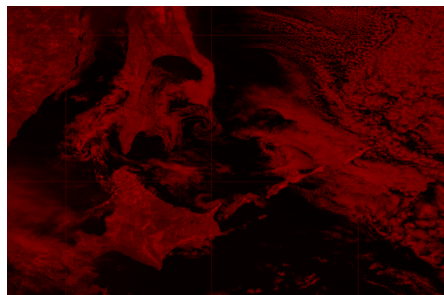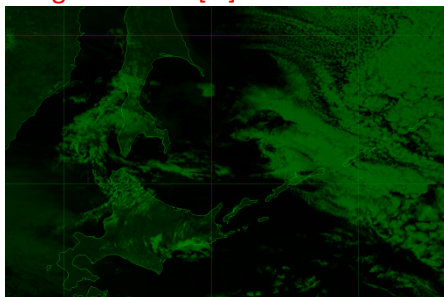JMA

Day Snow-Fog RGB
Detection of low-level clouds and snow/ice covered area

Meteorological Satellite Center, JMA
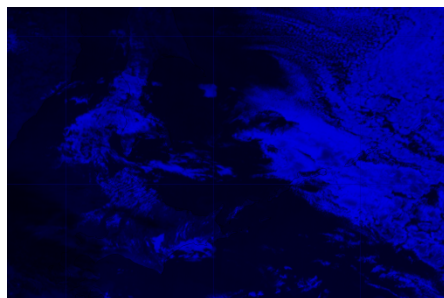
What's Day Snow-Fog RGB?

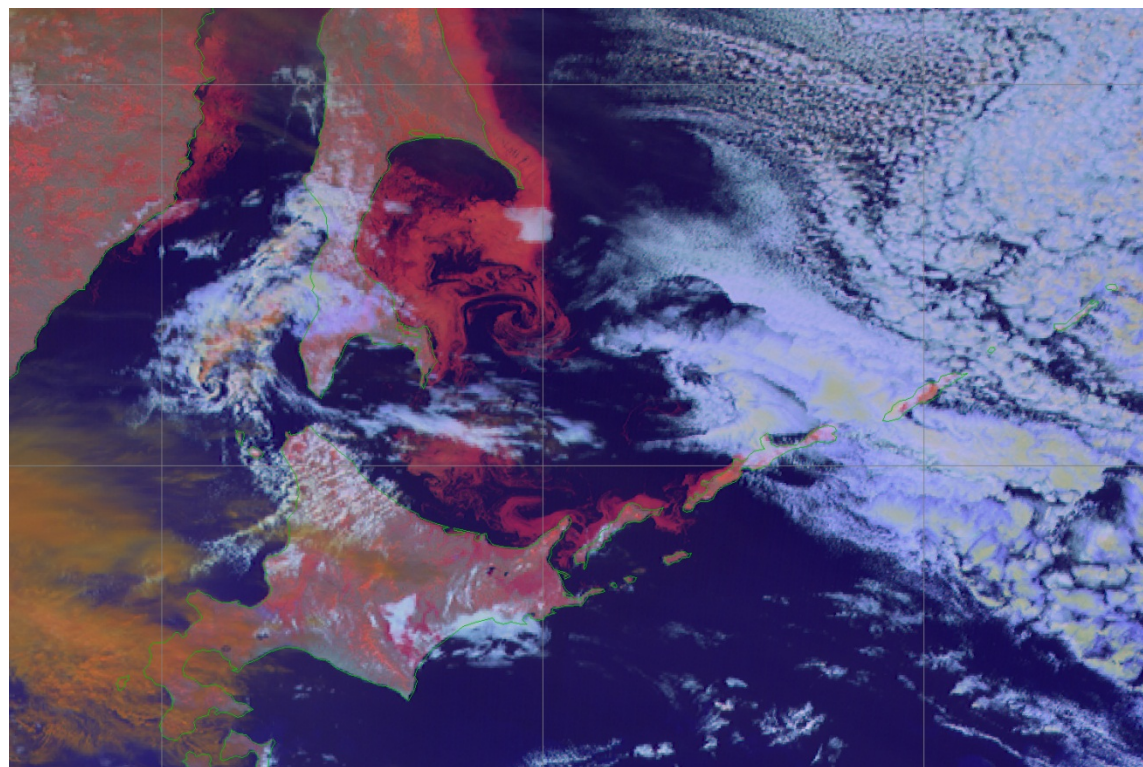
R : B04 (N1 0.86)
Range : 0～100 [%]   Gamma : 1.7

G : B05 (N2 1.6)
Range: 0～70 [%]   Gamma : 1.7

B : B07(I4 3.9) （Solar component）
Range : 0～30 [%]   Gamma : 1.7

2015-02-26 03UTC

Components of "Day Snow-Fog" RGB scheme

| Channel	Himawari-8/ -9	MTSAT-1R/-2	MSG	Physical Properties	
1	0.46 μm			vegetation, aerosol **B**	Visible
2	0.51 μm			vegetation, aerosol **G**	
3	0.64 μm	0.68 μm	0.635 μm	**low cloud, fog** **R**	
4	0.86 μm		0.81 μm	**vegetation, aerosol** ←	Near Infrared
5	1.6 μm		1.64 μm	**cloud phase** ←	
6	2.3 μm			particle size	
7	3.9 μm	3.7 μm	3.92 μm	low cloud, fog, forest fire ←	Infrared
8	6.2 μm	6.8 μm	6.25 μm	mid- and upper level moisture	
9	6.9 μm			mid- level moisture	
10	7.3 μm		7.35 μm	mid- and upper level moisture	
11	8.6 μm		8.70 μm	cloud phase, SO2	
12	9.6 μm		9.66 μm	ozone content	
13	10.4 μm	10.8 μm	10.8 μm	cloud imagery, information of cloud top	
14	11.2 μm			cloud imagery, sea surface temperature	
15	12.4 μm	12.0 μm	12.0 μm	cloud imagery, sea surface temperature	
16	13.3 μm		13.4 μm	cloud top height	

This scheme is displayed by compositing two near infrared channels (B05(N2 1.6) , B04(N1 0.86)) and infrared channel (B07(I4 3.9)).
Please note that 3.9 micron image is solar component (excepted infrared radiation component).

These channels have reflection characteristics of near infrared band for land/ sea surface conditions (such as snow/ ice covered area) respectively.

