HimawariCast Newsletter

No. 12, 15 October 2019

Japan Meteorological Agency

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Scheduled outages in full-disk observation

Question from a user:

- Why are Himawari-8 observation data for the periods starting at 02:40 and 14:40 UTC unavailable?

A satellite maneuver known as unloading is performed at these times.

Himawari-8 is operated at 140.7 degrees east. To keep the satellite close to its nominal longitude in the equatorial plane, east-west and north-south station-keeping maneuvers are periodically performed with firing thrusters. The unloading needed to dump angular momentum associated with solar radiation pressure is usually conducted at 02:40 UTC and 14:40 UTC. Table 1 shows housekeeping operations for Himawari-8.

Full-disk observation is not performed during such maneuvers because image navigation quality may be degraded in association with satellite attitude changes.

There are some little-known exceptions, however. If an east-west or north-south station-keeping maneuver is planned for the periods between 01:40 and 03:40 UTC or 13:40 and 15:40 UTC, the daily unloading is conducted simultaneously with the station-keeping maneuver. In such cases, full-disk observation is conducted at 02:40 or 14:40 UTC. For example, on 14 January 2019, such observation was conducted at 02:40 UTC because a north-south station-keeping maneuver was performed at 01:40 UTC.

The latest operational schedule for Himawari-8 housekeeping events is available at https://www.data.jma.go.jp/mscweb/en/operation8/bulletin_list_H8.html.

(Akiyoshi ANDOU)

Termination of Himawari JDDS FTP service and commencement of HTTPS service

Himawari-8/9 imagery and related geophysical products are provided via the JMA Data Dissemination System (Himawari JDDS).

As JMA plans to terminate FTP-based provision on 30 September 2020, an HTTPS service was commenced

Table 1 Himawari-8 housekeeping operations during which full-disk observation is not performed

	Periodicity	
North-South station-keeping maneuver	Every two weeks	Monday
East-West station-keeping maneuver	Twice every two weeks	Tuesday and Friday
Unloading maneuver	Twice a day	02:40 and 14:40 UTC
Solar calibration observation	Every two weeks	20:40, 20:50 or 21:10 UTC

on 30 September 2020, an HTTPS service was commenced on 24 July 2019. Users accessing Himawari JDDS via FTP should update their communication protocols to enable HTTPS provision.

Tables 2 and 3 show products disseminated via Himawari JDDS using FTP and HTTPS. The differences between the protocols are detailed below.

High-resolution Cloud Analysis Information (HCAI)

HCAI data distributed on an hourly basis via HTTPS will be available every 10 minutes as of December 2019. JMA will continue to provide hourly HCAI data via FTP.

AMV-based Sea-surface Wind data (ASWind)

JMA now provides ASWind data from Target Area observation every 10 minutes and from Full-disk observation every 30 minutes exclusively through Himawari JDDS via HTTPS as detailed below.

JPEG satellite imagery format

On 24 July 2019, JMA began providing satellite imagery through Himawari JDDS via HTTPS in addition to FTP provision. This imagery is freely available without registration at

https://www.jma.go.jp/jma/jma-eng/satellite/jdds.html#jpeg.

Registration for Himawari JDDS

To register for Himawari JDDS access, use the form available at:

https://www.jma.go.jp/jma/jma-eng/satellite/jdds.html#terms

Registered users can access satellite products online using an HTTP 1.1 client such as a Web browser or Wget.

Users accessing the service via FTP should update their communication protocols to enable HTTPS provision.

(Akiyoshi ANDOU)

Table 2 Satellite data disseminated through JDDS via FTP

	File format	Periodicity
High-resolution Cloud Analysis Information (HCAI)	GRIB2	Every 60 minutes
HRIT satellite imagery	HRIT	Every 30 minutes
JPEG satellite imagery	JPEG	Every 30/60 minutes

Table 3 Satellite data disseminated through JDDS via HTTPS

	File format	Periodicity
High-resolution Cloud Analysis Information (HCAI)	GRIB2	Every 60 minutes
		Every 10 minutes (*)
HRIT satellite imagery	HRIT	Every 30 minutes
JPEG satellite imagery	JPEG	Every 30/60 minutes
		Without user ID/password
ASWind from Target Area Observation	SATAID wind format	Every 10 minutes
ASWind from Full-disk Observation		Every 30 minutes

(*) JMA plans to begin HCAI dissemination every 10 minutes in December 2019.

