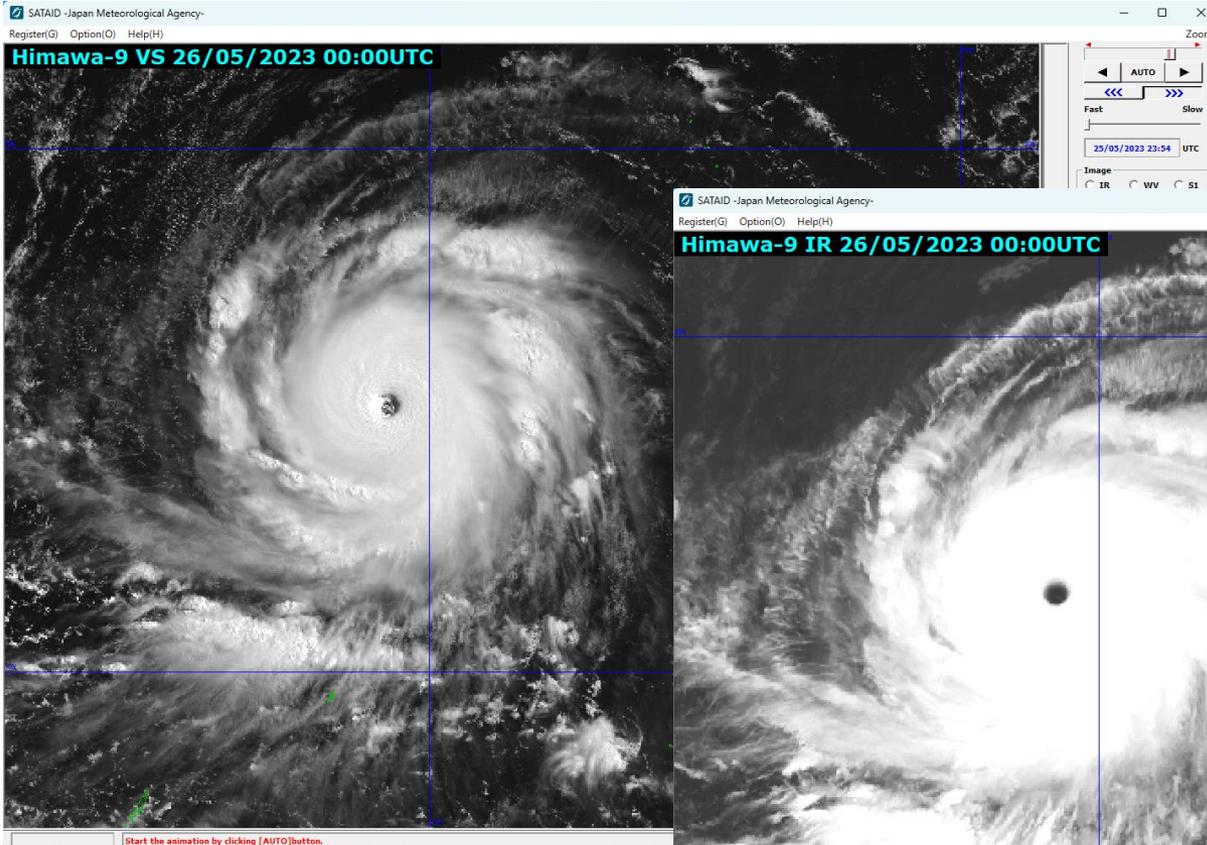
### Tips

Click "AUTO" button or push Space key to start animation.

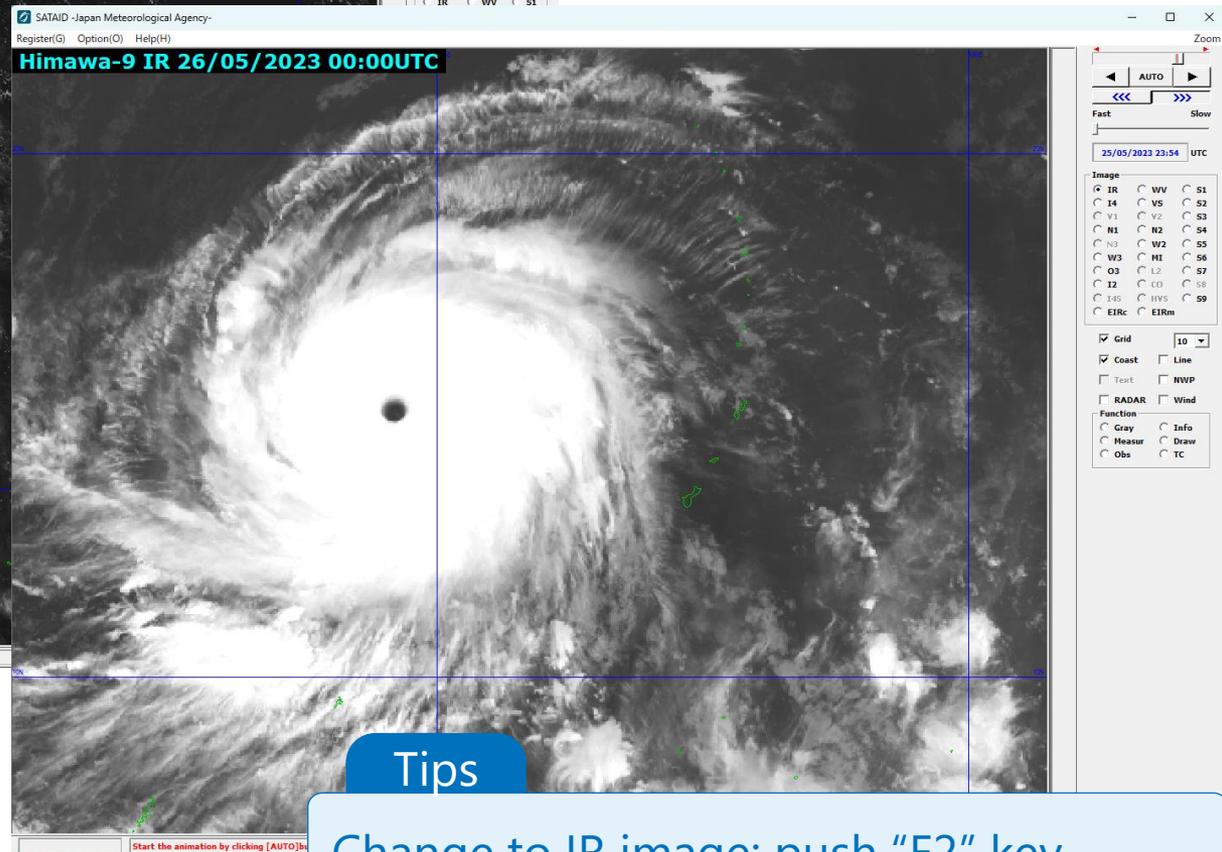
Let's have a familiarity with the SATAID basic operations!



