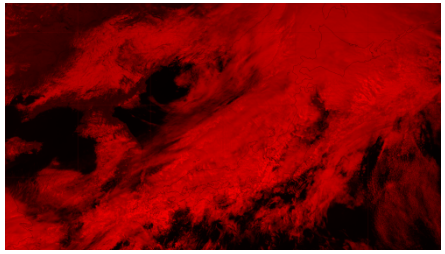
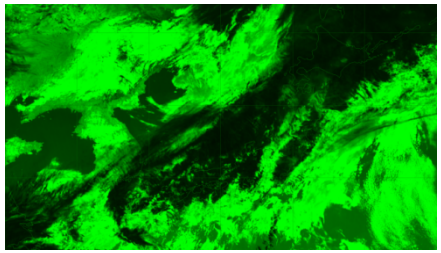
Day Microphysics RGB Nephanalysis in daytime

Meteorological Satellite Center, JMA

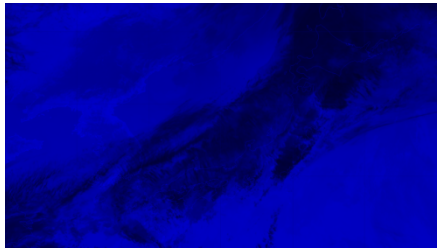
What's Day Microphysics RGB?



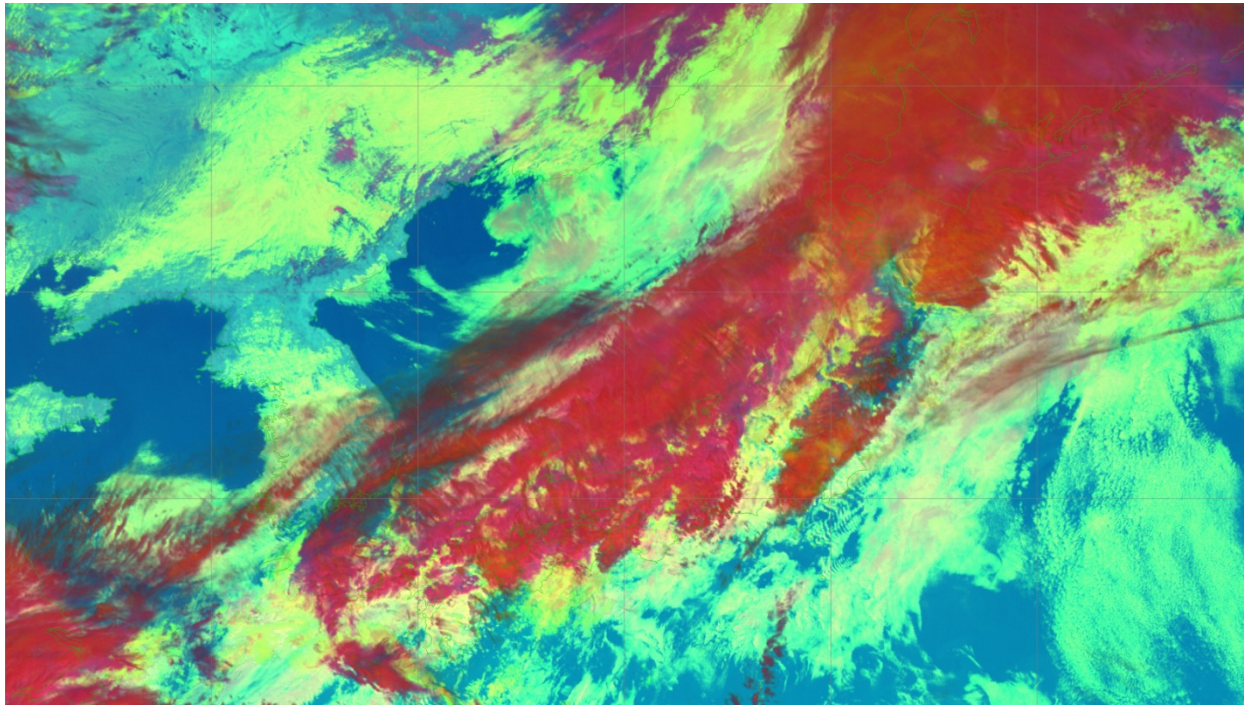
R : B04 (N1 0.86)
Range : 0～100 [%]　Gamma : 1.0



G : B07(I4 3.9)（Solar component）
Range : 0～60 [%]　Gamma : 2.5（Summer）
Range : 0～25 [%]　Gamma : 1.5（Winter）



B : B13(IR 10.4)（Reverse）
Range : 203～323 [K]　Gamma : 1.0



2015-04-03 03UTC

Components of “Day Microphysics” RGB

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 near infrared channel (B04(N1 0.86)) and infrared channels (B07(I4 3.9), B13(IR 10.4)).
Please note that 3.9 micron image is solar component (excepted infrared radiation component).

The 3.9 micron image has reflection characteristics for particle phase and size in cloud. This is helpful to distinguish cloud layer, convective clouds and so on.

A set of RGB “Day Microphysics “ scheme
(RGB: B04/B07r/B13)

R : B04 (N1 0.86)
Range: 0～100 [%] Gamma : 1.0
G : B07(I4 3.9)（Solar component）
Range : 0～60 [%] Gamma : 2.5（Summer）
Range : 0～25 [%] Gamma : 1.5（Winter）
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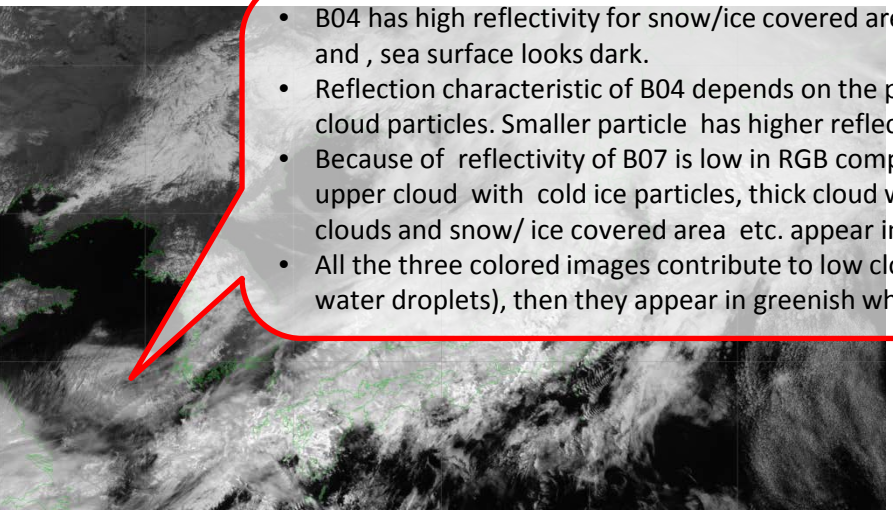
Range: 203～323 [K] Gamma : 1.0

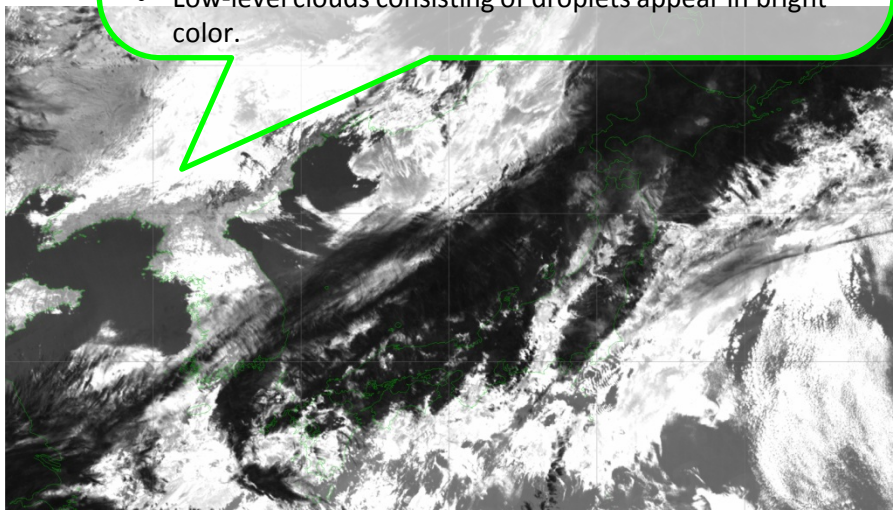
Characteristics and Basis of Three Components