AMV-based Sea-surface Wind data (ASWind) via Himawari JDDS

The Meteorological Satellite Center of the Japan Meteorological Agency (JMA/MSC) has developed a method to estimate sea surface winds in the vicinity of tropical cyclones using Himawari-8/9 data. The resulting product is called ASWind (Atmospheric motion vector based Sea-surface Wind), and is based on data provided by Himawari-8/9 every 30 minutes for Full-disk observation and every 10 minutes for Target Area observation, with high accuracy for areas of strong wind associated with tropical cyclones.

On 24 July 2019, ASWinds data in Satellite Animation and Interactive Diagnosis (SATAID) wind format were made available via Himawari JDDS. Figure 1 shows ASWind data in the SATAID program.

Displaying ASWind data in SATAID

This section outlines how to display ASWind data using the SATAID program. Square brackets indicate names of radio buttons, checkboxes, panels and menu items.

ASWind data directory specification
1) With the desired satellite image displayed, click the [Wind] check box on the operation panel (Figure 2) to open the [Cloud motion wind data] window (Figure 3).
2) Click the [Browse] button in the [Cloud motion wind data] window to set the directory path for wind data files (Figure 4).
3) Select the wind data file directory and click the [Open] button to apply the selection in the [Directory selection] window (Figure 4).

Label and file name settings
4) Click the [Setup] button in the [Cloud motion wind data] window (Figure 3) to open the [Setup of Wind data item] window (Figure 5).
5) Input and select the following items:
- Label
  This is displayed in the [Cloud motion wind data]
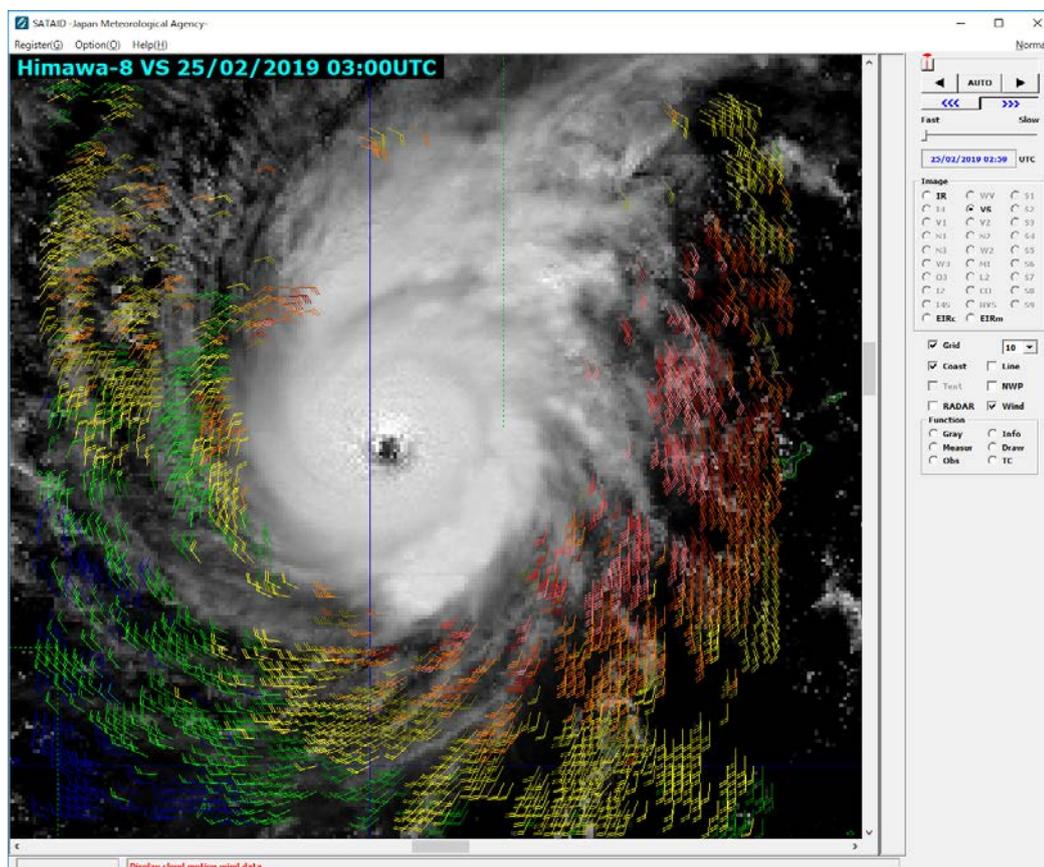
Figure 1 Sample ASWind image (25 February 2019)