# Selecting Satellite Images



↓ Displaying IR image



↑ Displaying VS image

**Tips**  
 Change to IR image: push "F2" key  
 Change to VS image: push "F5" key



# Enhancing Color

The screenshot shows a software interface with several sections:

- Normal:** Includes a slider, 'AUTO' button, and 'Fast'/'Slow' labels.
- Image:** A grid of radio buttons for selecting image types (IR, WV, S1, I4, VS, S2, V1, V2, S3, N1, N2, S4, N3, W2, S5, W3, MI, S6, O3, L2, S7, I2, CO, S8, I4S, HVS, S9, EIRc, EIRm).
- Grid:** A checked checkbox and a dropdown menu set to '10'.
- Function:** Radio buttons for 'Gray', 'Info', 'Measur', 'Draw', 'Obs', and 'TC'. 'Gray' is selected.
- Gray:** A sub-panel with 'Revs', 'Color', and 'Initial' radio buttons, and 'Brit' and 'Cntr' sliders.

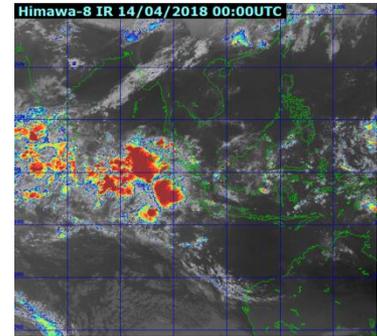
This panel shows the 'Gray' settings with three radio buttons: 'Revs', 'Color', and 'Initial'. The 'Color' button is highlighted with a blue box. Below it are sliders for 'Brit' and 'Cntr'.

Select a radio button to change the grayscale setting.

Check "Sandwich" to display sandwich image.

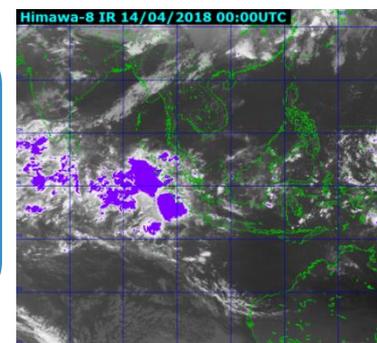
The 'Setting the emphasis' dialog box contains:

- Mode:** Radio buttons for '6bit', '4bit', 'Cols', 'Mix', 'Ext0', 'Ext1', 'Ext2', 'Ext3', and 'Cmap'.
- VIS:** A checked 'hour' checkbox and a 'Sandwich' checkbox (highlighted with a blue box).
- Buttons:** 'Set', 'Reset', 'Close', and 'Clear'.
- Gradation display box:** A horizontal bar with a color gradient from purple to black.

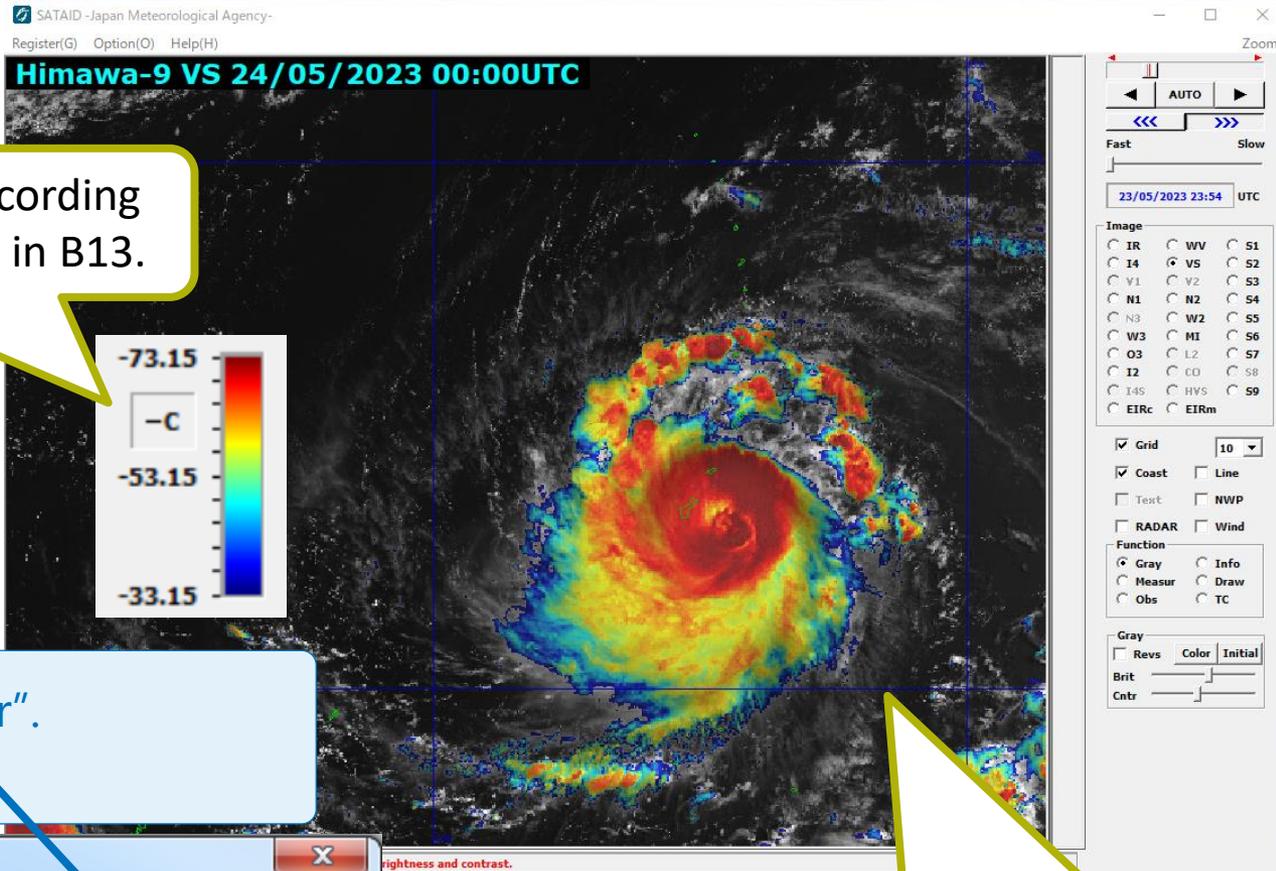


Click "Gray"

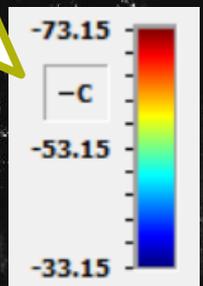
- To select a range to be emphasized:  
Click on two arbitrary points  
- To clear the range to be emphasized:  
Right-click on the first point and left-click on the second.



# Displaying Sandwich Images



Sandwich image is colored according to the cloud-top temperature in B13.



## Tips

Click "Gray" and click "Color".  
Finally check "Sandwich".