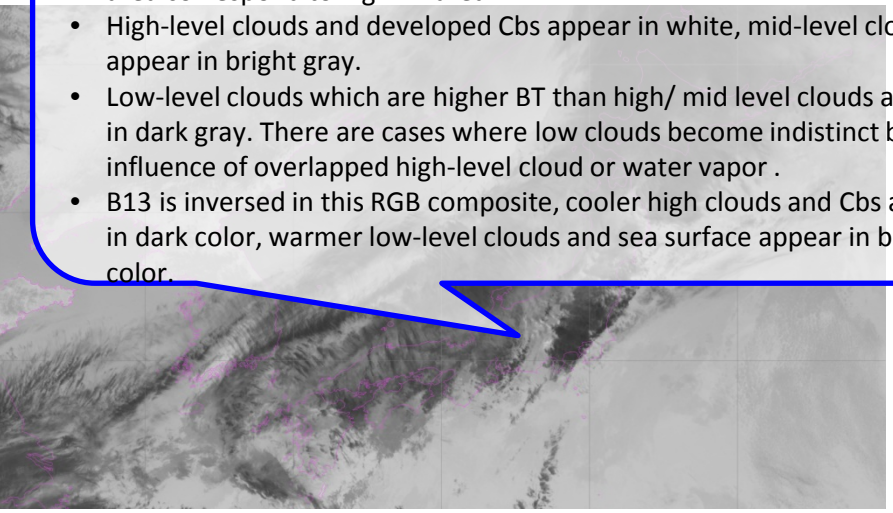
- B04 has high reflectivity for snow/ice covered area and clouds , and , sea surface looks dark.
- Reflection characteristic of B04 depends on the phase and size of cloud particles. Smaller particle has higher reflectivity.
- Because of reflectivity of B07 is low in RGB composite image, upper cloud with cold ice particles, thick cloud with upper clouds and snow/ ice covered area etc. appear in reddish.
- All the three colored images contribute to low clouds (small, water droplets), then they appear in greenish white.

R : B04 (N1 0.86) Range : 0～100 [%] Gamma : 1.0

- Reflection characteristic of B07 (solar component) depends on the phase and size of cloud particles.
- 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-level clouds consisting of droplets appear in bright color.



- Atmospheric window band, available for 24 hours.
- Whitish area corresponds to low brightness temperature(BT) area, dark area correspond to high BT area.
- High-level clouds and developed Cbs appear in white, mid-level cloud appear in bright gray.
- Low-level clouds which are higher BT than high/ mid level clouds appear in dark gray. There are cases where low clouds become indistinct by influence of overlapped high-level cloud or water vapor .
- B13 is inversed in this RGB composite, cooler high clouds and Cbs appear in dark color, warmer low-level clouds and sea surface appear in blue color.



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Day Microphysics RGB Interpretation of Colors

High-level clouds

Deep precipitating cloud (precip. not necessarily reaching the ground) - Bright, thick - Large ice particles - Cold cloud	Deep precipitating cloud (Cb cloud with strong updrafts and severe weather)* - Bright, thick - Small ice particles - Cold cloud *or thick, high-level lee cloudiness with small ice particles	Thin Cirrus cloud (Large ice particles)	Thin Cirrus cloud (Small ice particles)

Ocean	Veg. Land	Fires / Desert	Snow

Note: Based on SEVIRI/EUMETSAT interpretation

Day Microphysics RGB Interpretation of Colors

Mid-level clouds

Supercooled, thick water cloud
- Bright, thick
- Large droplets

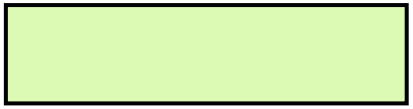
Supercooled, thick water cloud
- Bright, thick
- Small droplets

Supercooled thin water cloud
- Large droplets

Supercooled, thin water cloud
- Small droplets

Low-level clouds

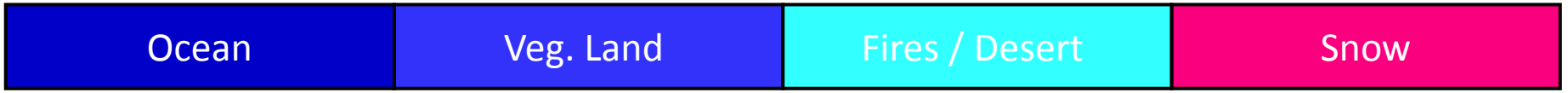
Thick water cloud (Warm rain cloud)
- Bright, thick
- Large droplets