window, and can be named as desired.
- FileName Prefix
  This is for the wind file name. For ASWind based on Target-area observation (aswind_tgvs_YYYYMMDDHHNN.bin), "aswind_tgvs_" should be input.
- FileType
  This is the wind file format. For ASWind data, "SWIN" (SATAID wind format) should be selected.

Table 4 shows sample settings for ASWind data.

Table 4 Sample settings for ASWind data

Label	FileName Prefix	FileType
ASW_FVS	aswind_fdir_	SWIN
ASW_FIR	aswind_fdvs_	SWIN
AWS_TVS	aswind_tgir_	SWIN
ASW_TIR	aswind_tgvs_	SWIN

Displaying ASWind data on satellite imagery

6) Activate the check box for ASWind data in the [Wind] group in the [Cloud motion wind data] window (Figure 3).

Changing wind barb colors

7) Wind barb colors can be changed by clicking [Col] in the [Wind] group in the [Cloud motion wind data] window. The scale color modes are 0 – 50 kt, 0 – 100 kt and fixed. [Col] usage is outlined below (Figure 6).
- Press Ctrl and click [Col] to toggle between fixed-color and 0 – 50 kt modes.
- Press Ctrl + Shift and click [Col] to toggle between fixed-color and 0 – 100 kt modes.
- Click [Col] alone to select a fixed color.

ASWind data are expected to support tropical cyclone monitoring and contribute to disaster risk reduction activities.

(Akiyoshi ANDOU, Kenichi NONAKA)
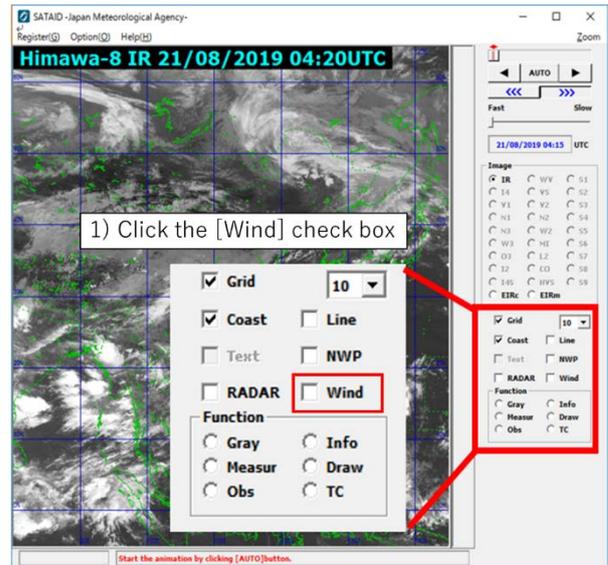
Figure 2 [Wind] check box
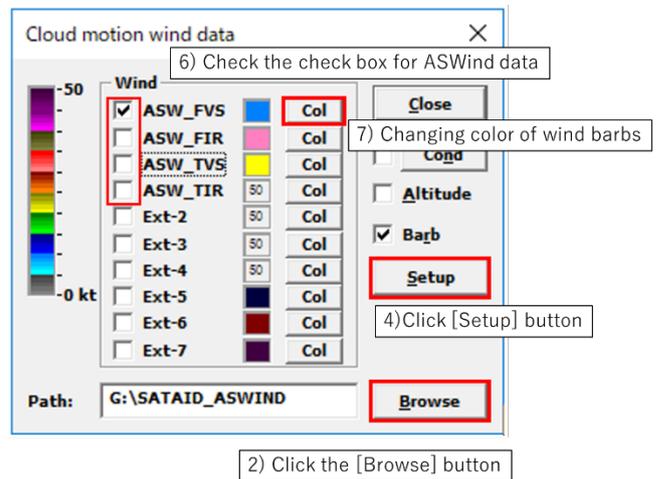
Figure 3 [Cloud motion wind data] window
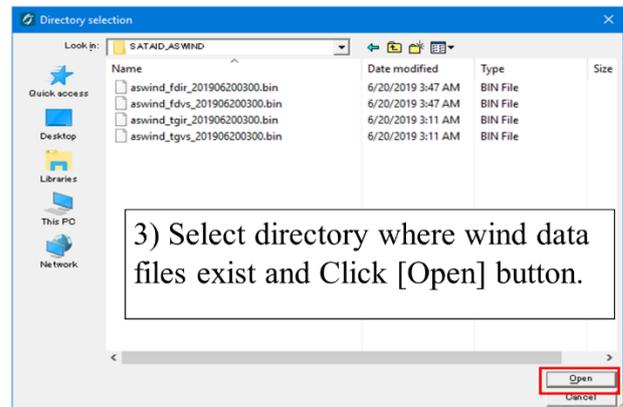
Figure 4 [Directory selection] window
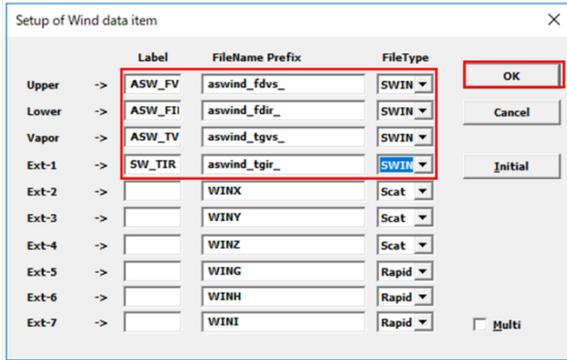
5) Input and select Label, FileName Prefix and FileType.