Setting the emphasis

<b>Mode</b> <input type="radio"/> 6bit <input type="radio"/> 4bit <input type="radio"/> Cols <input type="radio"/> Mix <input type="radio"/> Ext0 <input type="radio"/> Ext1 <input type="radio"/> Ext2 <input type="radio"/> Ext3 <input type="radio"/> Cmap	<b>VIS</b> <input type="checkbox"/> hour <input checked="" type="checkbox"/> Blue <input checked="" type="checkbox"/> Sandwich	Close Clear
--	---	----------------

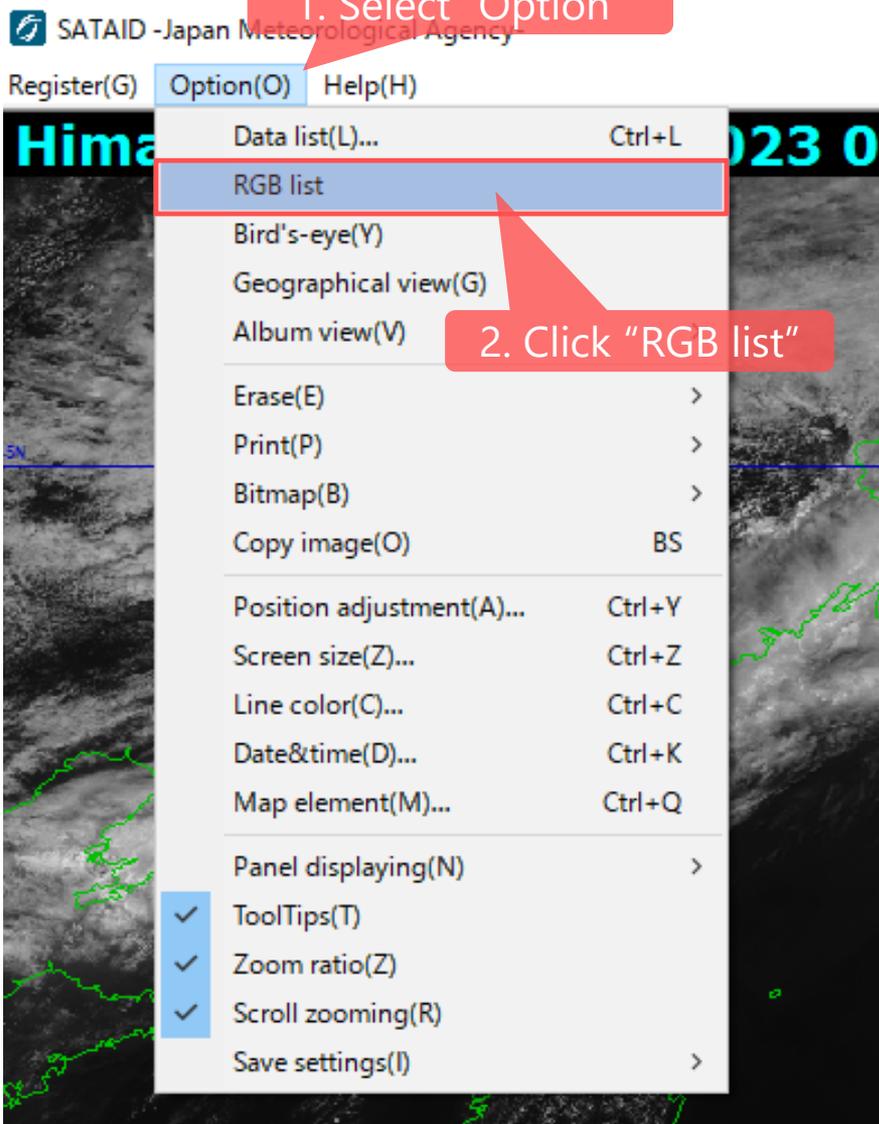
Set   Reset

Reddish areas indicate that the area may contain cumulonimbus.

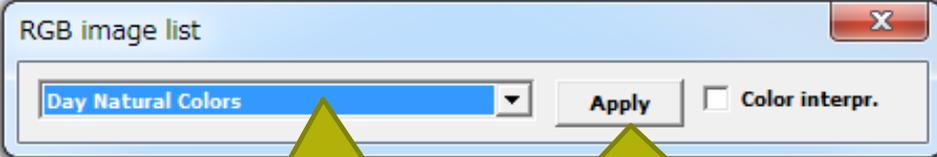


# Displaying RGB Images

1. Select "Option"

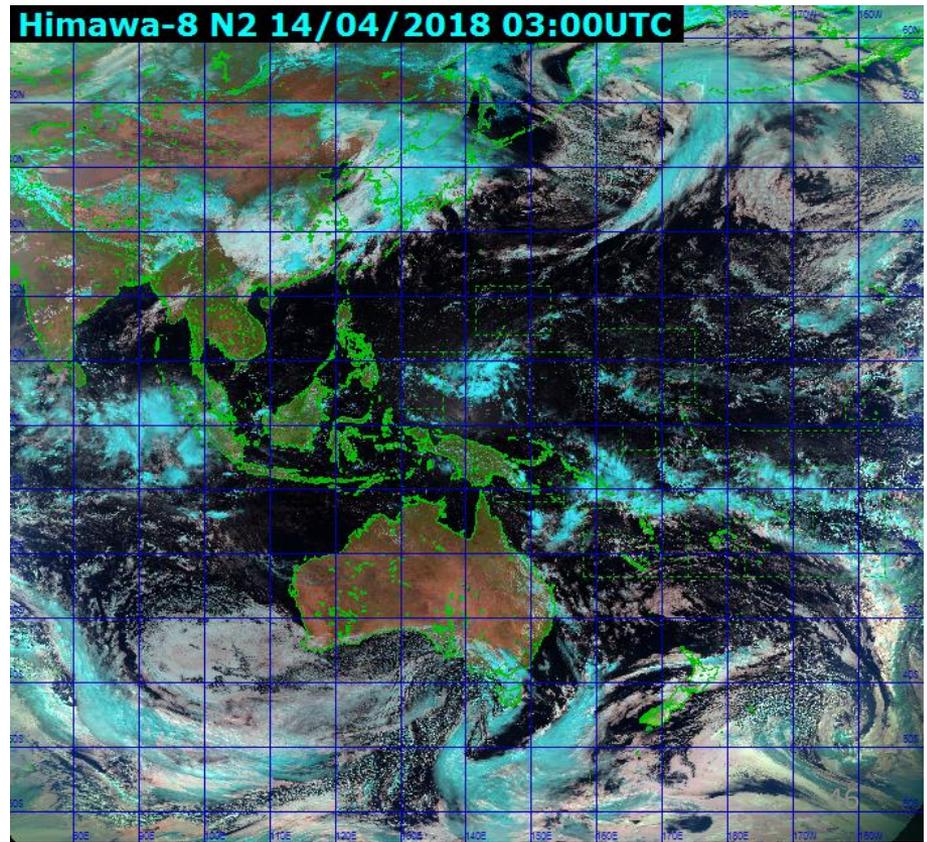


2. Click "RGB list"



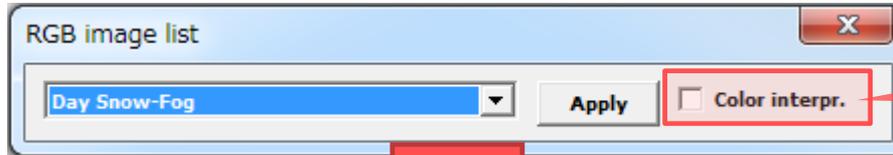
3. Select RGB image

4. Click "Apply" to display

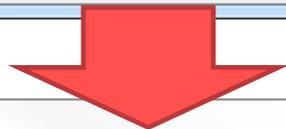




# Displaying color legends



Activate this checkbox.