Thick water cloud (no precipitation)
- Bright, thick
- Small droplets

Thin water cloud
- Large droplets

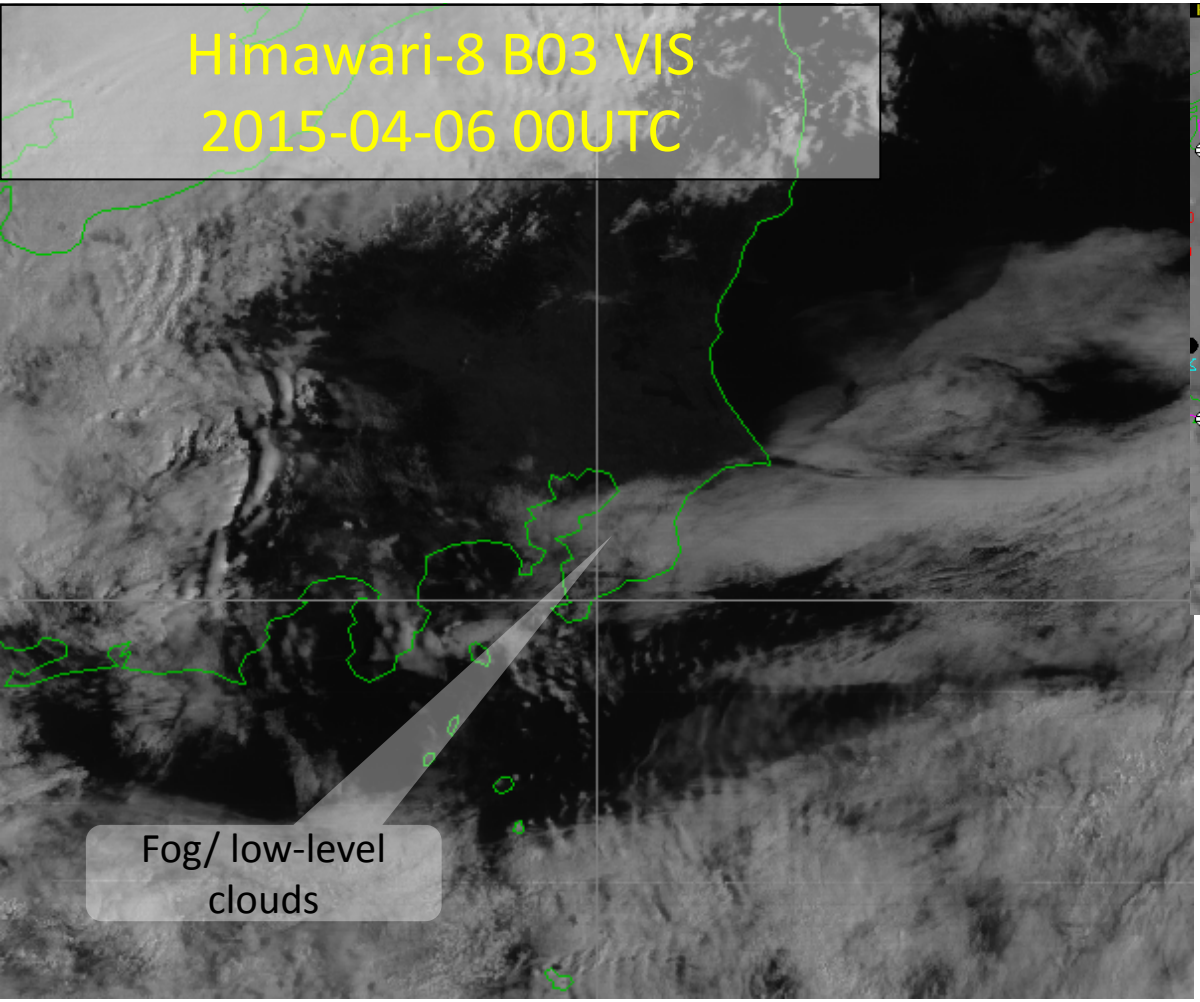
Thin water cloud
- Small droplets

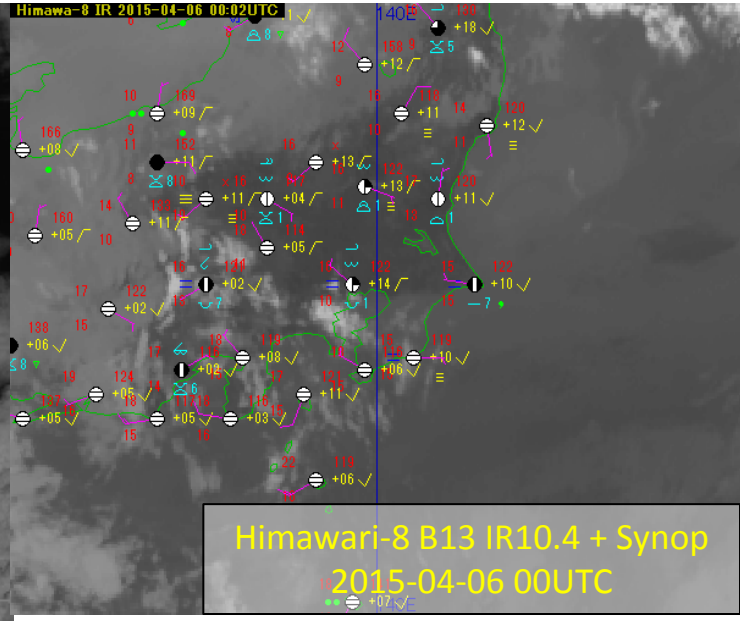


Note: Based on SEVIRI/EUMETSAT interpretation

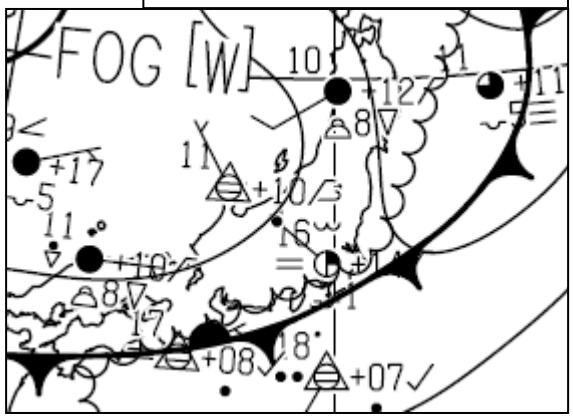
Example of Day Microphysics RGB

Fog/ low-level clouds after the rainfall in Kanto Plain, Japan





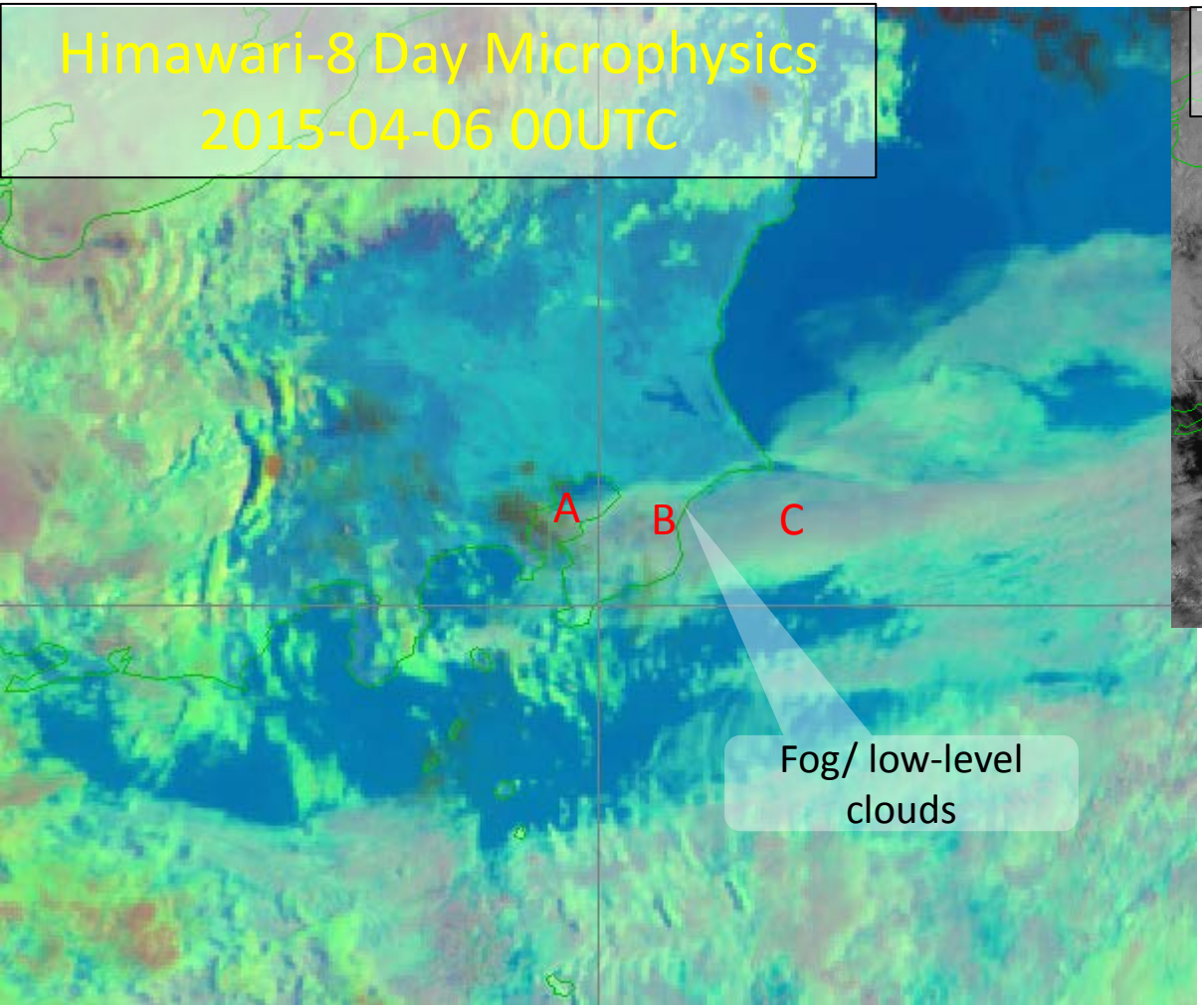
Weather Chart ASAS
2015-04-06 00UTC

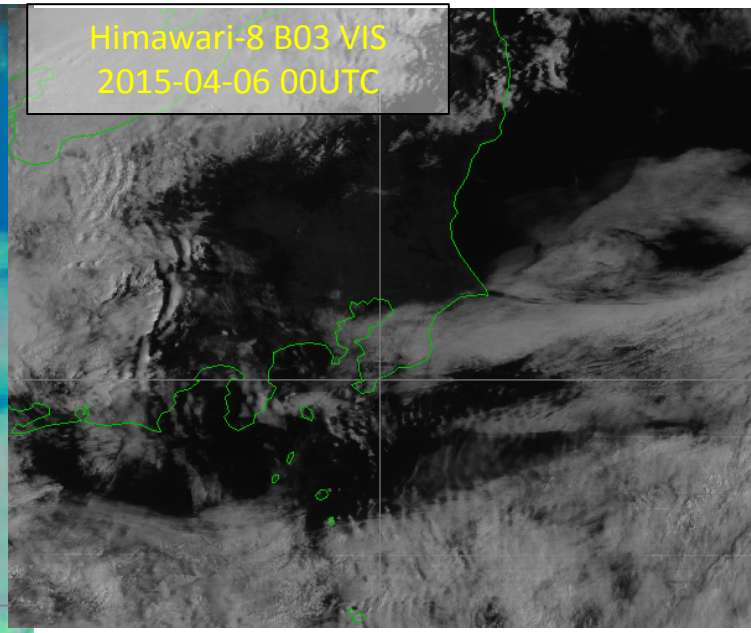


(Upper image) Smooth, whitish area correspond to fog or low-clouds in B03(VS 0.64) image.
(Upper right image) B13(IR 10.4) image overlapped ground observations. The fog was observed at some stations.
The fog or low-clouds are not distinct in B13(IR 10.4) image.