Figure 5 [Setup of Wind data item] window
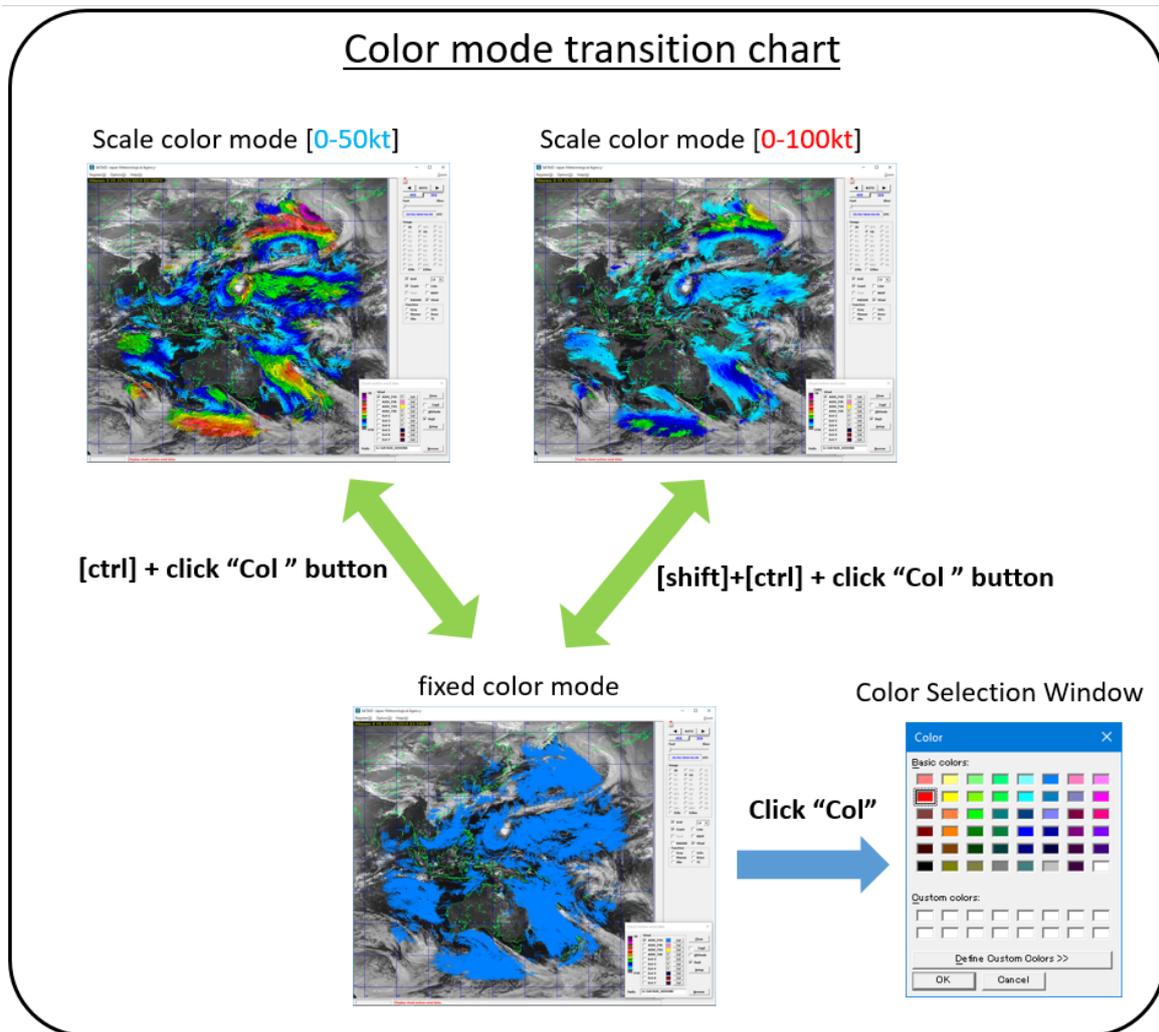
Figure 6 Color mode transition chart