SATAID -Japan Meteorological Agency-

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

**Himawa-8 N1 14/04/2018 03:00UTC**

Zoom

Fast Slow

14/04/2018 02:59 UTC

Image

- IR  WV  S1
- I4  VS  S2
- V1  V2  S3
- N1  N2  S4
- N3  W2  S5
- W3  MI  S6
- O3  L2  S7
- I2  CO  S8
- I4S  HVS  S9
- EIRc  EIRm

Grid 10

Coast  Line

Text  NWP

RADAR  Wind

Function

- Gray  Info
- Measur  Draw
- Obs  TC

RGB image list

Day Snow-Fog Apply  Color interpr.

- Deep precipitating cloud with large ice particles
- Deep precipitating cloud with small ice particles
- Thick water cloud with large droplets
- Thick water cloud with small droplets
- Ocean
- Vegetation
- Desert
- Snow

Start the animation by clicking [AUTO]button.



# Displaying RGB Images

## Day Convective Storms RGB

The screenshot shows the SATAID software interface. At the top, the title bar reads 'SATAID -Japan Meteorological Agency-' with menu options 'Register(G)', 'Option(O)', and 'Help(H)'. Below the title bar, the text 'Himawa-9 S4 24/05/2023 00:00UTC' is displayed. The main window is titled 'RGB image list' and contains a dropdown menu set to 'Day Convective Storms', an 'Apply' button, and a checked 'Color interpr.' checkbox. Below this are six color-coded options:

- Deep precipitating cloud with large ice particles
- Deep precipitating cloud with small ice particles
- Thin Cirrus clouds with large ice particles
- Thin Cirrus clouds with small ice particles
- Ocean
- Land

To the right of the configuration window is a large satellite image of a storm system, rendered in a color scale from purple (low intensity) to yellow (high intensity). A yellow callout box points to the yellowish core of the storm. On the far right, there is a control panel with various options like 'Grid', 'Coast', 'Text', 'RADAR', and 'Function'.

Yellowish color indicates convection with strong updraft

Tips

Select "Option" and click "RGB list".

# Creating New RGB Recipes



SATAID -Japan Meteorological Agency-

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

**Himawa-8 N1 14/04/2018 03:00UTC**

Zoom

Fast Slow

14/04/2018 02:59 UTC

Image

IR W1 W2 W3 W4 W5 W6 W7 W8 W9 W10 W11 W12 W13 W14 W15 W16 W17 W18 W19 W20 W21 W22 W23 W24 W25 W26 W27 W28 W29 W30 W31 W32 W33 W34 W35 W36 W37 W38 W39 W40 W41 W42 W43 W44 W45 W46 W47 W48 W49 W50 W51 W52 W53 W54 W55 W56 W57 W58 W59 W60 W61 W62 W63 W64 W65 W66 W67 W68 W69 W70 W71 W72 W73 W74 W75 W76 W77 W78 W79 W80 W81 W82 W83 W84 W85 W86 W87 W88 W89 W90 W91 W92 W93 W94 W95 W96 W97 W98 W99 W100

Grid 10

Coast Line

Start the animation by clicking [AUTO] button.

1. Right-click the upper-left of the window

File	Ctrl+F
Edit	Ctrl+E
Info	Ctrl+I

2. Click "Edit"

RGB image list

Day Snow-Fog

Apply  Color interp.

Deep precipitating  
Thick water cloud  
Ocean  
Vegetation  
Desert  
Snow

RGB recipe data

Pick Modify Insert Delete Save Save As Register Close

Title	ImageR	ImageG	ImageB	MinR	MaxR	MinG	MaxG	MinB	MaxB	GammaR	GammaG	GammaB
True Color	V5	V2	V1	0	1	0	1	0	1	1.0	1.0	1.0
Day Natural Colors	N2	N1	V5	0	0.98	0	1.1	0	1	1.0	1.0	1.0
Day Convective Storms	S4(W3-...	S2(I4-I...	S7(N2-...	-5.9	36.9	-1.7	66.1	-0.71	0.24	1.0	0.5	1.0
24hour Microphysics	S1(IR-12)	S5(IR-...	IR-	-2.6	6.7	0.98	4.93	248.5	302.4	1.0	1.2	1.0
Day Microphysics -su...	N1	I45	IR-	0	1	0	0.6	203	323	1.0	2.5	1.0
Day Microphysics -wi...	N1	I45	IR-	0	1	0	0.25	203	323	1.0	1.5	1.0
Night Microphysics	S1(IR-12)	S2(I4-IR)	IR-	-2.6	6.7	-5.2	3.1	243.6	292.6	1.0	1.0	1.0
Day Snow-Fog	N1	N2	I45	0	1	0	0.7	0	0.3	1.7	1.7	1.7
Airmass	S4(W3-...	S6(IR-...	WV	0.6	26.2	-5.9	40.48	208.5	243.9	1.0	1.0	1.0
Dust	S1(IR-12)	S5(IR-...	IR-	-2.6	6.7	0.98	10.87	261.2	288.7	1.0	2.5	1.0
Ash	S1(IR-12)	S5(IR-...	IR-	-2.6	6.7	-4.93	6.3	243.6	302.42	1.0	1.0	1.0
[test]Water Vapors	IR	WV	W3	202.29	278.96	214.66	242.67	245.12	261.03	10	5.5	5.5
[test]Water Vapors2	S4(W3-...	W3	WV	-3	30	213.15	278.15	208.50	243.90	3.5	2.5	2.5
[test]Cloud Phase Di...	IR	V5	N2	219.619	280.6707	-0.0346	0.7792	0.0119	0.5932	1.0	1.0	1.0
[test]Fire Detection	V1	N2	L2	0.1	0.05	0.0	0.5	159.15	222.15	1.0	1.0	1.0

# Comparison with RGB values



SATAID -Japan Meteorological Agency-

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

**Himawa-8 N1 14/04/2018 03:00UTC**

Zoom

Fast Slow

14/04/2018 02:59 UTC

Image

IR W1 W2 W3 W4 W5 W6 W7 W8 W9 W10 W11 W12 W13 W14 W15 W16 W17 W18 W19 W20 W21 W22 W23 W24 W25 W26 W27 W28 W29 W30 W31 W32

N1 N2 N3 N4 N5 N6 N7 N8 N9 N10 N11 N12 N13 N14 N15 N16 N17 N18 N19 N20 N21 N22 N23 N24 N25 N26 N27 N28 N29 N30 N31 N32

O3 O4 O5 O6 O7 O8 O9 O10 O11 O12 O13 O14 O15 O16 O17 O18 O19 O20 O21 O22 O23 O24 O25 O26 O27 O28 O29 O30 O31 O32

I2 I3 I4 I5 I6 I7 I8 I9 I10 I11 I12 I13 I14 I15 I16 I17 I18 I19 I20 I21 I22 I23 I24 I25 I26 I27 I28 I29 I30 I31 I32

I45 I46 I47 I48 I49 I50 I51 I52 I53 I54 I55 I56 I57 I58 I59 I60 I61 I62 I63 I64 I65 I66 I67 I68 I69 I70 I71 I72 I73 I74 I75 I76 I77 I78 I79 I80 I81 I82 I83 I84 I85 I86 I87 I88 I89 I90 I91 I92 I93 I94 I95 I96 I97 I98 I99 I100

EIRc EIRm

Grid 10

Coast  Line

RGB image list

Day Snow-Fog Apply  Color interpr.

