

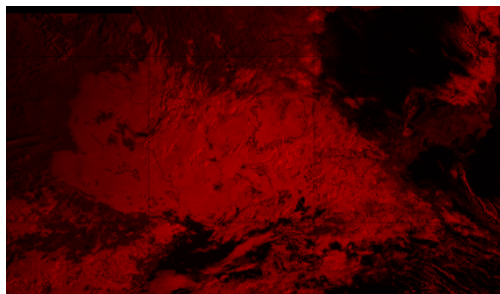


Natural Color RGB

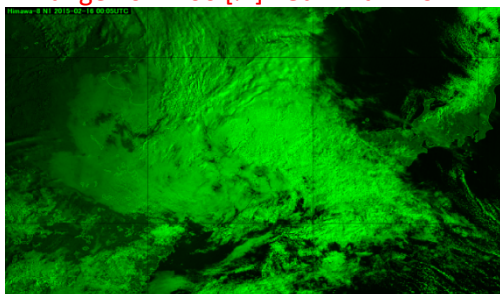
Detection of snow/ice, vegetation and clouds

Meteorological Satellite Center, JMA

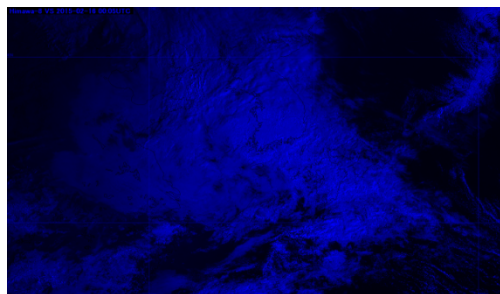
What's Natural Color RGB?



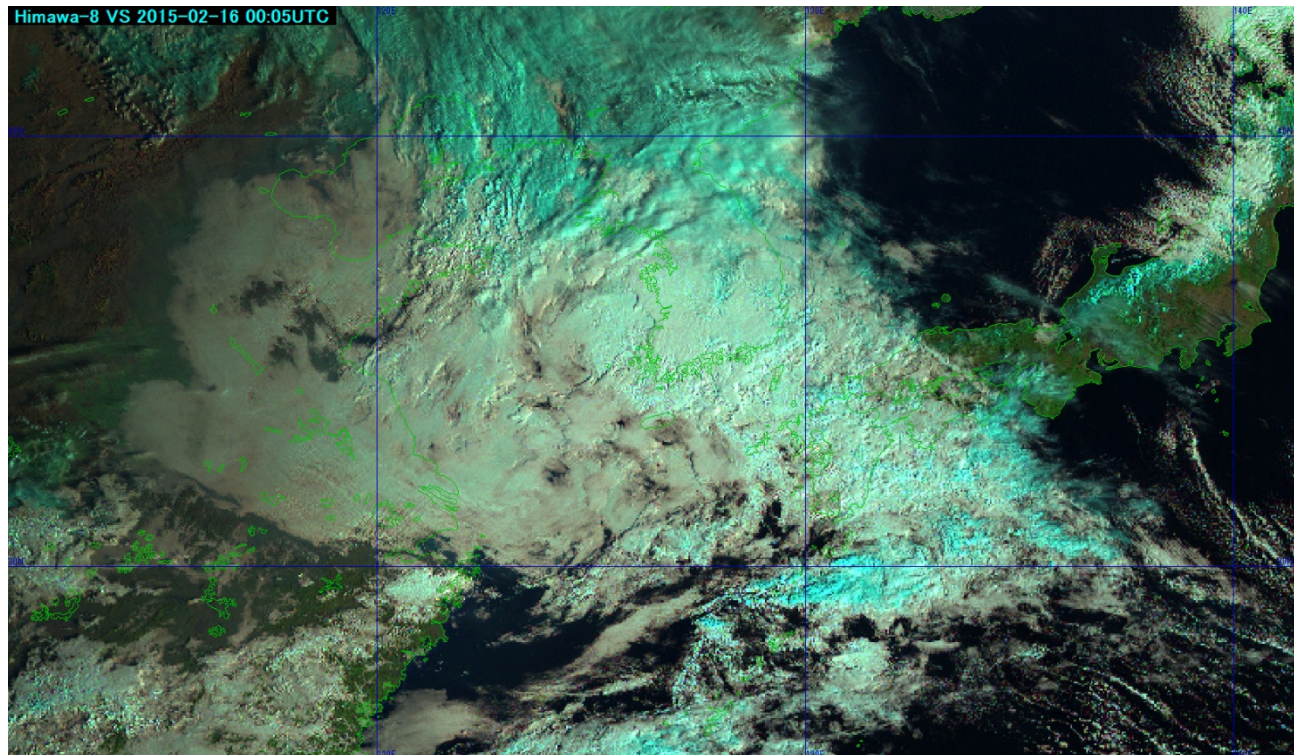
R : B05(N2 1.6)
Range : 0~100 [%] Gamma : 1.0