Ash RGB based on Himawari observation imagery

Volcanic eruptions generally release toxic sulfur dioxide (SO_2) and airborne ash, which negatively impacts aviation safety.

The specific thresholds of Ash RGB data for volcanic ash and gas detection during daytime and nighttime periods make this information useful for ongoing monitoring of volcanic eruptions. The scheme (consisting of combinations of imagery assigned to the three primary colors) of this RGB set is common to 24-hour Microphysics RGB and Dust RGB (Table 5), which were featured in newsletters No. 10 and No. 11, respectively.

As with 24-hour Microphysics RGB and Dust RGB, detection of volcanic ash containing silicon is facilitated by brightness temperature difference (BTD) imagery produced from Band 13 and Band 15 ($BTD_{B13-B15}$) with assignment to the red of the RGB. Aeolian dust identification is also facilitated by $BTD_{B13-B15}$ as with 24-hour Microphysics RGB and Dust RGB.

Difference imagery produced from Band 11 and Band 13 ($BTD_{B11-B13}$) is assigned to the green of the RGB, facilitating discrimination of volcanic SO_2 because of absorption by this gas in Band 11. Differentiation between water clouds and ice clouds is also facilitated by $BTD_{B11-B13}$. This imagery further supports volcanic ash detection, although not as well as $BTD_{B13-B15}$.

The inverted Band 13, which is assigned to the blue of the RGB, shows surface and cloud-top temperatures (with warm-colored pixels increasing the contribution of blue to RGB imagery) in the same way as 24-hour Microphysics RGB, Dust RGB and Night Microphysics RGB.

Against this background, volcanic ash is displayed in a reddish (produced by high contribution of red) or pinkish hue. Greenish and yellowish hues may appear in volcanic plumes containing volcanic SO_2, with yellowish hues indicating a mixture of gas and ash. Color interpretation for Ash RGB is shown in Figure 8.

The Ash RGB imagery in Figure 9 shows the eruption of Mt. Raikoke in the Kuril Islands at 09:00 UTC on 22 June 2019 (inside the dashed white line). The plume contains ash and a distinct presence of volcanic SO_2 (B and C).

Figure 10 shows the eruption of Mt. Kirishima in Japan. Similarly, the plume appears to contain volcanic SO_2 (C). Its darker part (B) appears to contain or be covered by ice crystals, which may account for the water vapor in the plume.