- Deep precipitating cloud with large ice particles
- Deep precipitating cloud with small ice particles
- Thick water cloud with large droplets
- Thick water cloud with small droplets
- Ocean
- Vegetation
- Desert
- Snow

Start the animation by clicking [AUTO]button.

1. Right-click the upper-left of the window

File	Ctrl+F
Edit	Ctrl+E
Info	Ctrl+I

2. Click "Info"

RGB information

Press Day Natural Colors Close

Initial

	Image	Temp/Ref	Gamma	Value	Min	Max
R	N2	0.442	1.000	116		
G	N1	0.499	1.000	116		
B	VS	0.450	1.000	115		

# RGB Images by "Mix" Function



Normal

AUTO

Fast Slow

13/04/2018 23:59 UTC

Image

- IR  WV  S1
- I4  VS  S2
- V1  V2  S3
- N1  N2  S4
- N3  W2  S5
- W3  MI  S6
- O3  L2  S7
- I2  CO  S8
- I4S  HVS  S9
- EIRc  EIRm

Grid 10

Color  Text  NWP

RADAR  Wind

Function

- Gray  Info
- Measur  Draw
- Obs  TC

Gray

- Revs  Color  Initial

Brit

1. Click "Gray"

2. Click "Color"

3. Ctrl + "Mix"

Setting the emphasis

Mode

- 6bit  4bit  Cols  Mix
- Ext0  Ext1  Ext2  Ext3
- Cmap

VIS

- hour
- Blue
- Sandwich

Set Reset Close Clear



Setup of image mixture

Gamma

Image-1 : IR [Cyan] 1.00

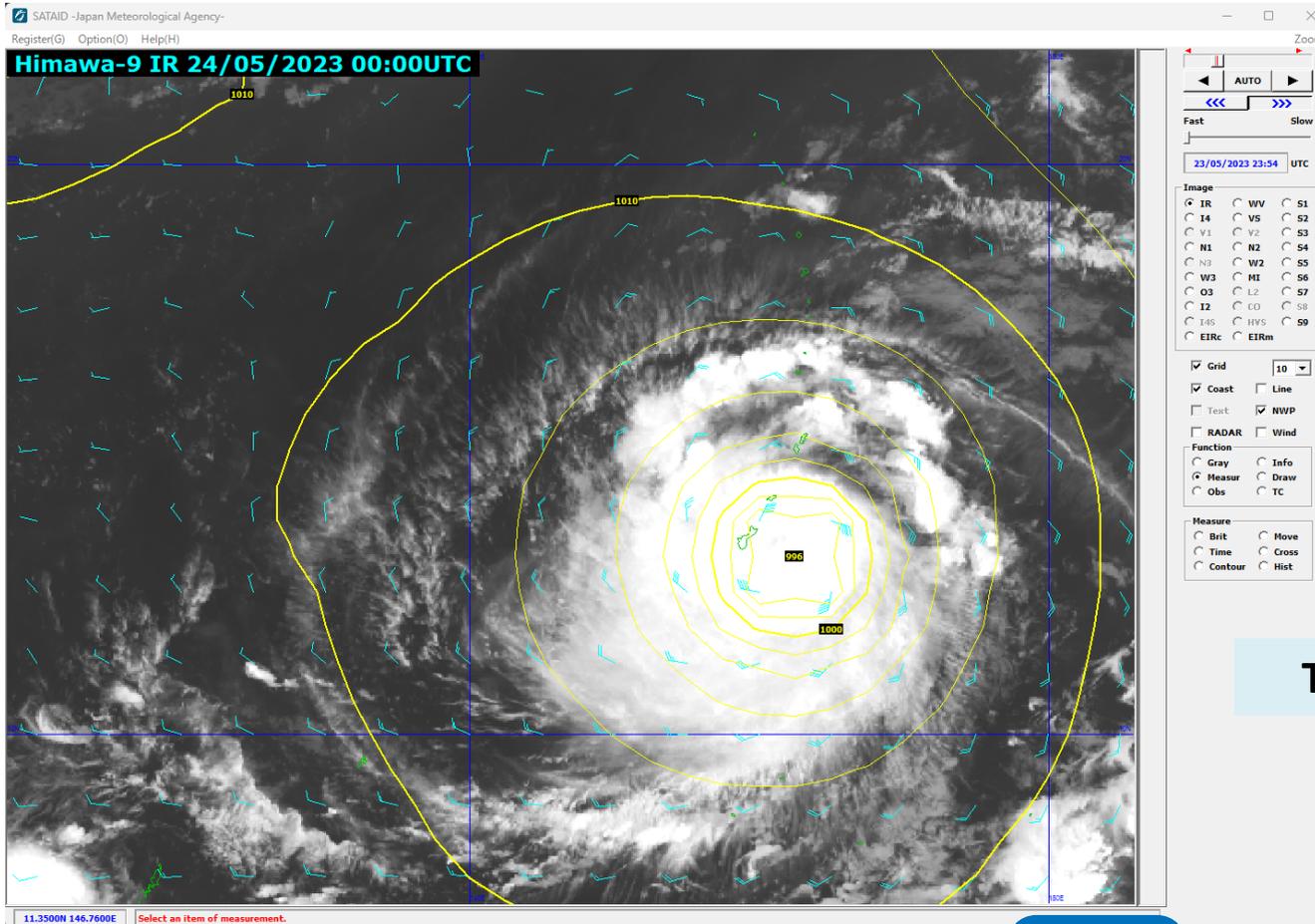
Image-2 : VS [Magenta] 1.00

Image-3 : WV [Blue] 1.00

OK Cancel Apply Initial



# Overlaying NWP data



Try various data overlays!

↑ Overlaying Surface “Wind” and “Psea” on IR imagery.

## Tips

Check “NWP” and select “GSM”.



# Data Evaluation

## Evaluation of brightness temperature

### Tips

Click "Measur" and click "Brit".  
Finally click on the image.

When NWP data are displayed,  
estimated altitudes will be shown.

### Tips

Zoom in: Ctrl + Shift + Left-Click  
Zoom out: Ctrl + Shift + Right-Click 53

Let's look at brightness temperature and altitude of cloud top of the cloud bands approaching Guam.

# Data Evaluation



## Approximate center position of typhoon

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

Himawa-9 IR 23/05/2023 04:30UTC

Click "Brit"

Cloud motion

23/05/2023 04:23UTC  
 1st : 11.6800N 146.6100E  
 23/05/2023 07:23UTC  
 End : 11.9200N 146.4300E  
 Dist.: 33km ( 18NM)  
 Dire.: 324° (NW)  
 Speed: 6KT

## Movement direction and speed of typhoon

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

Himawa-9 IR 23/05/2023 07:30UTC

Click "Move"

Brightness level

23/05/2023 04:23UTC  
 Pos. : 11.6800N 146.6100E  
 Bri. : 18.8°C

### Tips

Select the first point in the first image.  
 Select the second point in the next image.