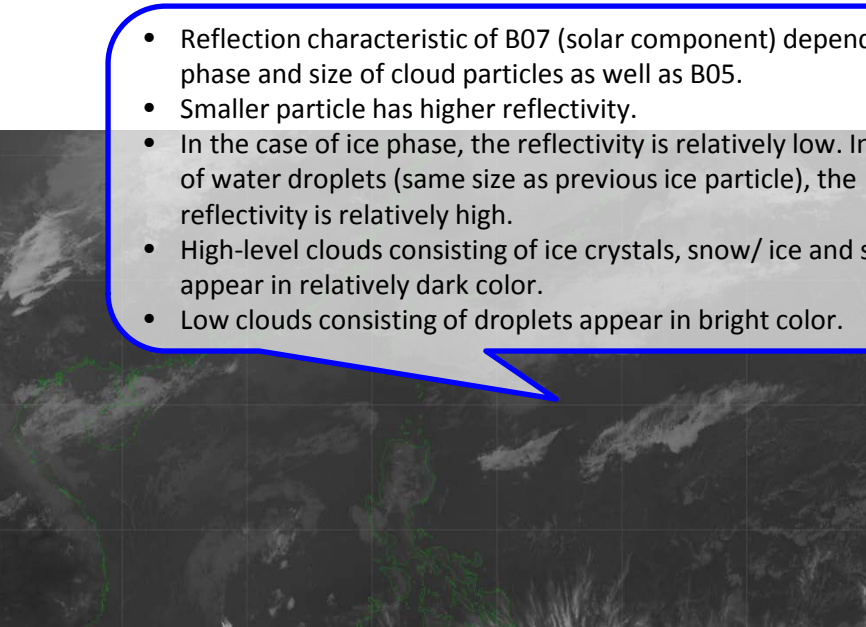A set of RGB "Day Snow-Fog" scheme (RGB: B04/B05/B07r)

R : B04 (N1 0.86)
Range : 0～100 [%]   Gamma : 1.7
G : B05 (N2 1.6)
Range : 0～70 [%]   Gamma : 1.7
B : B07(I4 3.9) （Solar component）
Range : 0～30 [%]   Gamma : 1.7
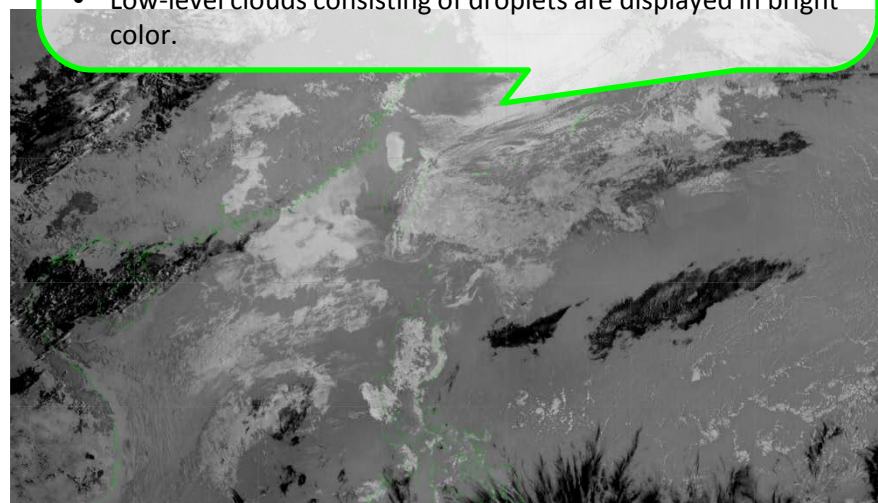
Characteristics and Basis of Three Components
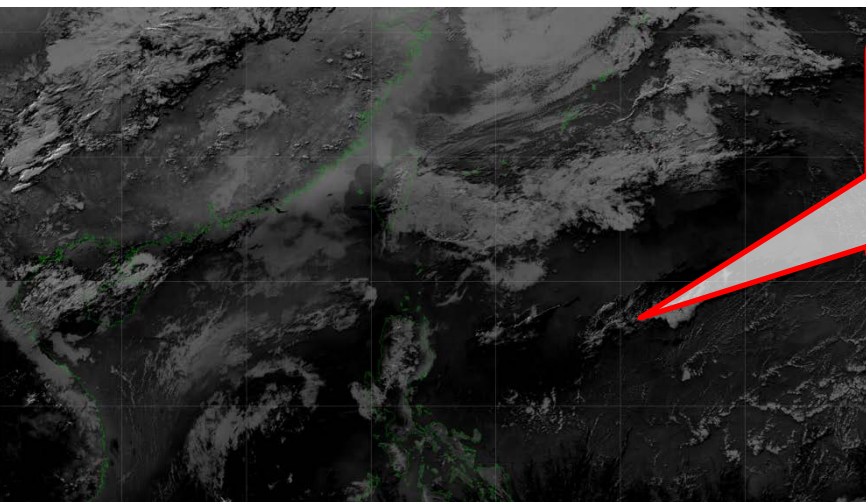
- B04 as well as B03, has high reflectivity for snow/ice covered area and clouds, sea surface looks dark.
- On RGB imagery, high –level clouds consisting of ice particles, snow/ice and sea ice, which are low reflectivity on green B05 and blue B07, are displayed in red color.
- Low-level clouds (water clouds) which are high reflectivity on the three colored images, are displayed in white-grey color.

R : B04 (N1 0.86) Range : 0～100 [%] Gamma : 1.7

- Reflection characteristic of B05 depends on the phase and size of cloud particles
- Reflectivity is small for large cloud particles.
- Ice cloud particles absorb light beams, and reflectivity is small.
- High-level clouds consisting of ice particles, snow/ice and sea ice are displayed in darker color.
- Low-level clouds consisting of droplets are displayed in bright color.

- Reflection characteristic of B07 (solar component) depends on the phase and size of cloud particles as well as B05.
- Smaller particle has higher reflectivity.
- In the case of ice phase, the reflectivity is relatively low. In the case of water droplets (same size as previous ice particle), the reflectivity is relatively high.
- High-level clouds consisting of ice crystals, snow/ ice and sea ice appear in relatively dark color.
- Low clouds consisting of droplets appear in bright color.

G : B05 (N2 1.6) Range : 0～70 [%] Gamma : 1.7

B : B07(I4 3.9)（Solar component） Range : 0～30 [%] Gamma : 1.7

Interpretation
of Colors for "Day Snow-Fog"

Deep precipitating cloud
(precip. not necessarily
 reaching the ground)