Example of Day Microphysics RGB

Fog/ low-level clouds after the rainfall in Kanto Plain, Japan





Thick water cloud
- Large droplets

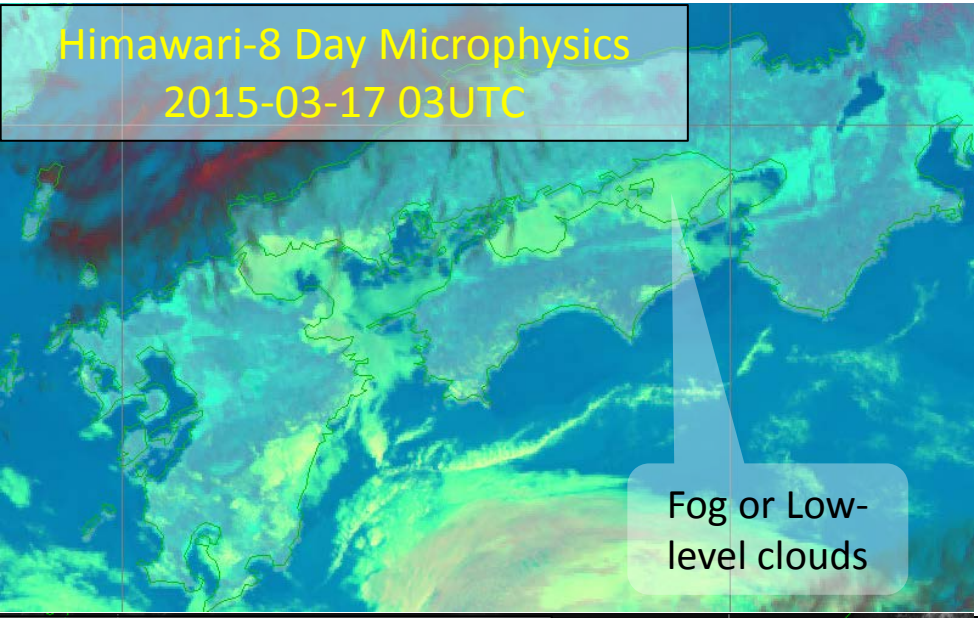
Thick water cloud
- Small droplets

Ocean

Smooth, greenish white area corresponds to fog or low-level clouds extended to Tokyo Bay(A), Bo-so Peninsula(B) and Pacific Ocean(C). Water clouds with large droplets appear in slightly reddish color.

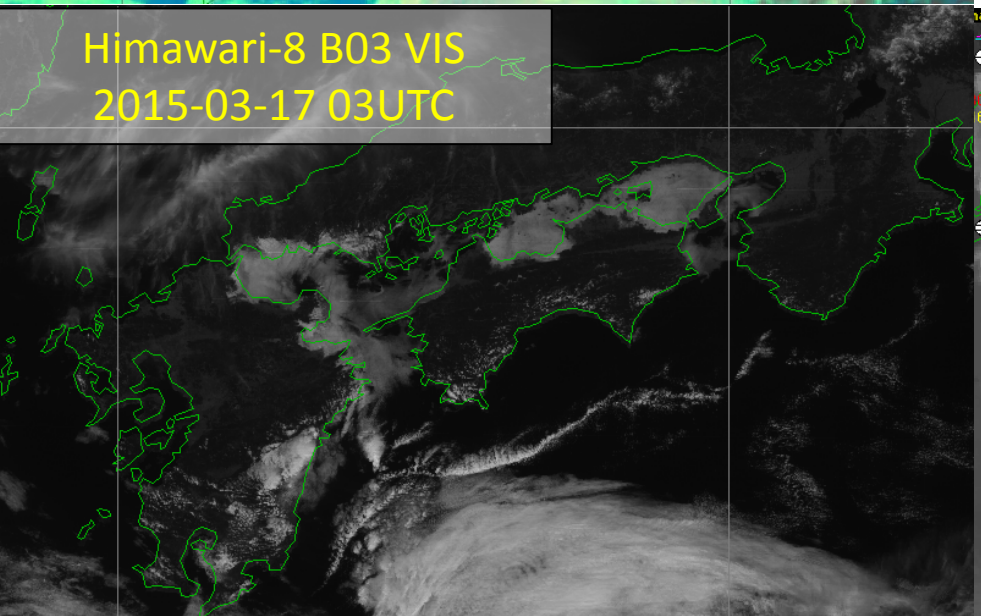
Example of Day Microphysics RGB

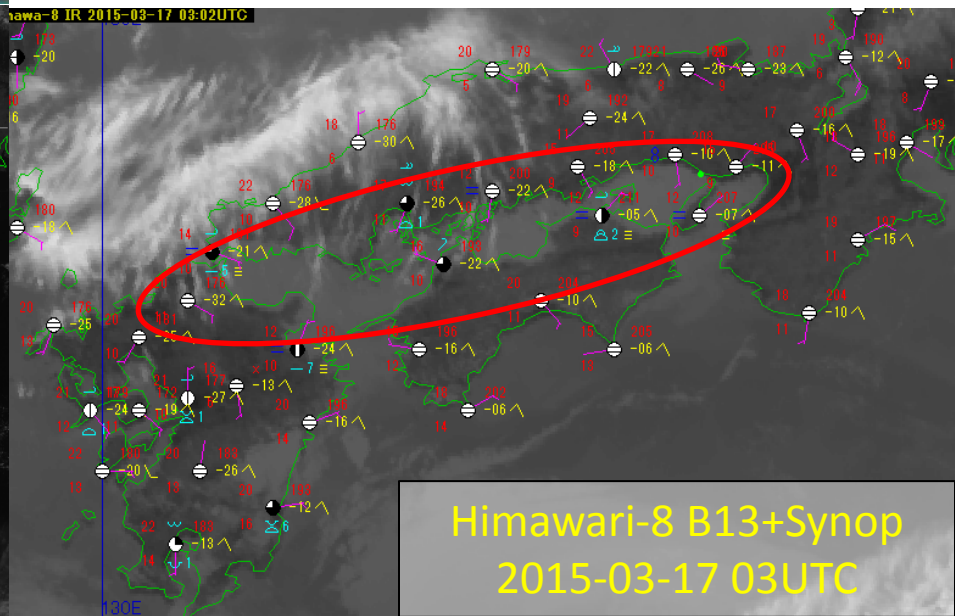
Fog/Low-level Clouds of “Setonai-kai (Inland Sea of Japan)”