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



B : B03(VS 0.64)
Range : 0~100 [%] Gamma : 1.0



Components of “Natural Color” 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	7.0 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	12.3 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 (traditional) visible channel (B03(VS 0.64)).

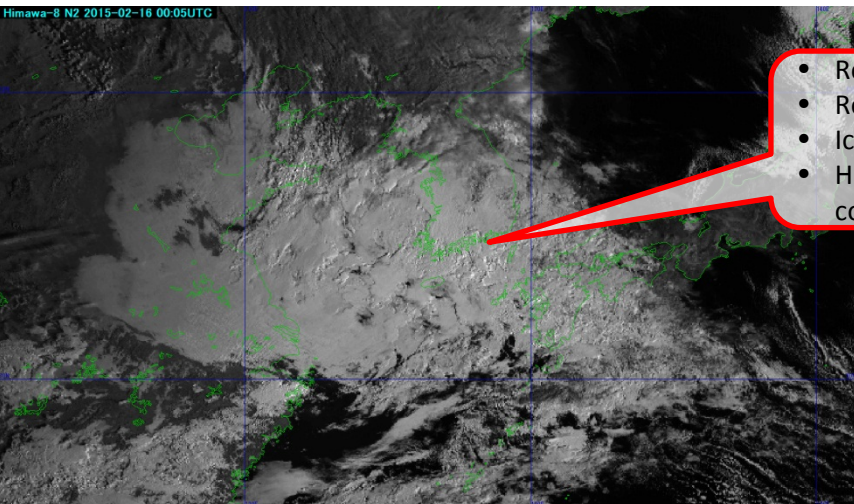
These channels have reflection characteristics for land/ sea surface conditions (such as snow/ ice covered area , vegetation) respectively.

On the other hand, this scheme is available in day-time only.

A set of RGB “Natural Colors” scheme
(RGB:B05/B04/B03)

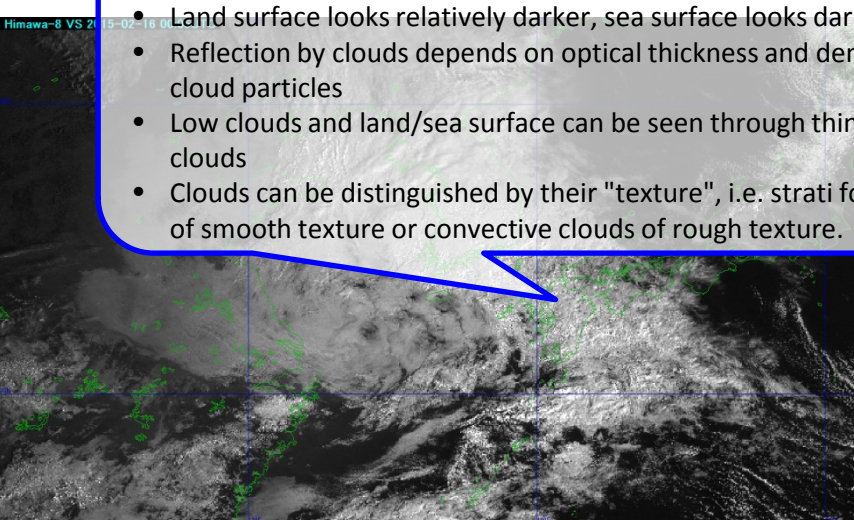
R : B05(N2 1.6)
Range : 0~100 [%] Gamma : 1.0
G : B04(N1 0.86)
Range : 0~100 [%] Gamma : 1.0
B : B03(VS 0.64)
Range : 0~100 [%] Gamma : 1.0