- Bright, thick
- Large ice particles

Deep precipitating
cloud*
Bright, thick
Small ice particles

- Bright, thick
- Small ice particles

*or thick, high-level lee
cloudiness with small
ice particles

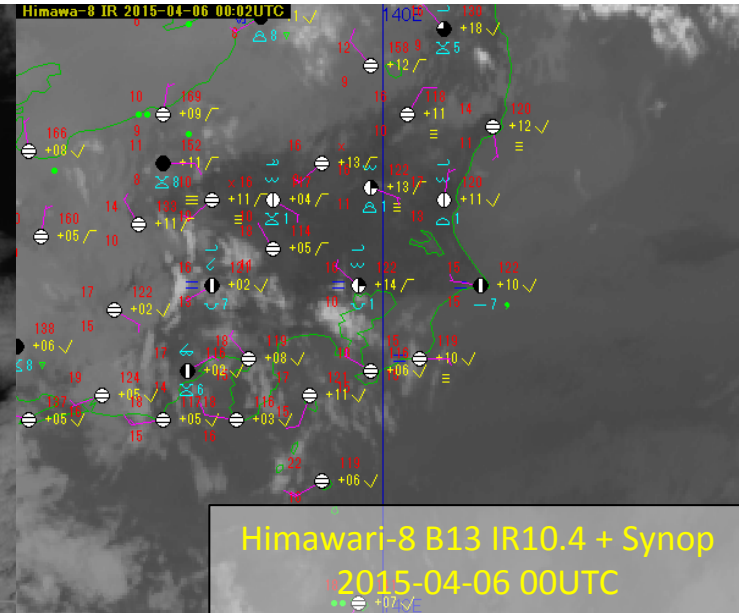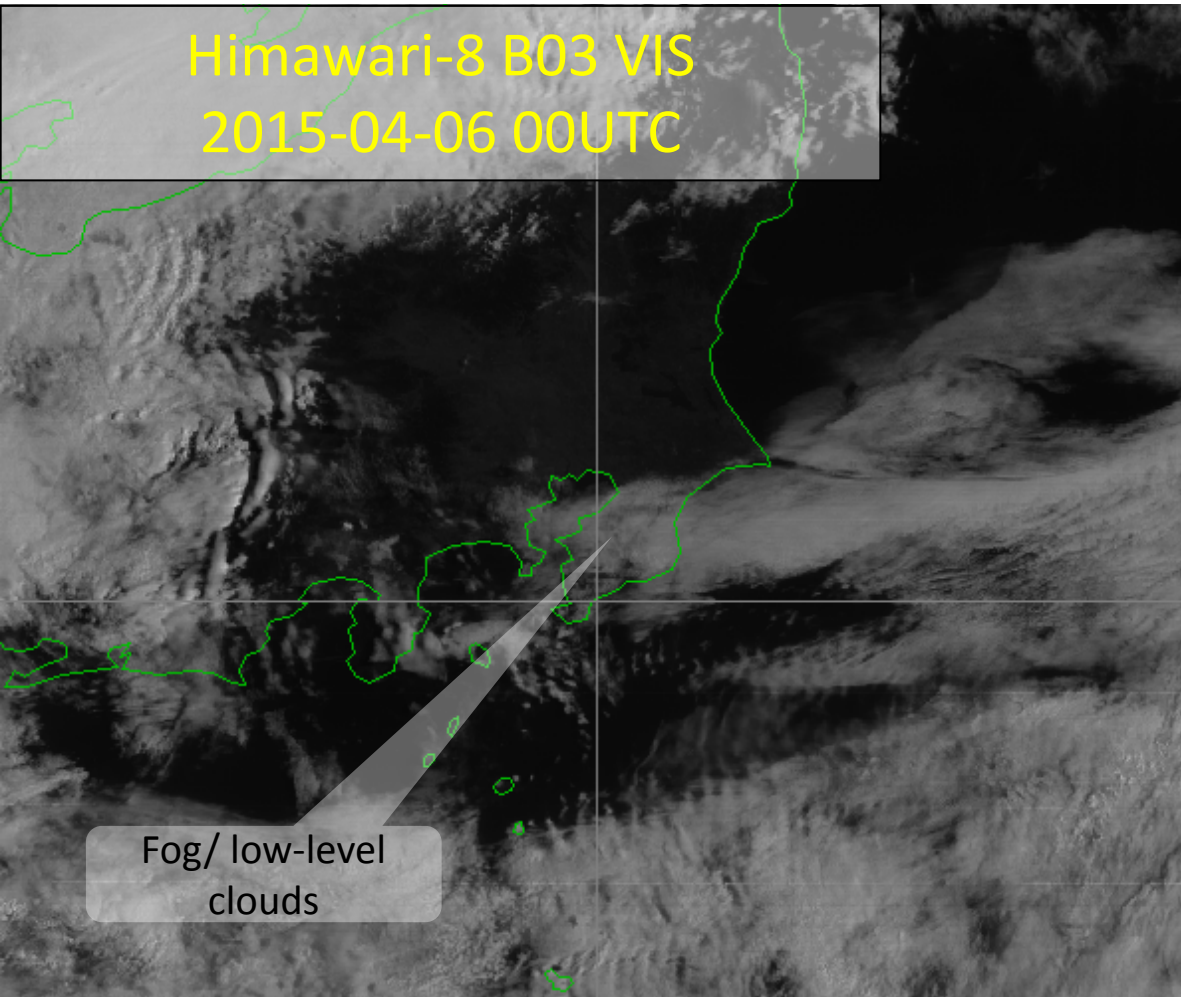Thick water cloud
- Large droplets
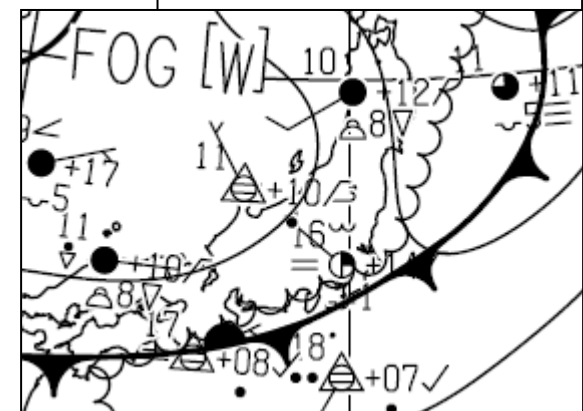
Thick water cloud
- Small droplets

Ocean	Vegetation	Desert	Snow

Note: Based on SEVIRI/EUMETSAT interpretation

5

Example of Day Snow-Fog RGB
Fog/ low-level clouds after the rainfall in Kanto Plain, Japan

Himawari-8 B03 VIS
2015-04-06 00UTC

Fog/ low-level clouds

Himawari-8 B13 IR10.4 + Synop
2015-04-06 00UTC

Weather Chart ASAS
2015-04-06 00UTC

(Upper image) Smooth, whitish area correspond to fog or low-clouds in B03(VS 0.64) image.
(Upper right image) B13(IR 10.4) image overlapped ground observations. The fog was observed at some stations.
The fog or low-clouds are not distinct in B13(IR 10.4) image.

Example of Day Snow-Fog RGB
Fog/ low-level clouds after the rainfall in Kanto Plain, Japan