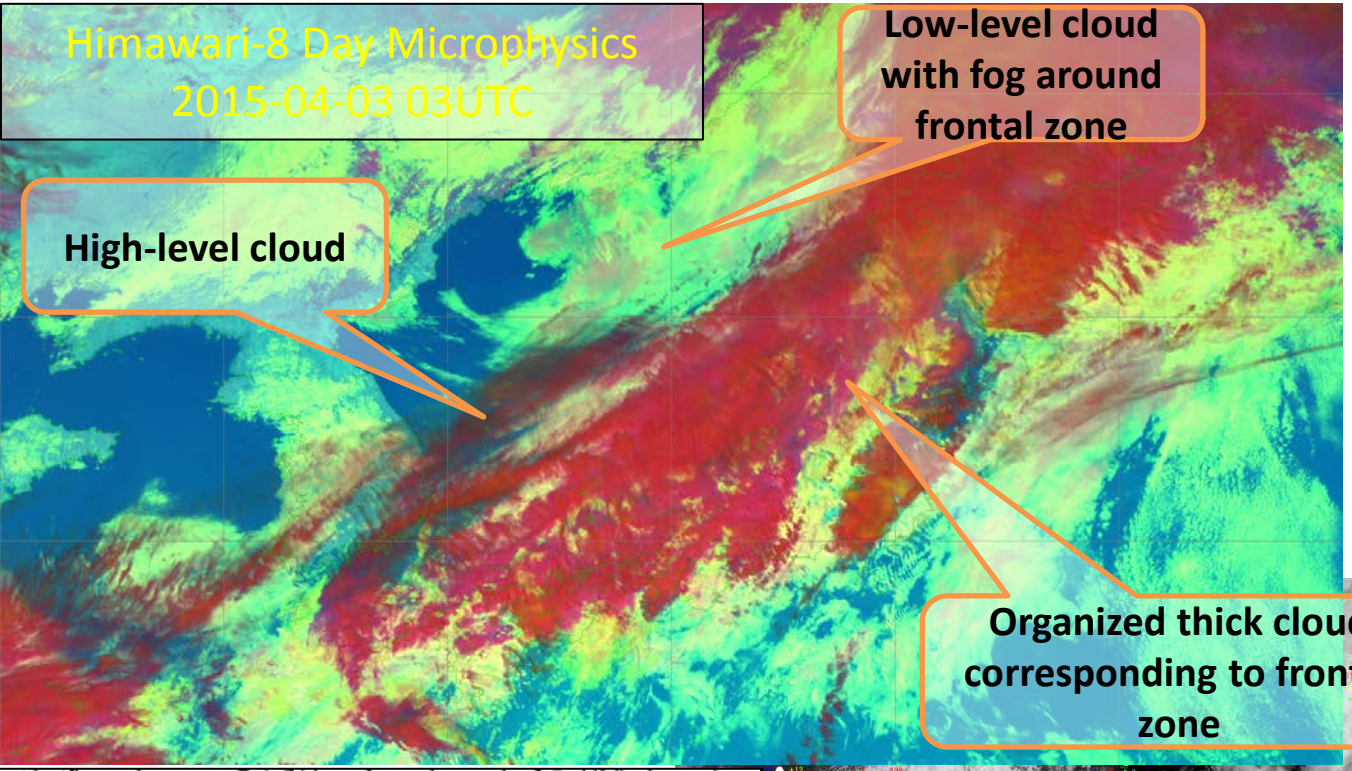
(Lower right) Fog/ low-level clouds were observed at some stations (around red oval). However, fog/ low-level clouds are not clear in the IR image.

(Upper and lower left) Smooth, greenish white areas in Day Microphysics RGB correspond to whitish fog/ low-level clouds in B03 visible image.