Characteristics and Basis of Three Components



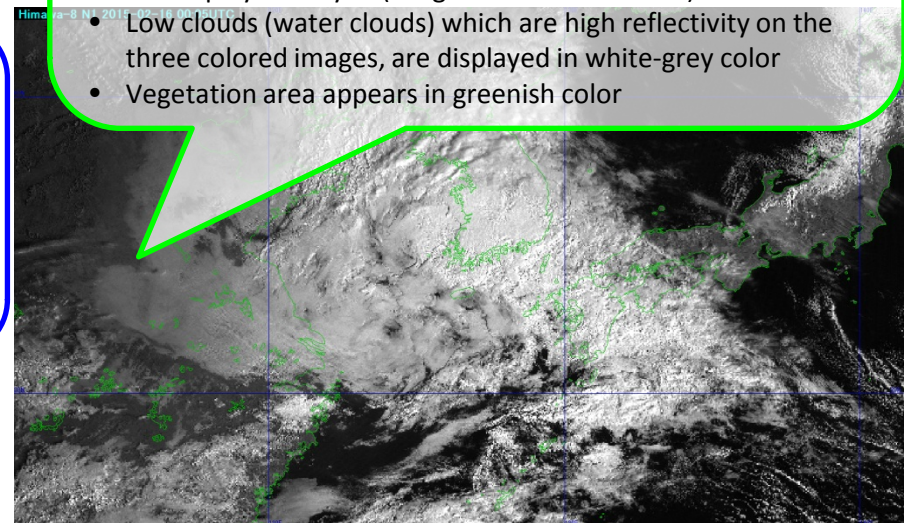
R : B05(N2 1.6) Range : 0~100 [%] Gamma : 1.0

- 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 clouds consisting of ice particles, snow/ice and sea ice are displayed in darker color



B : B03(VS 0.64) Range : 0~100 [%] Gamma : 1.0

- B03 has, in general, high reflectivity for snow/ice covered area and clouds
- Land surface looks relatively darker, sea surface looks darkest
- Reflection by clouds depends on optical thickness and density of cloud particles
- Low clouds and land/sea surface can be seen through thin high clouds
- Clouds can be distinguished by their "texture", i.e. strati form clouds of smooth texture or convective clouds of rough texture.