Figure 11 shows the eruption of Krakatoa volcano in Indonesia. Hardly any hues corresponding to volcanic ash are seen, but thick droplets (B) and ice crystals (A) are observed in the plume. The hues are similar to those of thick clouds (D) and thin high-level clouds (G). This indicates that the volcanic plume may have contained large amounts of water vapor. A greenish SO_2 plume can also be seen at a distance (C).

As shown in Figures 9, 10 and 11, the hues of this RGB are highly dependent on thermal conditions (i.e., latitude and diurnal/seasonal variations). Accordingly, the high-latitude situation in Figure 9 generally has greenish shades, and the low-latitude situation of Figure 11 generally has bluish shades.

(Akihiro Shimizu)

Table 5 Band components and related specifications for Ash RGB

Color	AHI Bands	Central wave length [μm]	Physical relation to	Smaller contribution to signal of	Larger contribution to signal of
Red	B13 − B15	10.4 − 12.4	Cloud optical thickness Volcanic ash	Thin ice clouds	Thick clouds Volcanic ash
Green	B11 − B13	8.6 − 10.4	Cloud phase	Thin ice clouds Volcanic ash	Water clouds SO_2 plume
Blue	B13 (inverse)	10.4	Cloud top temperature Temperature of surface	Cold clouds Cold surface	Warm clouds Warm surface
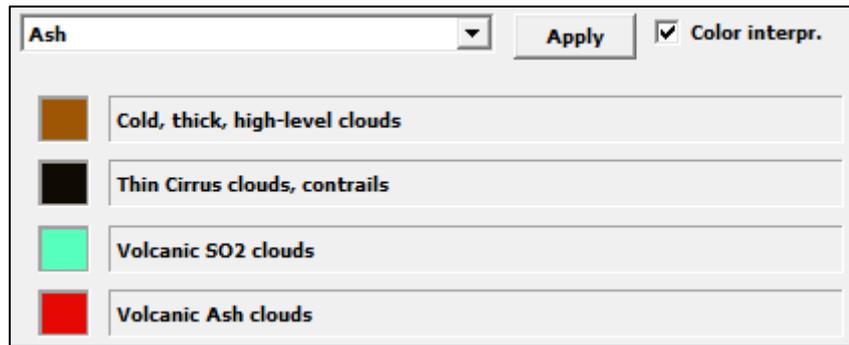
Figure 8 Ash RGB interpretation in SATAID
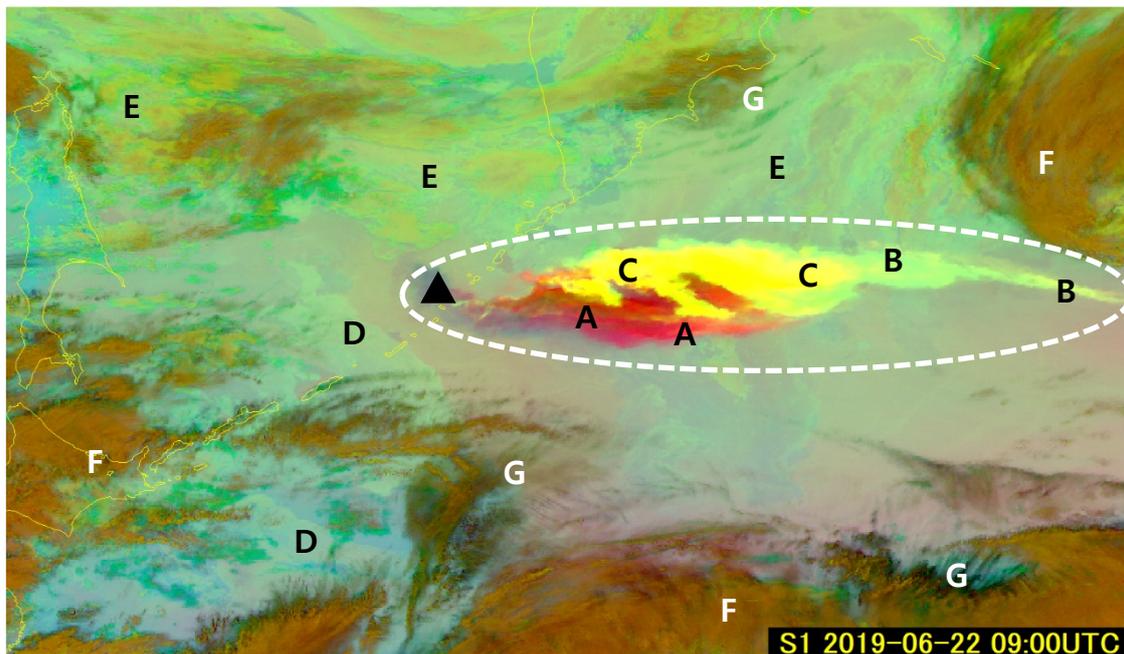
Figure 9 Eruption of Mt. Raikoke in the Kuril Islands (09:00 UTC, 22 June 2019). The white dashed line marks the volcanic plume, and the black triangle marks the volcano.
A: volcanic ash; B: volcanic SO_2; C: volcanic ash with SO_2; D: thick low-level clouds; E: thick mid-level clouds; F: thick (high-level) clouds; G: thin cirrus clouds