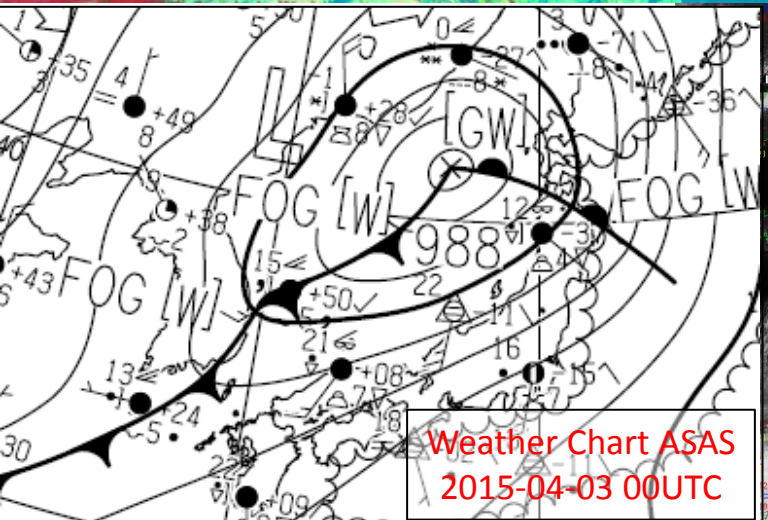


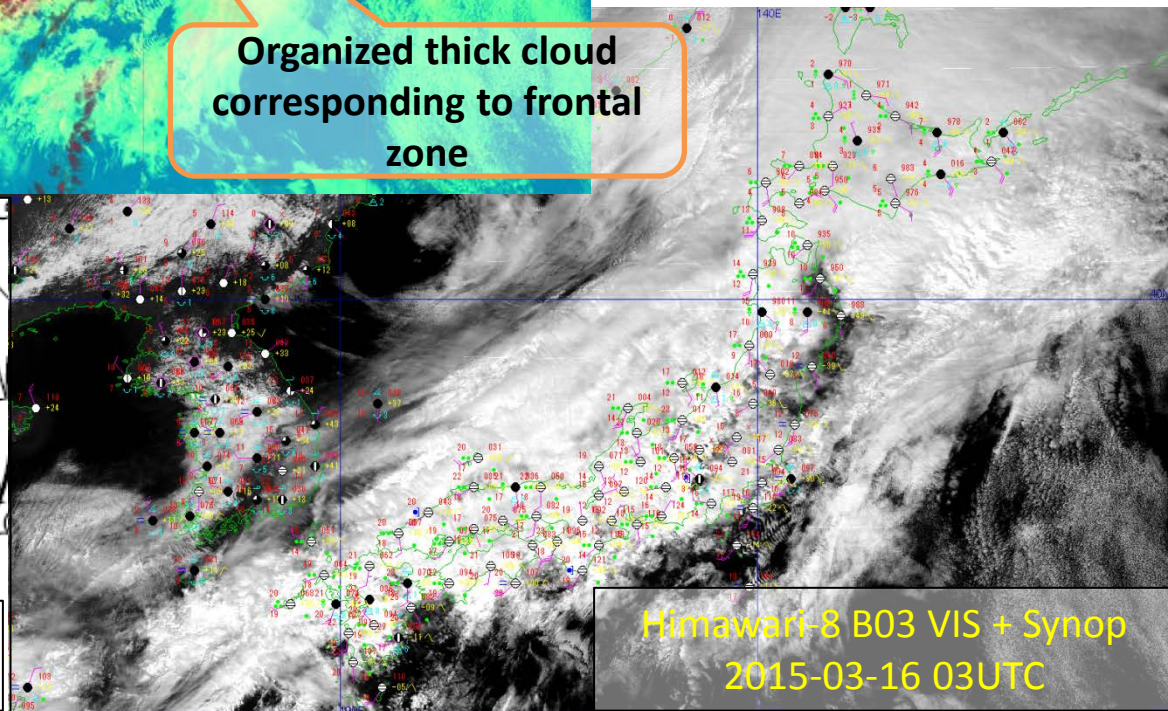


Example of Day Microphysics RGB Frontal zone

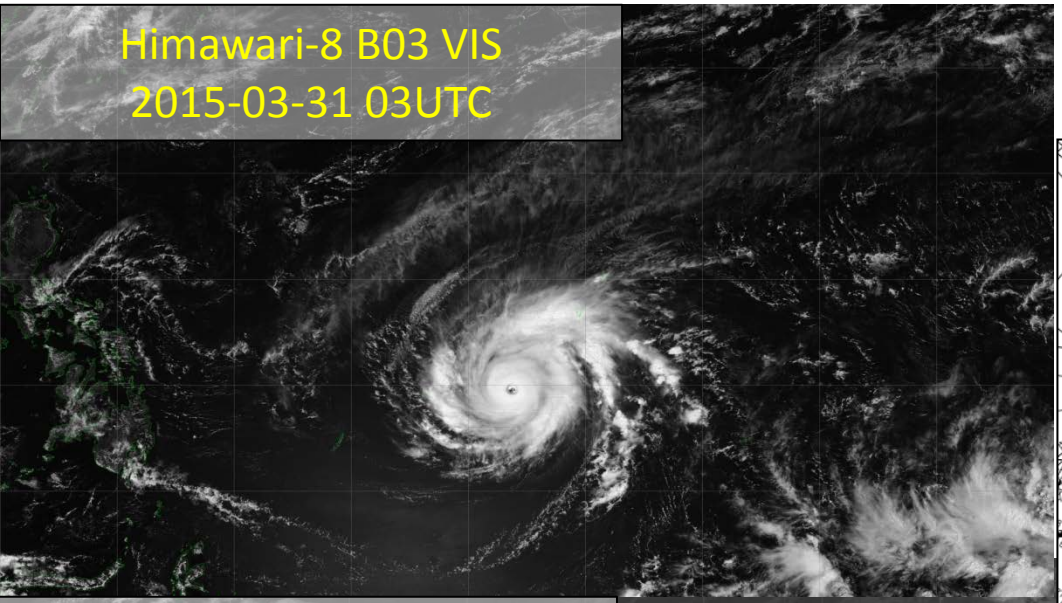


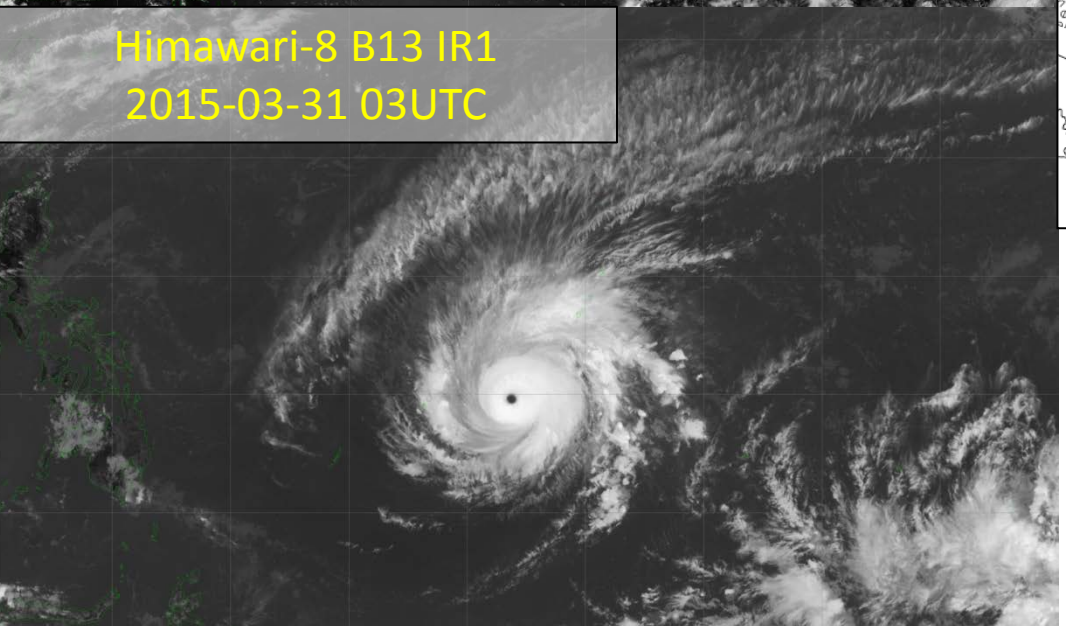
- Thin Cirrus cloud Small ice particles
- Thin Cirrus cloud Large ice particles
- Deep precipitating cloud (Cb cloud with strong updrafts and severe weather)
- Deep precipitating cloud (precip. not necessarily reaching the ground)
- Supercooled, thick water cloud Small droplets
- Supercooled, thick water cloud Large droplets
- Thick water cloud - Large droplets
- Thick water cloud- Small droplets
- Ocean