Himawari-8 Day Snow-Fog
2015-04-06 00UTC

Himawari-8 B03 VIS
2015-04-06 00UTC

A   B   C
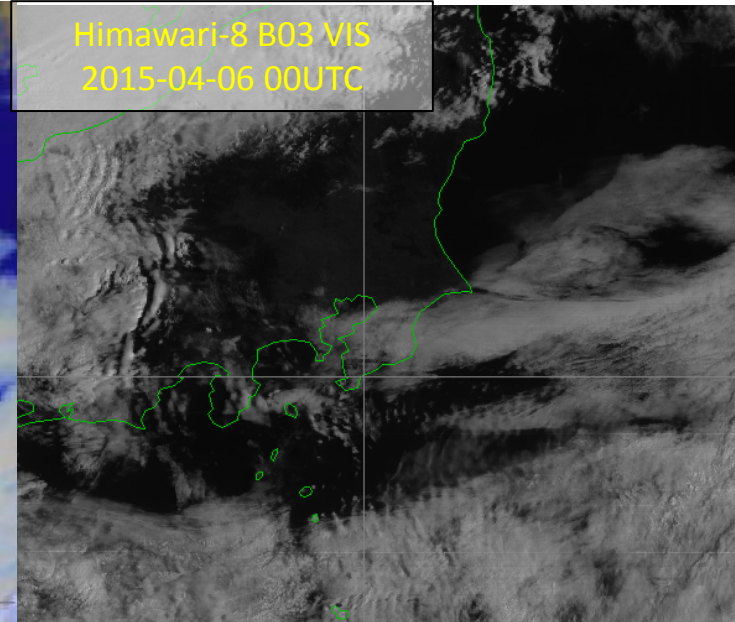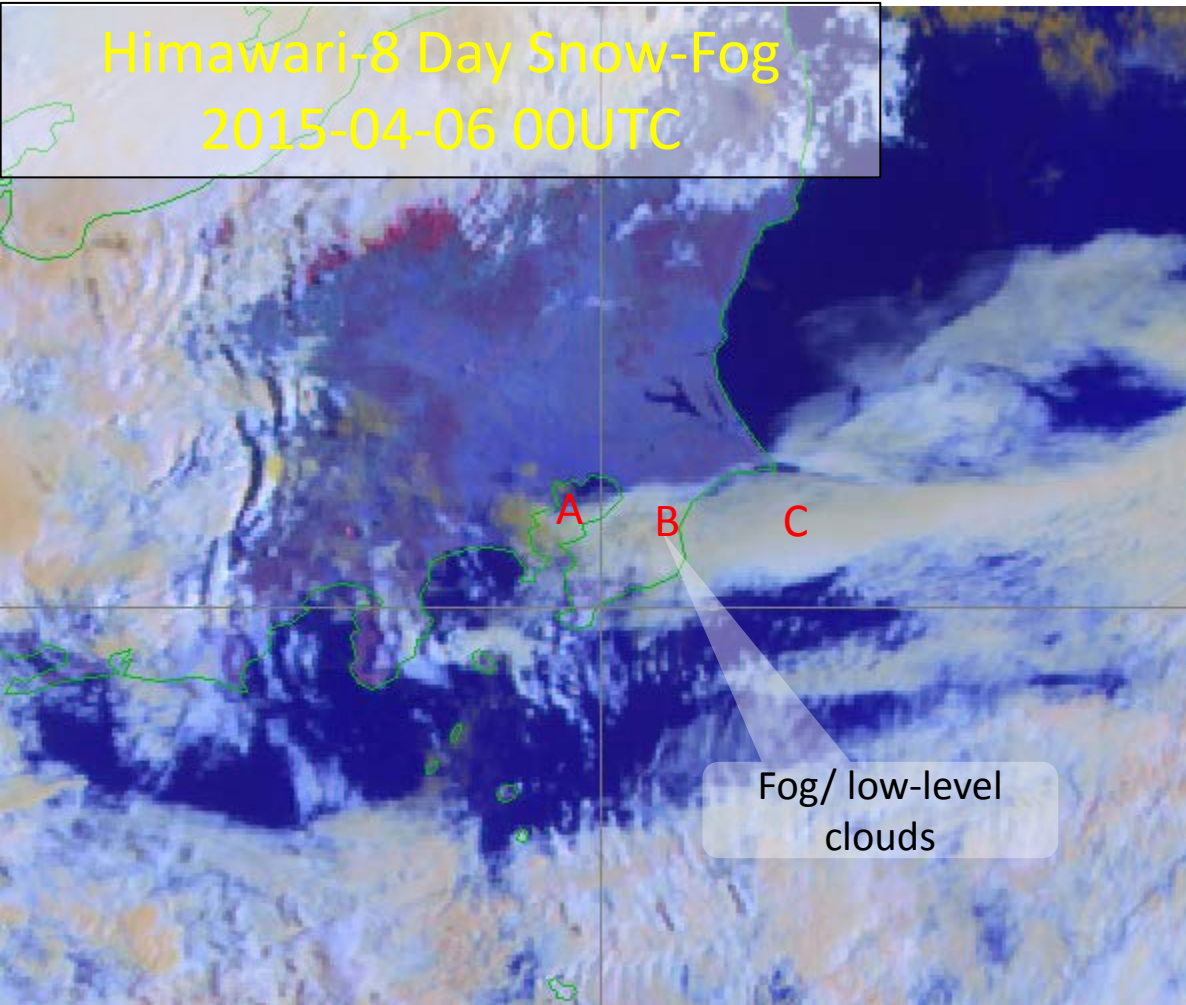
Fog/ low-level
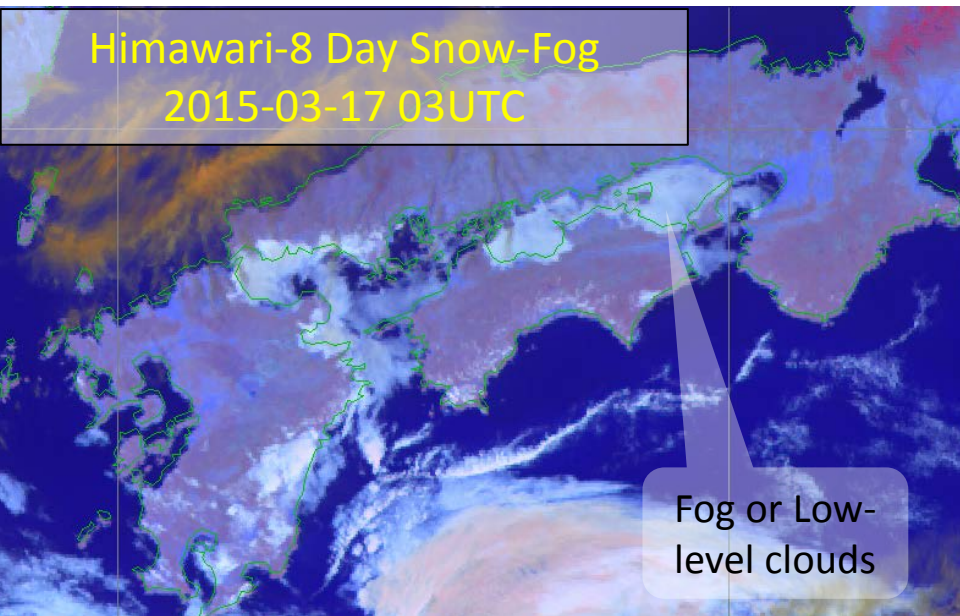clouds

Thick water cloud
-    Large droplets

Thick water cloud
-    Small droplets

Ocean

Smooth, whitish area corresponds to fog or low-level clouds
extended to Tokyo Bay(A), Bo-so Peninsula(B) and Pacific Ocean(C).

Example of Day Snow-Fog RGB
Fog/Low-level Clouds of "Setonai-kai (Inland Sea of Japan)"

Himawari-8 Day Snow-Fog
2015-03-17 03UTC

Fog or Low-level clouds

Himawari-8 B03 VIS
2015-03-17 03UTC

Himawari-8 B13+Synop
2015-03-17 03UTC

(Lower right) Fog/ low-level clouds were observed at some stations (around red oval). However, fog/ low-level clouds are not clear in the IR image.