# Data Evaluation

## Evaluation of cross section

**25/05/2023 23:54UTC**  
**1st : 15.1000N 134.7000E**  
**End : 15.1300N 145.0500E**

**hPa**

100  
150  
200  
250  
300  
400  
500  
600  
700  
850  
925  
1000

135E 140E 145E

**25/05/2023 23:54UTC**  
**1st : 15.1000N 134.7000E**  
**End : 15.1300N 145.0500E**

**°C**

-112.5  
-100.0  
-80.0  
-60.0  
-40.0  
-20.0  
0.0  
20.0  
40.0  
60.0  
80.0  
97.5

135E 140E 145E

**Cross section**

03 12 59  
145 145 98  
EIRc EIRm 99

Grid  10  
 Coast  Line  
 Text  NWP  
 RADAR  Wind

Function  
 Gray  Info  
 Measur  Draw  
 Obs  TC

Measure  
 Brit  Move  
 Time  Cross  
 Contour  Hist

**Tips**

Click "Measur" and click "Cross".  
 Finally drag on image.

When NWP data are displayed, a cross-sectional graph of NWP data will be shown.

# Overview of Case 2

## Volcanic eruption of Sheveluch, Russia



SATAID -Japan Meteorological Agency-

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

**Himawa-9 IR 10/04/2023 14:30UTC**

**Sheveluch volcano**

Normal

AUTO

Fast Slow

10/04/2023 14:21 UTC

Image

- IR
- I4
- V1
- N1
- N3
- W3
- O3
- I2
- I4S
- EIRc
- WV
- VS
- V2
- N2
- W2
- MI
- L2
- CO
- HVS
- EIRm
- S1
- S2
- S3
- S4
- S5
- S6
- S7
- S8
- S9

Grid  Coast  Text  RADAR

Line  NWP  Wind

Function

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

Sheveluch volcano in the Kamchatka Peninsula, Russia erupted at around 13UTC on the night of 10th April 2023.

The height of the volcanic plume was estimated to reach about 16 km!

Take full advantage of multiple band imagery and RGB composites according to the purpose.

**Tips**

Adjust animation speed: First-Slow scrollbar or up key and down key



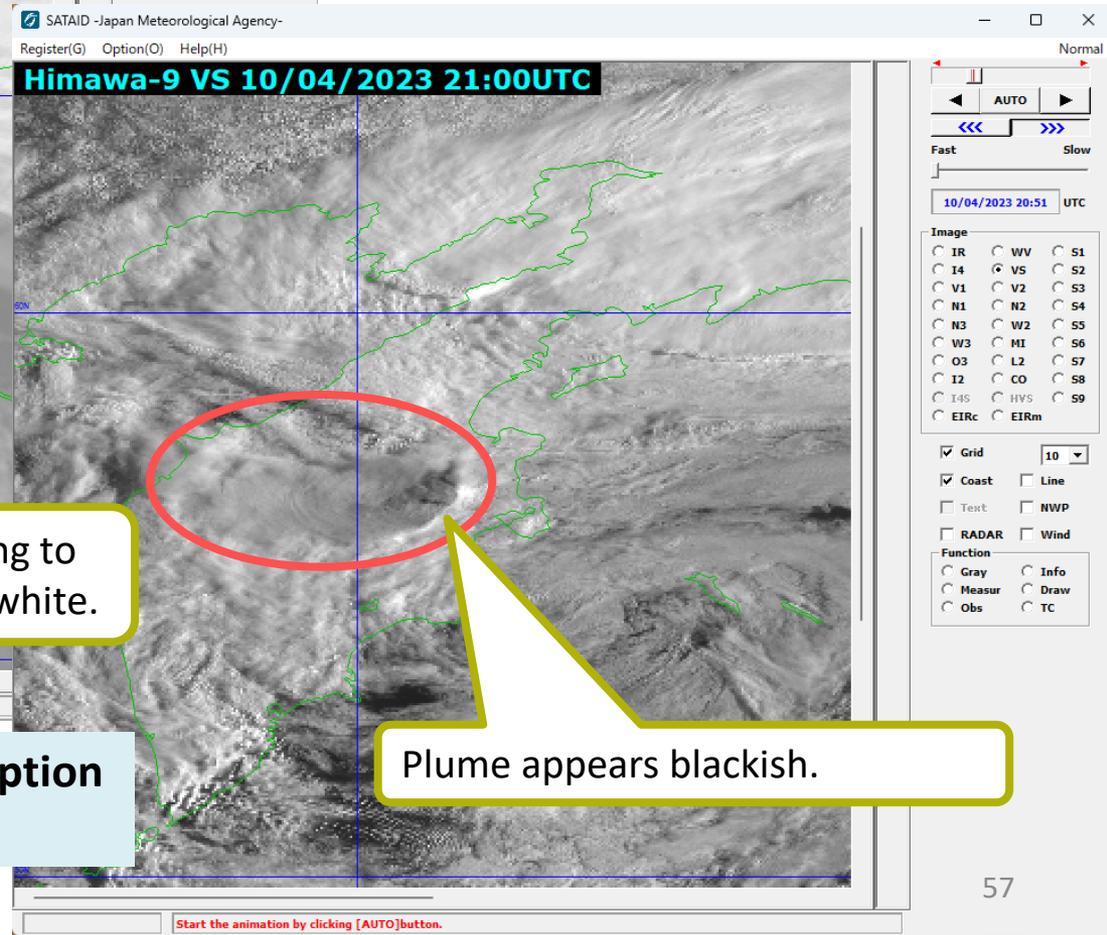
# Selecting Satellite Images

↓ VS image of the next day  
(21:00UTC 10<sup>th</sup> April)



Fan-shaped plume spreading to the west of the volcano in white.

↑ IR image immediately after the eruption  
(14:30UTC 10<sup>th</sup> April)



Plume appears blackish.



# Displaying RGB Images

## True Color RGB

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

**Himawa-9 VS 10/04/2023 21:00UTC**

Normal

Fast Slow

10/04/2023 20:51 UTC

Image

- IR  WV  S1
- I4  V5  S2
- V1  V2  S3
- N1  N2  S4
- N3  W2  S5
- W3  MI  S6
- O3  L2  S7
- I2  CO  S8
- I45  HYS  S9
- EIRc  EIRm

Grid  Line

Coast  NWP

Text  RADAR  Wind

Function

- Gray  Info
- Measur  Draw
- Obs  TC

Start the animation by clicking [AUTO]button.

### Tips

Select "Option" and click "RGB list".

Plume appears brownish.