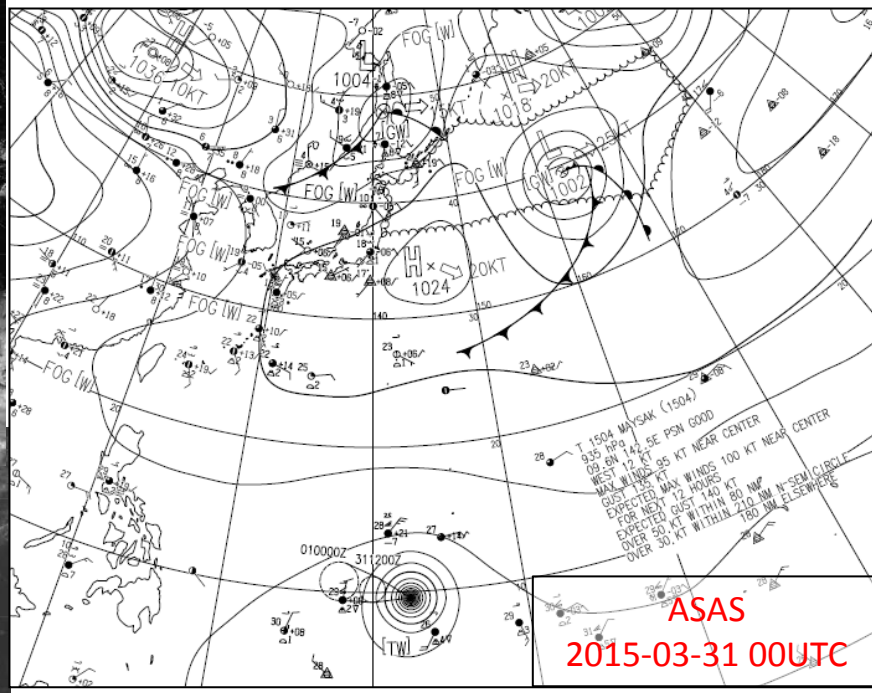




Example of Day Microphysics RGB
Typhoon No.4（T1504）

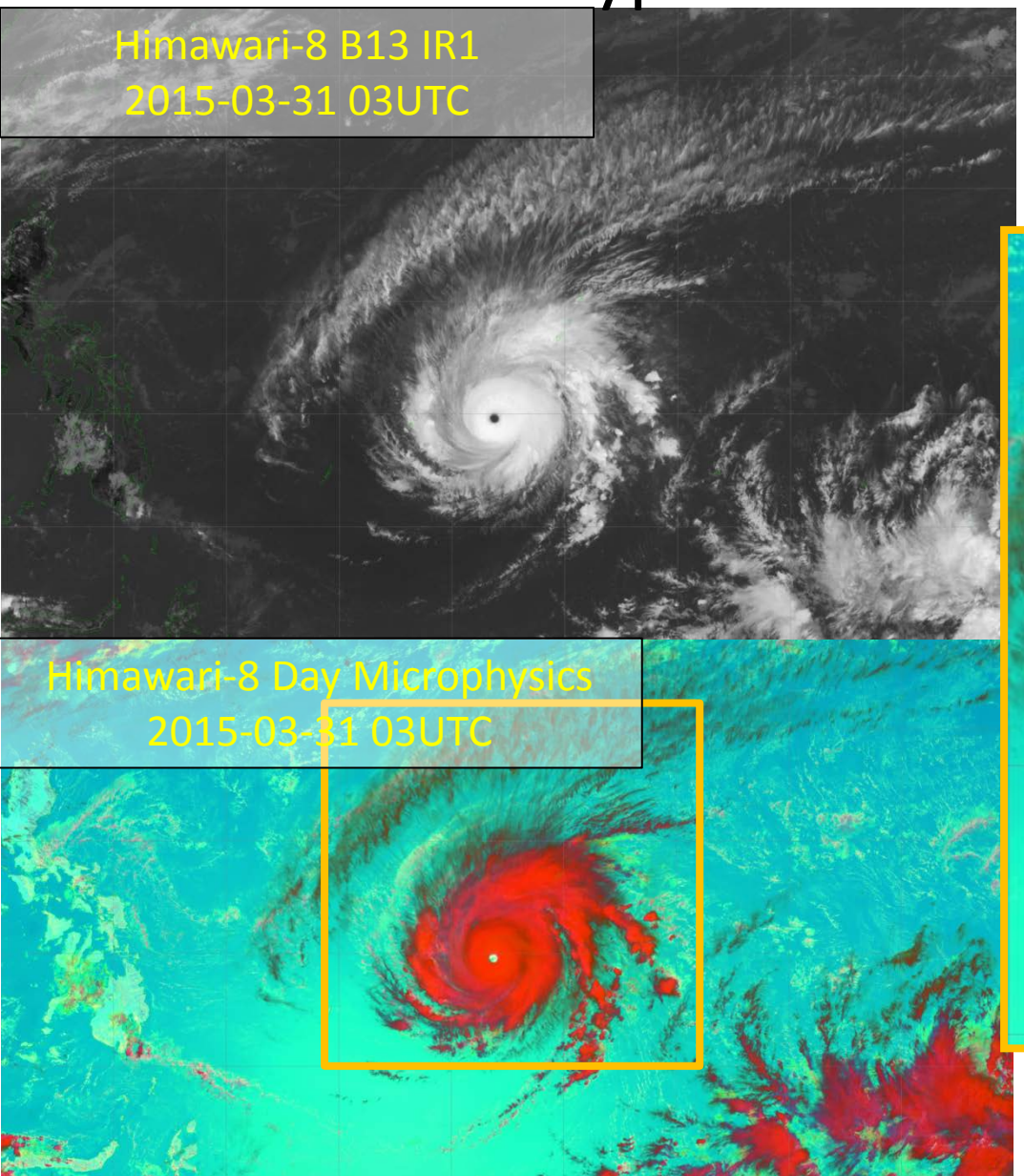




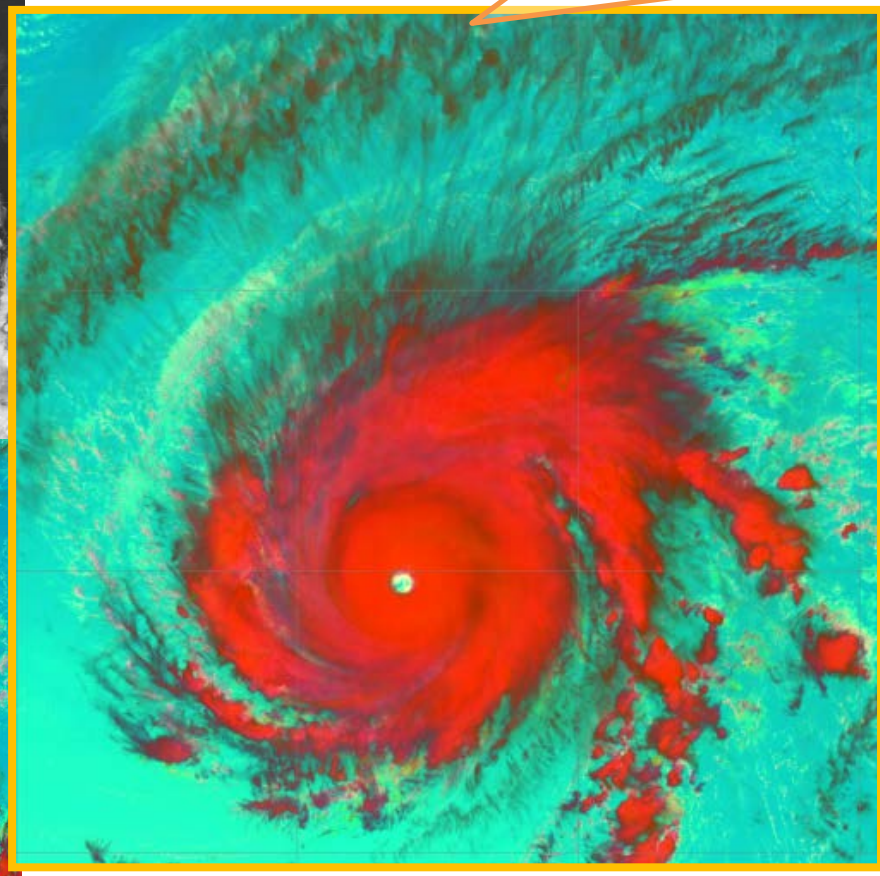


T 1504 MAYSAK (1504)
935 hPa
09.6N 142.5E PSN GOOD
WEST 12 KT
MAX WINDS 95 KT NEAR CENTER
GUST 135 KT
EXPECTED MAX WINDS 100 KT NEAR CENTER
FOR NEXT 12 HOURS
EXPECTED GUST 140 KT
OVER 50 KT WITHIN 80 NM
OVER 30 KT WITHIN 210 NM N-SEMICIRCLE
180 NM ELESWHERE

Example of Day Microphysics RGB
Typhoon No.4（T1504）



Easy identification of thick cloud and cloud layers of typhoon



Example of Day Microphysics RGB

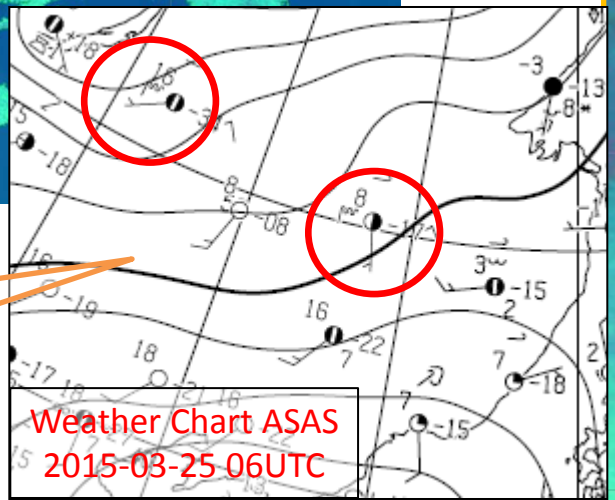
Hotspot (fire)

Himawari-8 Day Microphysics
2015-03-25 03UTC

High temperature spots by fire etc. scatter as hotspots.

Himawari-8 B07 (Reverse)
2015-03-25 03UTC

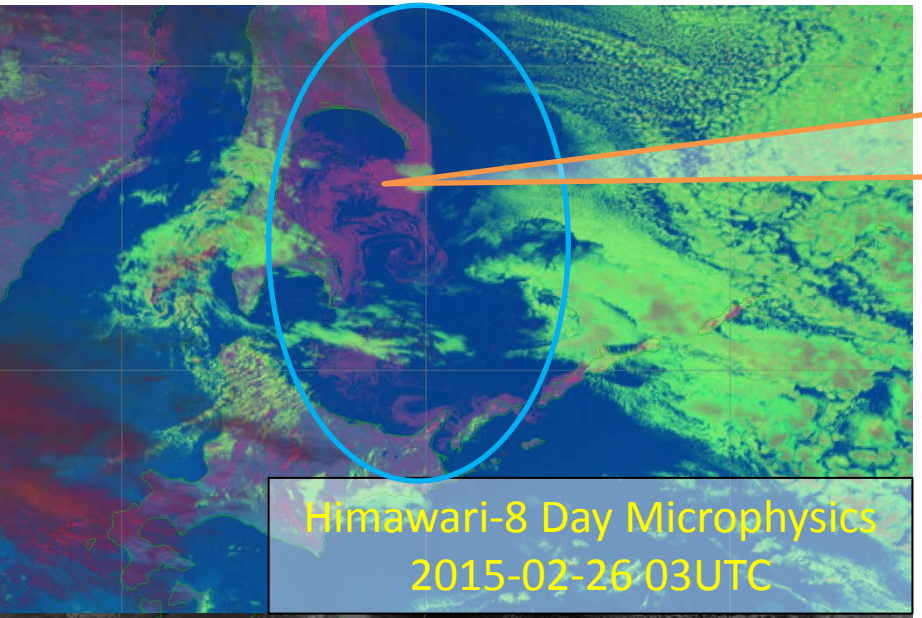
Some stations observed smoke!