(Upper and lower left) Smooth, whitish areas in Day Snow-Fog RGB correspond to whitish fog/ low-level clouds in B03 visible image.
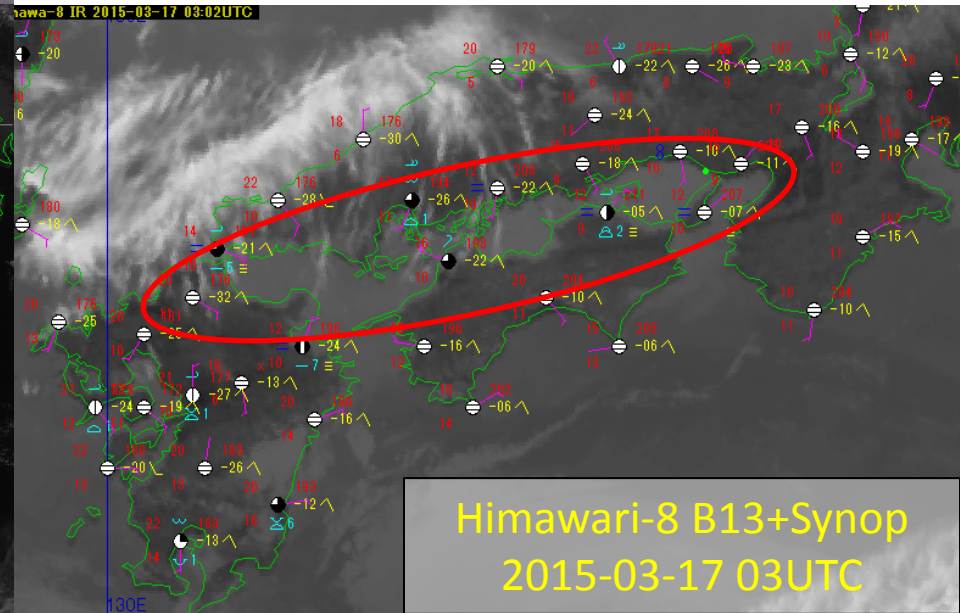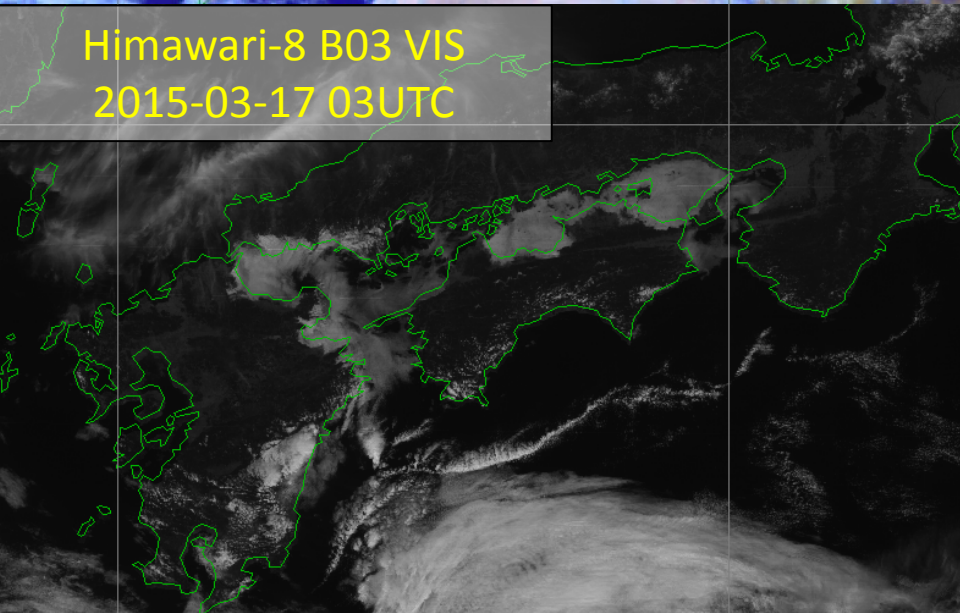
Example of Day Snow-Fog RGB Frontal zone
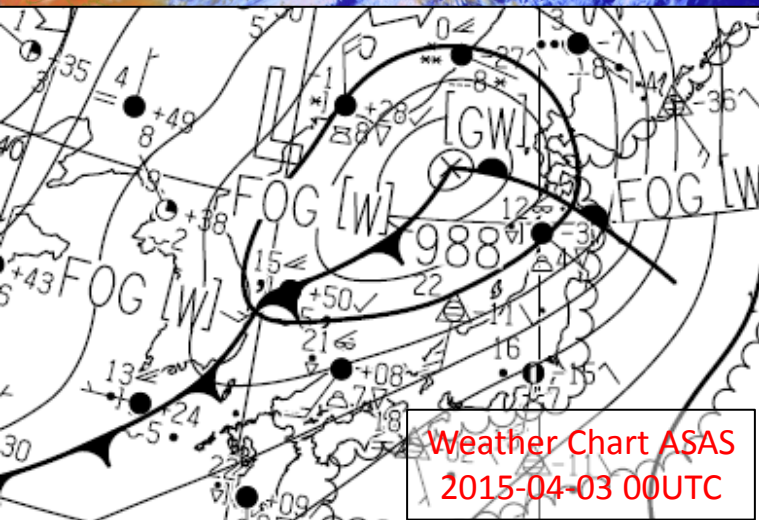
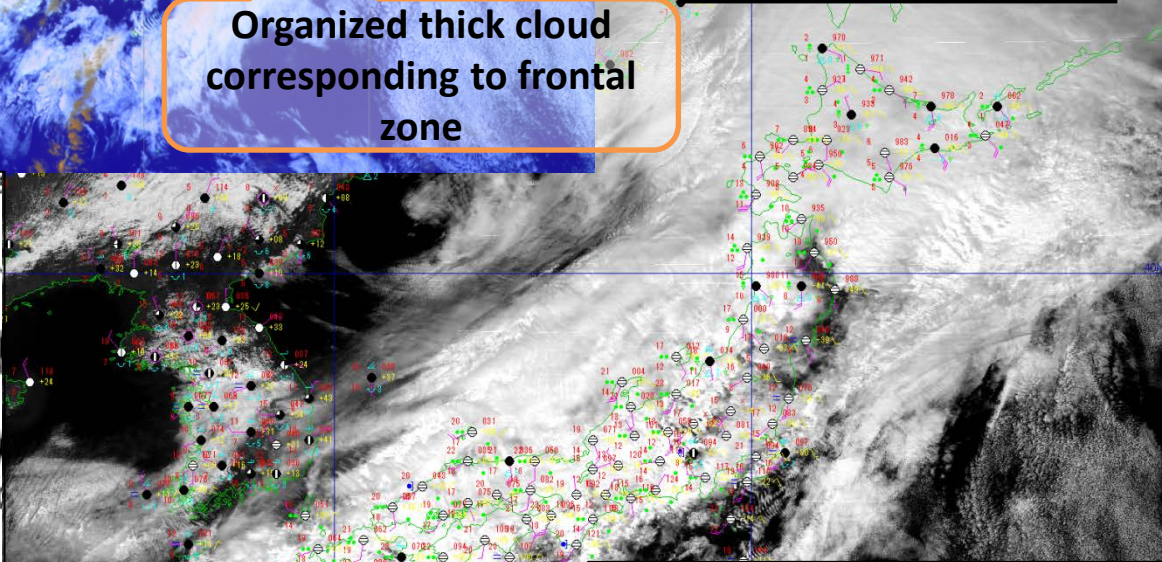Himawari-8 Day Snow-Fog
2015-04-03 03UTC
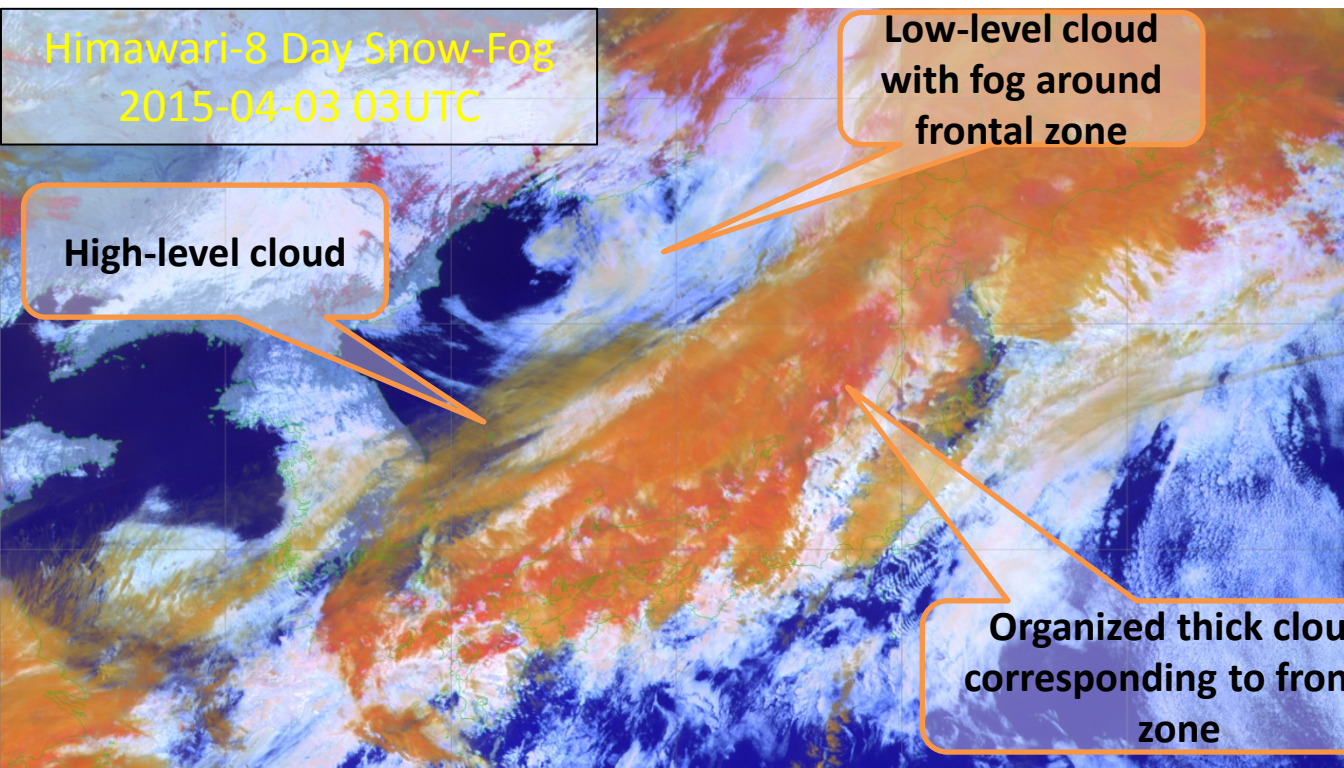
Low-level cloud with fog around frontal zone