# Displaying RGB Images



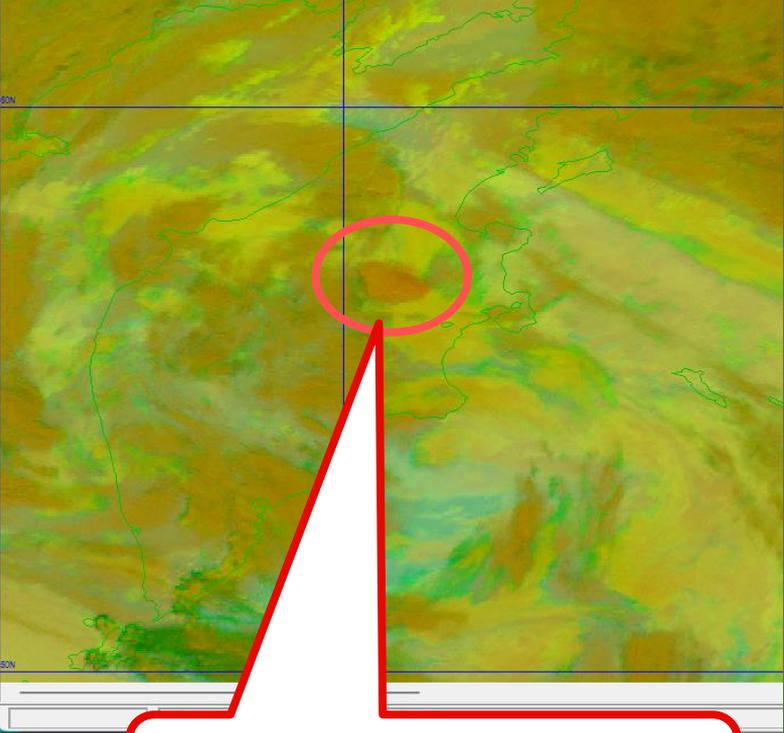
## Ash RGB

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

Himawa-9 S1 10/04/2023 14:30UTC

Normal

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

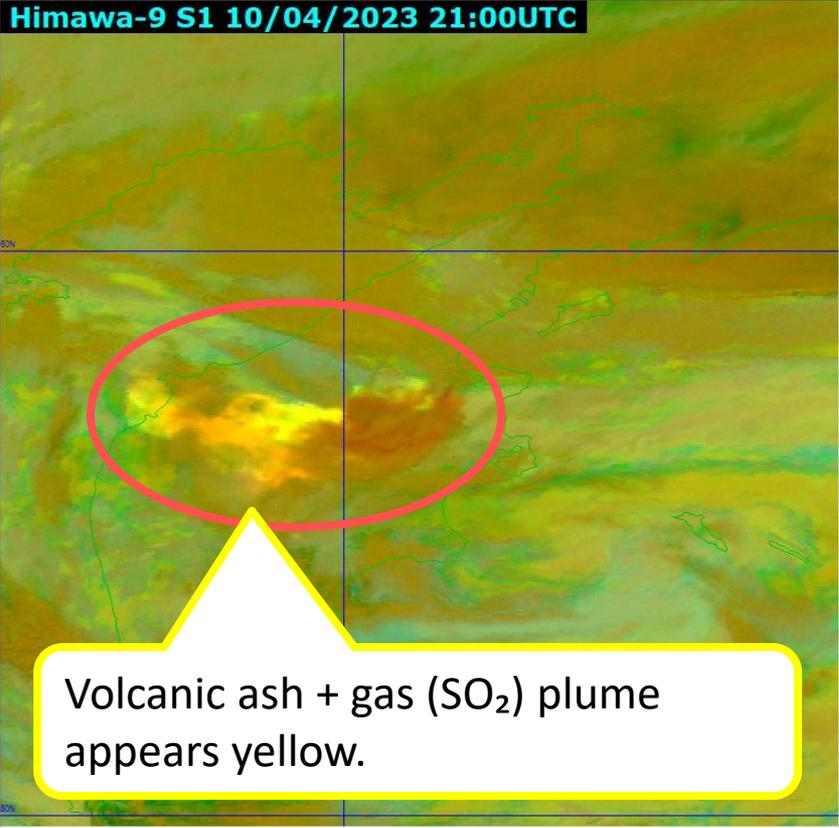


Volcanic ash plume appears reddish.

RGB image list

Ash   Color interpr.

- Cold, thick, high-level clouds
- Thin Cirrus clouds, Contrails
- Volcanic SO2 clouds
- Volcanic Ash clouds



Volcanic ash + gas (SO<sub>2</sub>) plume appears yellow.

Fast Slow

10/04/2023 20:51 UTC

Image

- IR  WV  S1
- I4  VS  S2
- V1  V2  S3
- N1  N2  S4
- N3  W2  S5
- W3  MI  S6
- O3  L2  S7
- I2  CO  S8
- I4S  HVS  S9
- EIRc  EIRm

Grid  Line

Coast  NWP

Text  Wind

RADAR

Function

- Gray  Info
- Measur  Draw
- Obs  TC

Start the animation by clicking [AUTO] button.



# Displaying RGB Images

## Ash RGB

SATEAID - Japan Meteorological Agency

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

**Himawari-9 S1 12/04/2023 00:00UTC**

Zoom

Fast Slow

11/04/2023 23:51 UTC

Image

- IR
- I4
- V1
- N1
- W3
- O3
- I2
- I4S
- EIRc
- WV
- VS
- V2
- N2
- W2
- MI
- L2
- CO
- HVS
- EIRm
- S1
- S2
- S3
- S4
- S5
- S6
- S7
- S8
- S9

Grid 10

Coast  Line

Text  NWP

RADAR  Wind

Function

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

Measure

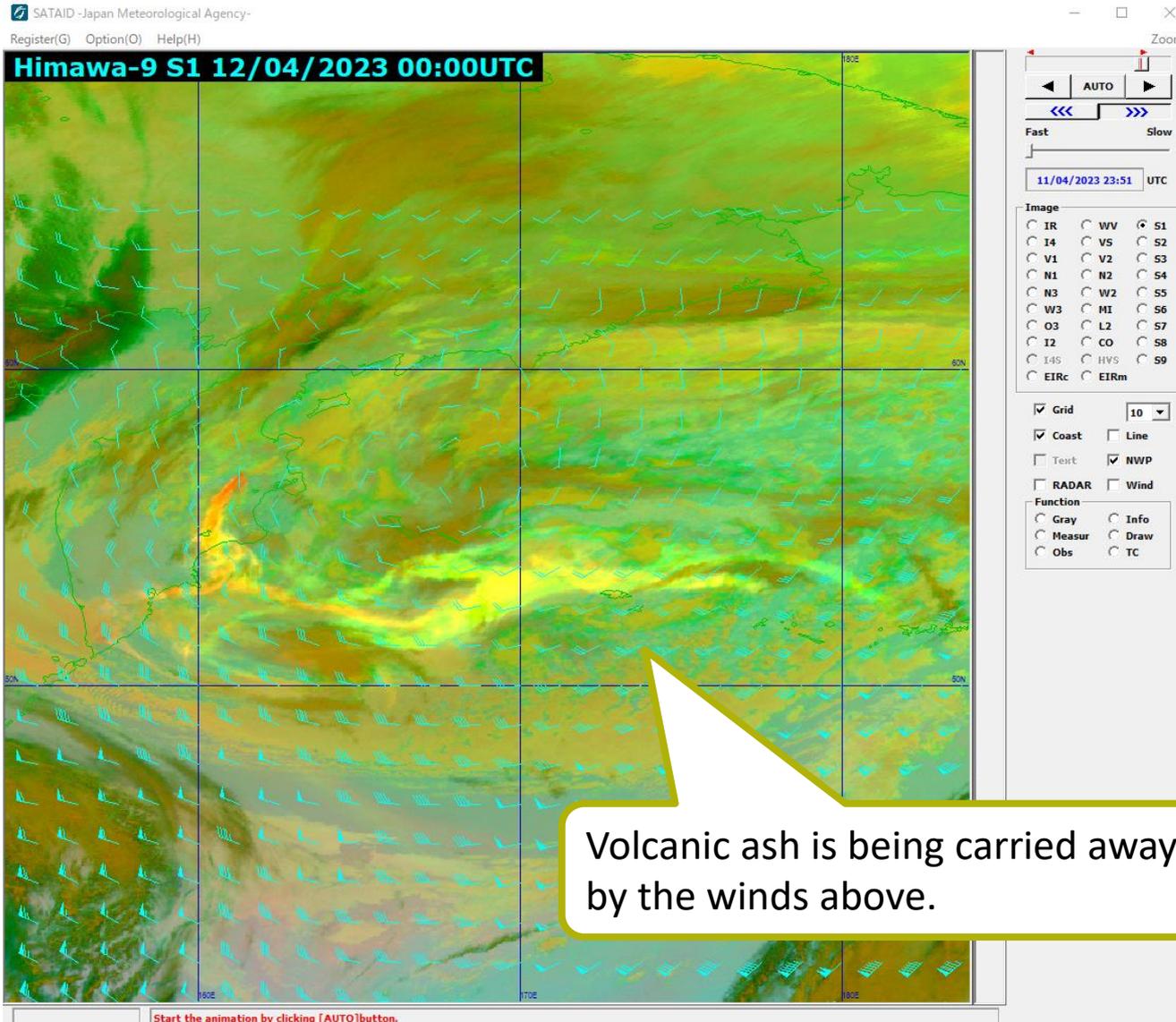
- Brit
- Move
- Time
- Cross
- Contour
- Hist