Figure 10 Eruption of Mt. Kirishima, Japan (07:00 UTC, 14 May 2018). The white dashed line marks the volcanic plume, and the black triangle indicates the volcano.
A: volcanic ash; B: volcanic ash with ice crystals; C: volcanic ash with SO_2
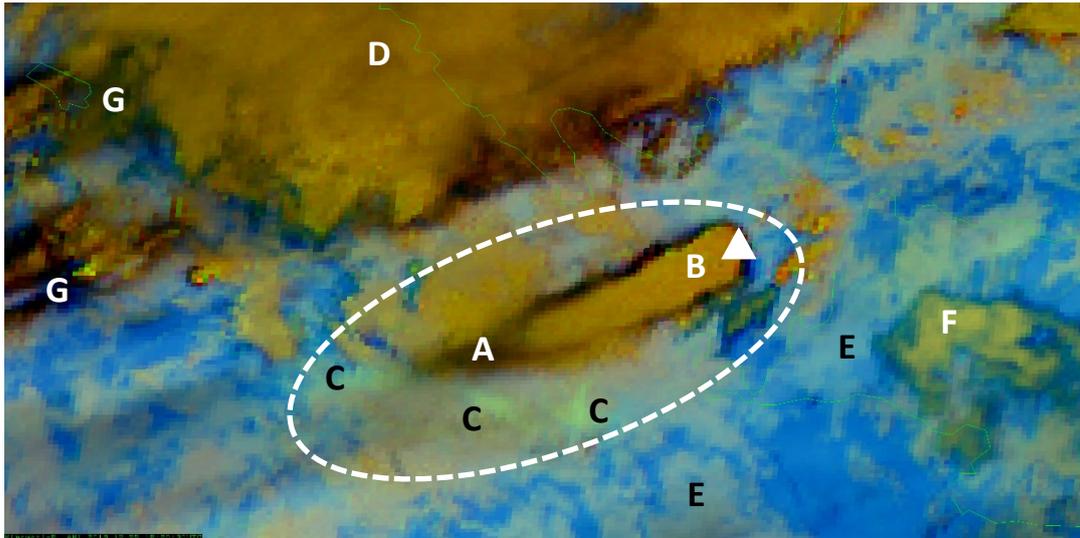
Figure 11 Eruption of Krakatoa volcano, Indonesia (18:20 UTC, 22 December 2018). The white dashed line marks the volcanic plume, and the white triangle indicates the volcano.
A: thin volcanic plume with ice crystals; B: thick volcanic plume with water droplets; C: SO_2; D: thick clouds; E: low-level clouds; F: mid-level clouds; G: thin high-level clouds

Feedback

JMA welcomes feedback from users on Himawar-iCast data usage, and particularly invites articles to be posted in this newsletter. Such input will help other users consider new ideas for their services.

The Agency also invites questions on HimawariCast services. These may relate to the functions of the SA-TAID program, interpretation/analysis of multi-band imagery or other areas of interest. Feel free to send queries to be answered in this newsletter.

All articles and questions are welcomed. Your contributions are greatly appreciated.