High-level cloud

Organized thick cloud corresponding to frontal zone

| |
|---|
| Deep precipitating cloud (precip. not necessarily reaching the ground) |
| Deep precipitating cloud Bright, thick, small ice particles |
| Thick water cloud - Large droplets |
| Thick water cloud - Small droplets |
| Ocean |

Weather Chart ASAS
2015-04-03 00UTC

Himawari-8 B03 VIS + Synop
2015-03-16 03UTC

Example of Day Snow-Fog RGB
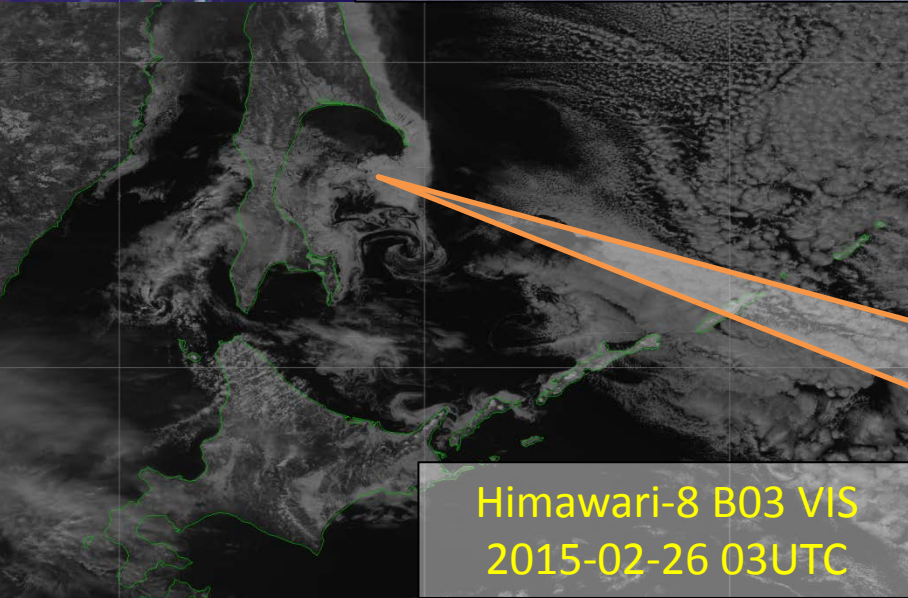## Sea ice and Snow/Ice covered area