50.0800N 154.0400E Select an item of measurement.

The volcanic ash is seen in red to yellow as it flows counterclockwise to the southeast of the volcano.



# Overlaying NWP data



## Tips

Check "NWP" and select "GSM".

Volcanic ash is being carried away by the winds above.

# Displaying RGB Images



## SO2 RGB

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

**Himawa-9 S9 11/04/2023 00:00UTC**

Normal

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

**Himawa-9 S9 12/04/2023 00:00UTC**

52.6400N 168.6400E Select an item of measurement.

SO<sub>2</sub> appears red, green or yellow.

### Color interpretation for SO2 RGB

Color	Interpretation
	Upper-level SO <sub>2</sub>
	Lower-level SO <sub>2</sub>
	Lower-/upper-level SO <sub>2</sub>
	Thick clouds
	Thin high-level clouds
	Low-level clouds

From SO2 RGB  
Quick Guide

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

**Himawa-9 S9 12/04/2023 00:00UTC**

Fast Slow

11/04/2023 23:51 UTC

Image

IR  WV  S1

I4  VS  S2

V1  V2  S3

N1  N2  S4

N3  W2  S5

W3  M1  S6

O3  L2  S7

I2  CO  S8

I4S  HVS  S9

EIRc  EIRm

Grid  10

Coast  Line

Text  NWP

RADAR  Wind

Function

Gray  Info

Measur  Draw

Obs  TC

Measure

Brit  Move

Time  Cross

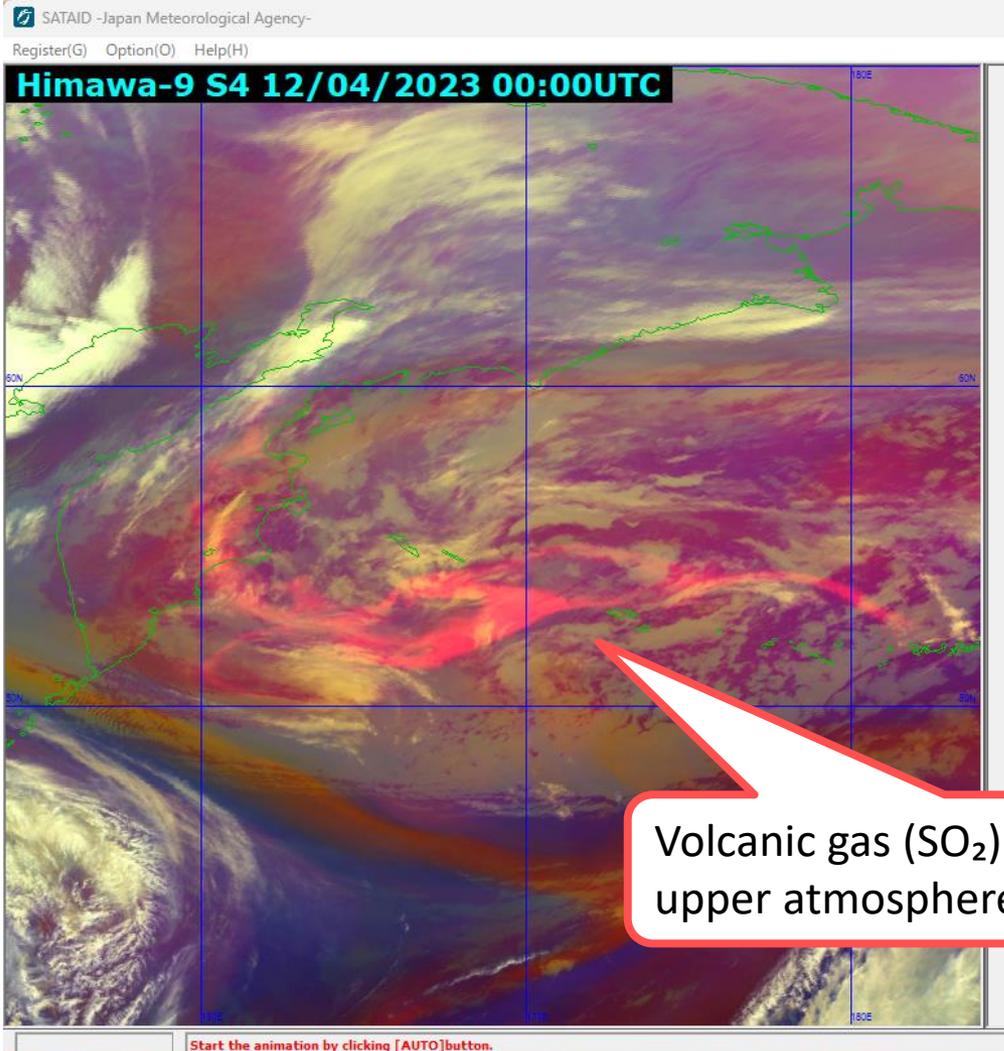
Contour  Hist

58.0000N 154.3600E Select an item of measurement.



# Displaying RGB Images

## Airmass RGB



RGB image list ✕

Airmass Apply  Color interpr.

- Thick, high-level clouds
- Thick, mid-level clouds
- Thick, low-level clouds (low latitude)
- Thick, low-level clouds (high latitude)
- JET
- Cold Airmass
- Warm Airmass (high humidity at upper tropopause)
- Warm Airmass (low humidity at upper tropopause)

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

Volcanic gas (SO<sub>2</sub>) in the middle and upper atmosphere appears reddish.

# Summary



- We accomplished hands-on practical training of RGB case studies by using SATAID in this presentation.
- SATAID can display superimposed satellite imagery and NWP data.
- SATAID can display RGB imagery by simple operation.
- There are more uses, so please also try using it after this presentation.



**Thank you  
for your participation!**

# Introduction to SATAID



For more information on SATAID, please see Introduction Guide for SATAID.