Weather Chart ASAS
2015-03-25 06UTC

Example of Day Microphysics RGB

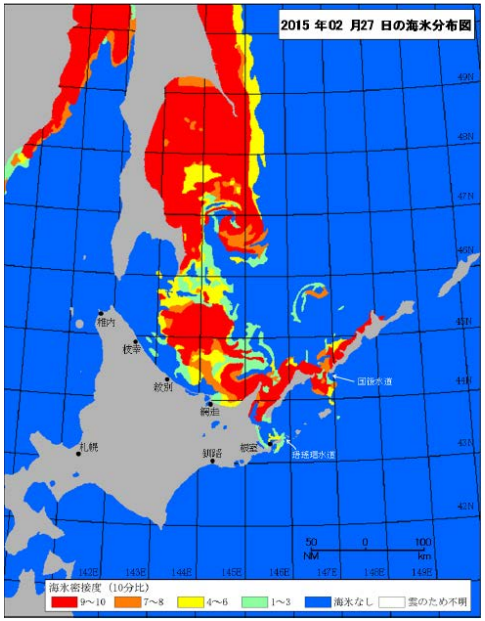
Sea ice and Snow/Ice covered area

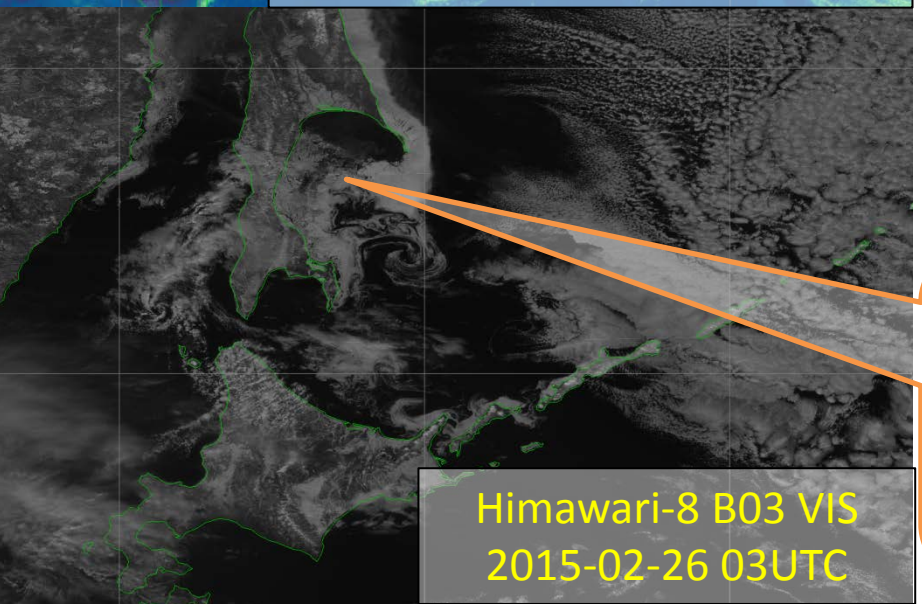


Reddish area on the ocean corresponds to sea ice/ drift ice.
It's easy to distinguish low-level clouds.

Thick water cloud - Large droplets
Thick water cloud - Small droplets
Snow
Ocean

Sea ice distribution chart for Hokkaido region 2015-2-27

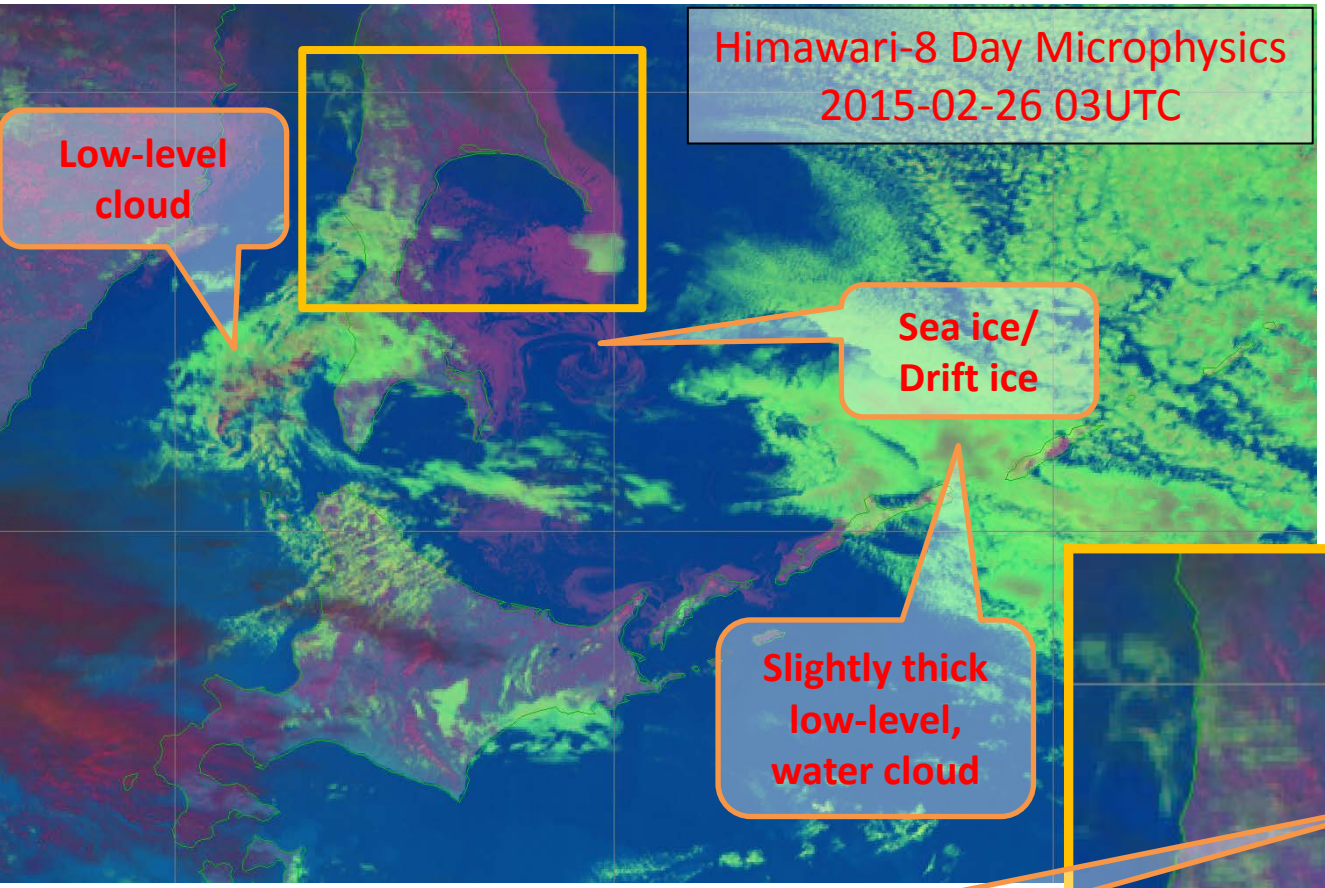




Sea ice and drift ice are clear on visible image, but the distinction of low-level clouds is slightly difficult without animation.

Example of Day Microphysics RGB

Sea ice and Snow/Ice covered area



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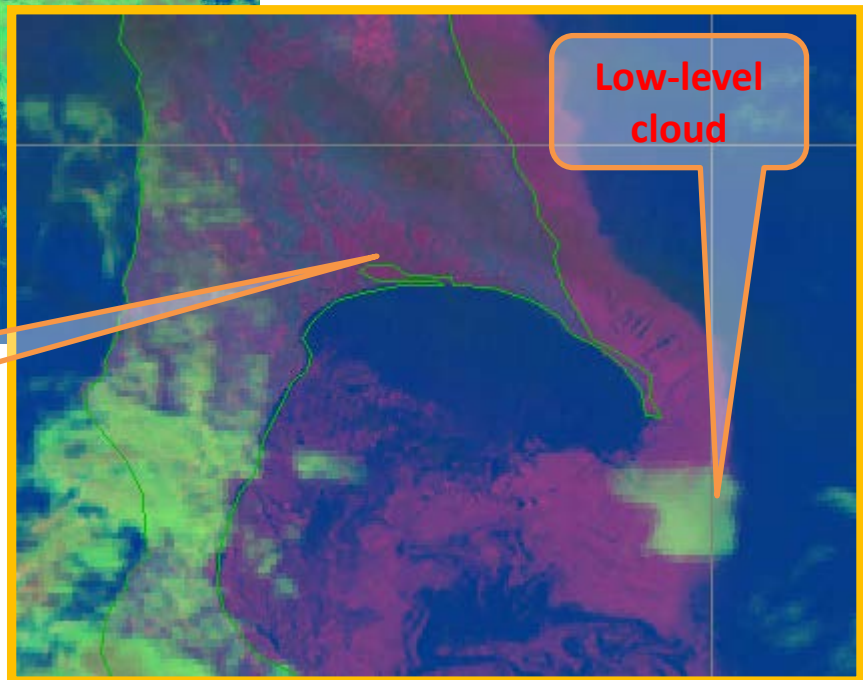

Reddish area on the ground surface corresponds to snow/ ice covered area.
It's easy to distinguish snow/ ice covered area from low-level clouds.

Day Microphysics RGB

Nephanalysis in daytime (summary)

This RGB scheme is …

- effective for convective cloud distinction in day time (especially particle size distinction in rough)
- effective to distinguish snow/ ice covered area and the distribution of fires
- so far, unavailable for SATAID, because this includes the solar reflectance component