Sea ice distribution chart
for Hokkaido region
2015-2-27
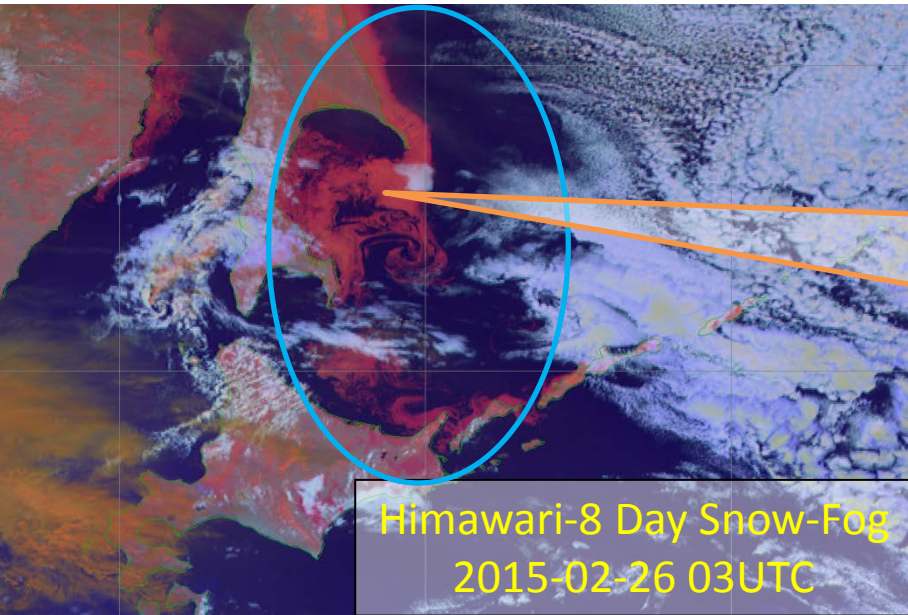
Reddish area on the ocean corresponds to sea ice/ drift ice.
It's easy to distinguish whitish low-level clouds.

Himawari-8 Day Snow-Fog
2015-02-26 03UTC

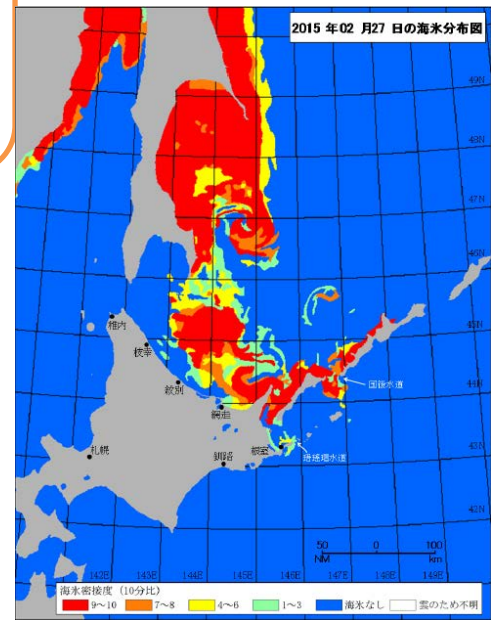Thick water cloud
- Large droplets

Thick water cloud
- Small droplets

Snow

Ocean

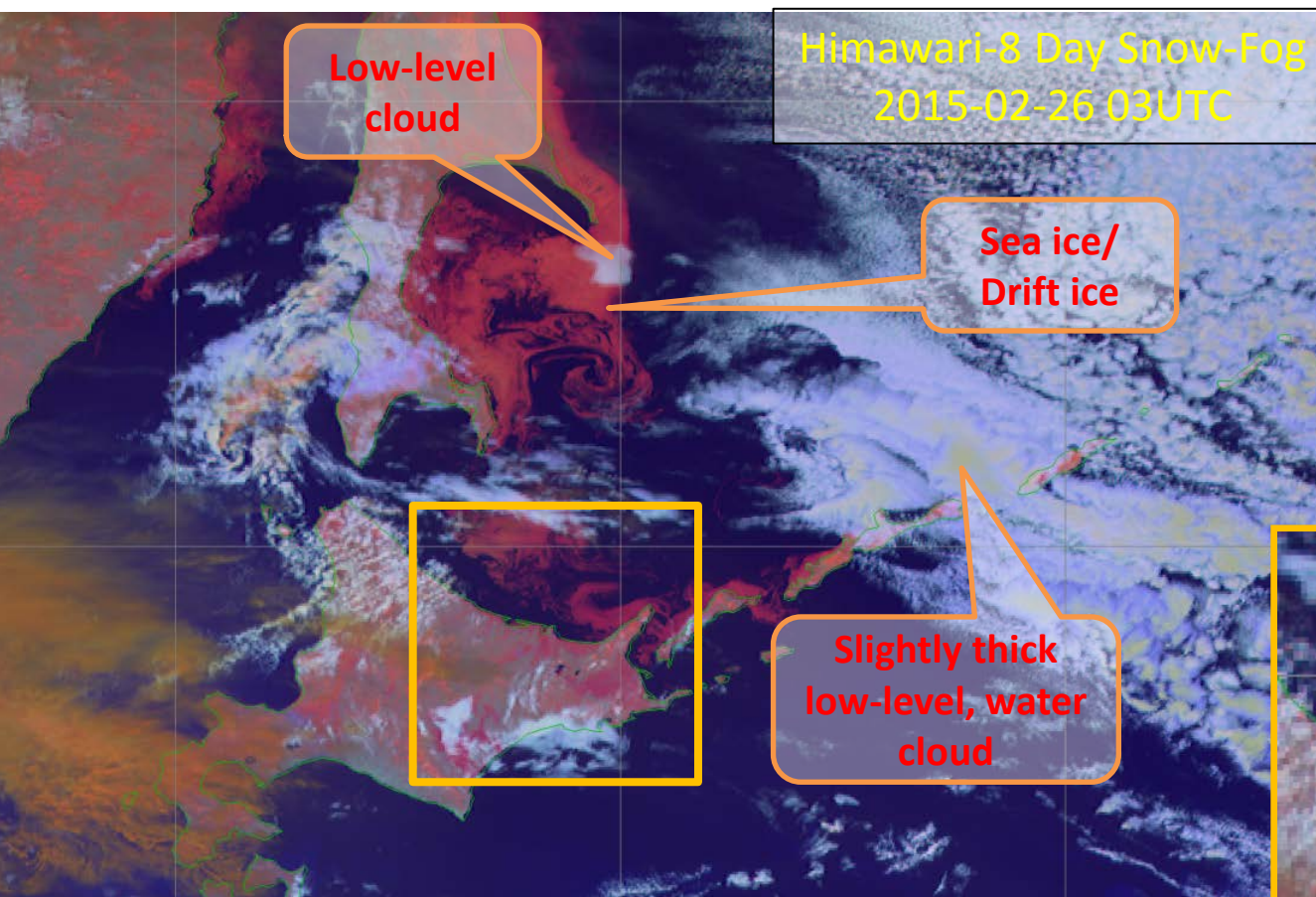**Sea ice and drift ice are clear on visible image, but the distinction of low-level clouds is slightly difficult without animation.**

Himawari-8 B03 VIS
2015-02-26 03UTC

Example of Day Snow-Fog RGB
Sea ice and Snow/Ice covered area

Himawari-8 Day Snow-Fog
2015-02-26 03UTC
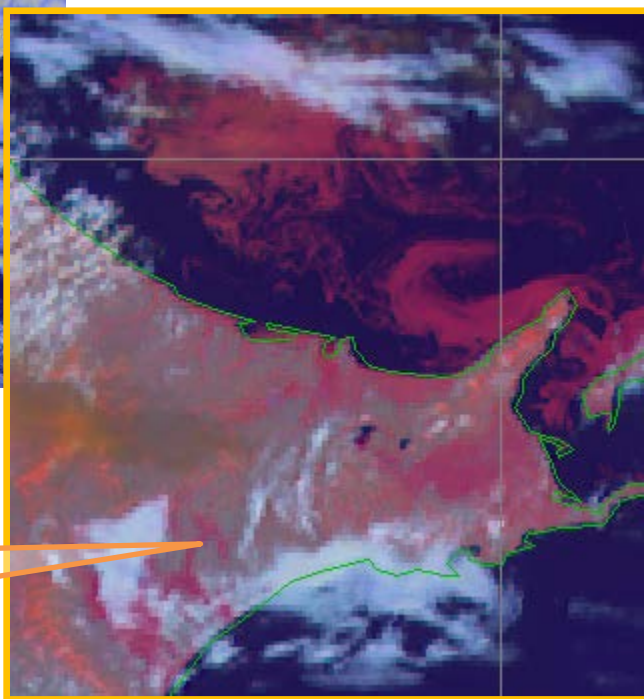
Low-level cloud

Sea ice/ Drift ice

Slightly thick low-level, water cloud

Thick water cloud
- Large droplets
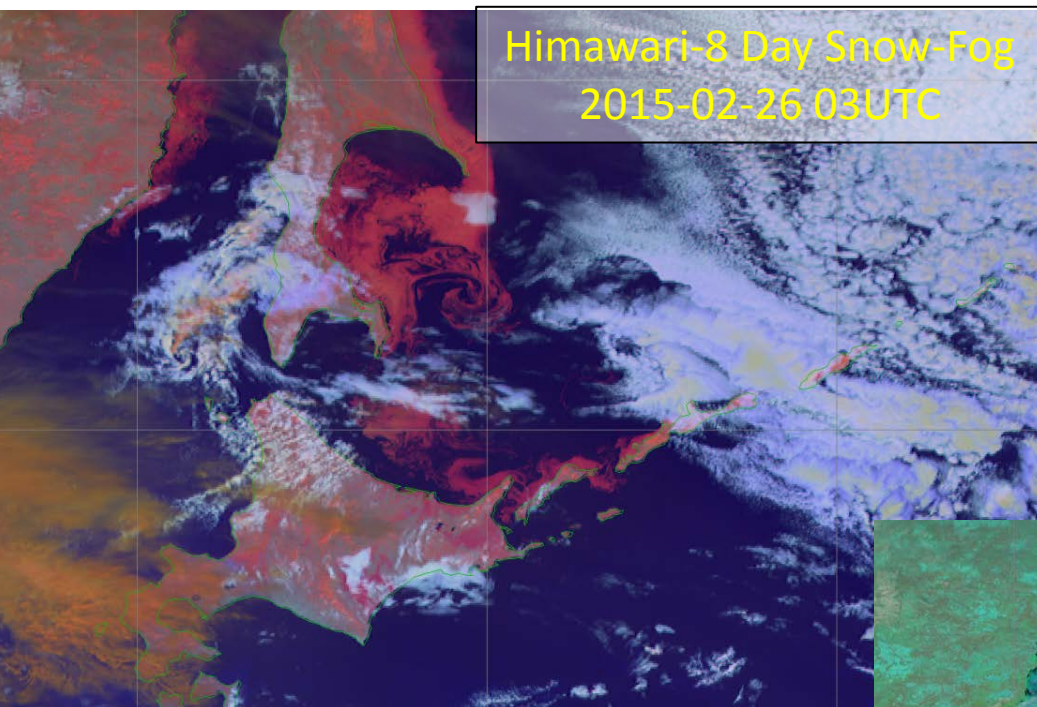
Thick water cloud
- Small droplets

Snow

Ocean

Reddish area on the ground surface corresponds to snow/ ice covered area. It's easy to distinguish (whitish) snow/ ice covered area from low-level clouds.

Example of Day Snow-Fog RGB
Sea ice and Snow/Ice covered area

Himawari-8 Day Snow-Fog
2015-02-26 03UTC

Interpretation of Colors for Natural Color RGB

- High-level ice clouds
- Low-level water clouds
- Veg. Land
- Snow

Note: Based on SEVIRI/EUMETSAT interpretation

Himawari-8 Natural Colors
2015-02-26 03UTC
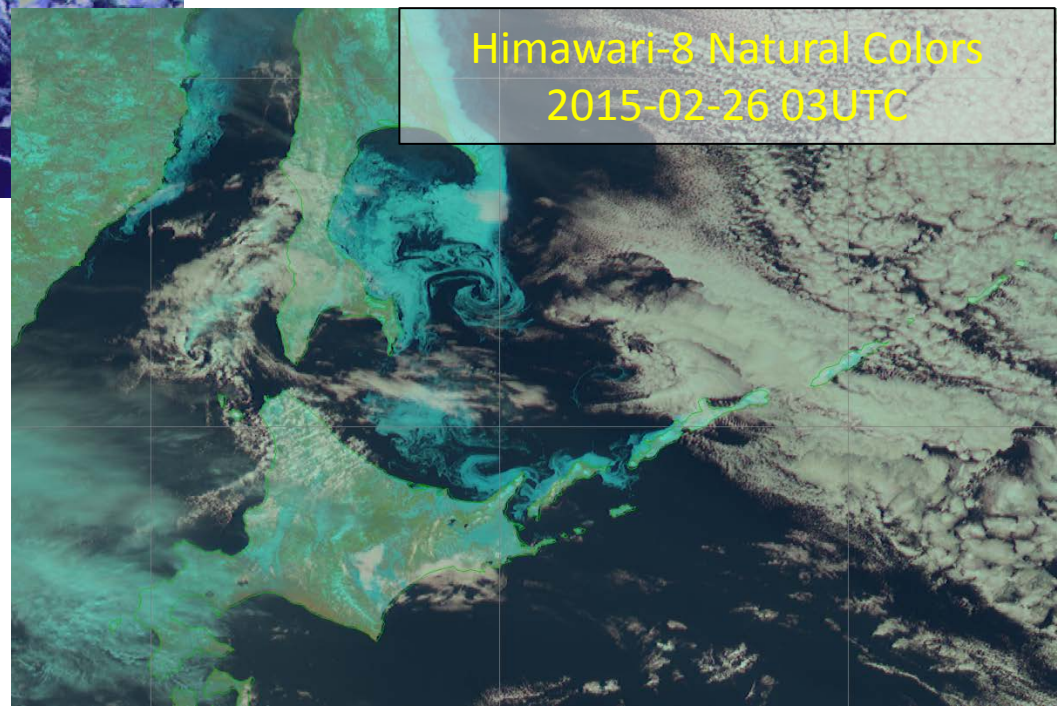
- It's easy to distinguish sea ice/ drift ice and snow/ ice covered area on both of two RGBs.
- Better identification of thickness of low-level clouds on Day Snow-Fog, better identification of vegetation distribution on Natural Colors.

→ It's effective to compare and use the RGB images according to different application!

RGB Day Snow-Fog RGB
Detection of low-level clouds and snow/ice covered area
(summary)

This RGB scheme will…

- make easy to distinguish between low clouds and snow/ice rather than only VIS

- but in day-time only

- be so far, unavailable for SATAID, because this includes the solar reflectance component