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

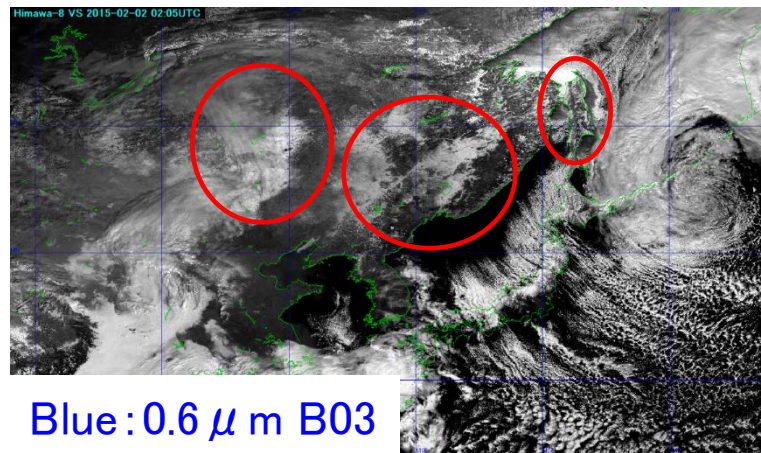
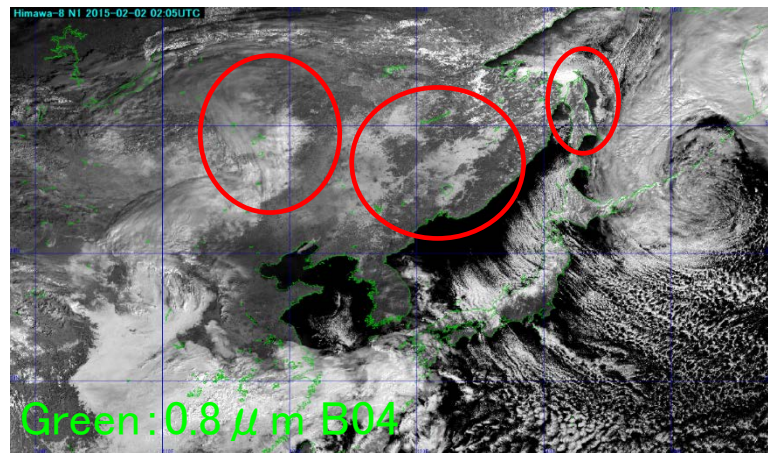
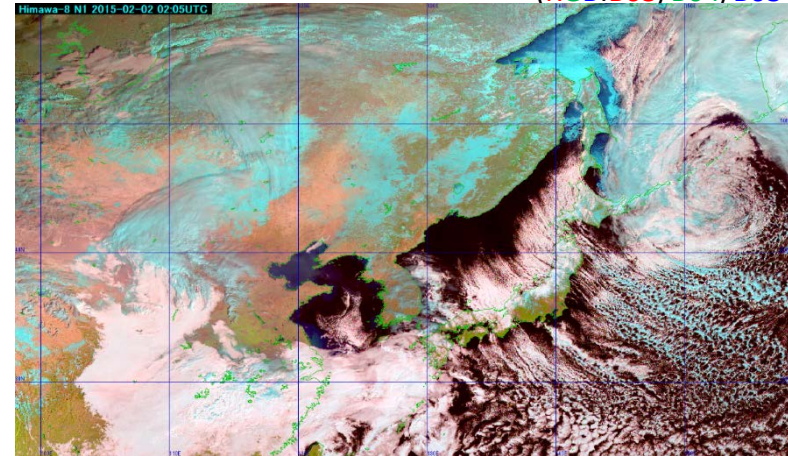
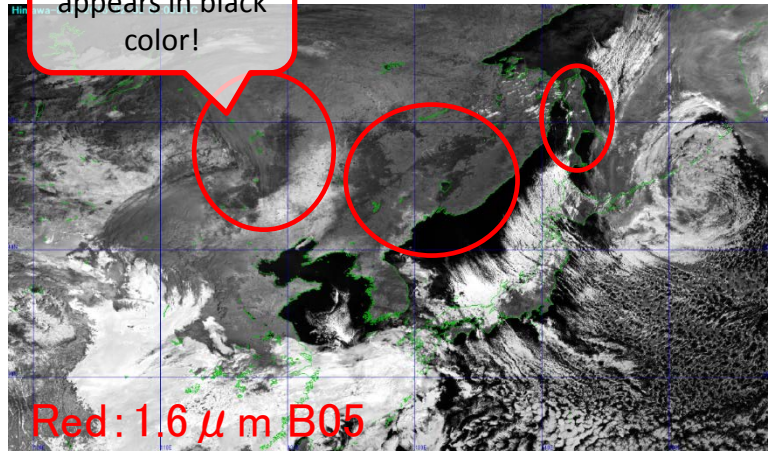
- B04 as well as B03, has high reflectivity for snow/ice covered area and clouds
- Land surface looks relatively darker, sea surface looks darkest
- Vegetation distribution can be derived because of high reflectivity by "chlorophyll" in plant bodies
- On RGB imagery, high clouds consisting of ice particles, snow/ice and sea ice, which are low reflectivity on red B05, are displayed in cyan (i.e. green B04 + blue B03) color
- Low clouds (water clouds) which are high reflectivity on the three colored images, are displayed in white-grey color
- Vegetation area appears in greenish color

Basis of snow/ice detection on RGB image

Low reflectivity, appears in black color!

On 1.6 micron image, water clouds (in fog or low clouds) have high reflectivity. On the other hand, snow/ice covered areas have low reflectivity (appear in black on the left image).
 ∴ Snow/ice covered areas contain few “red” component on RGB image.

Natural Colors
 (RGB:B05/B04/B03)



On 0.8 and 0.6 micron images, snow/ice covered areas (as well as water clouds) have high reflectivity (appear in white on the above images).
 ∴ Snow/ice covered areas contain “blue” + “green” components (appear in cyan) and low clouds contain “red” + “blue” + “green” components (appear in whitish) on RGB image.

Interpretation of Colors for “Natural Colors”

High-level ice clouds

Low-level water clouds

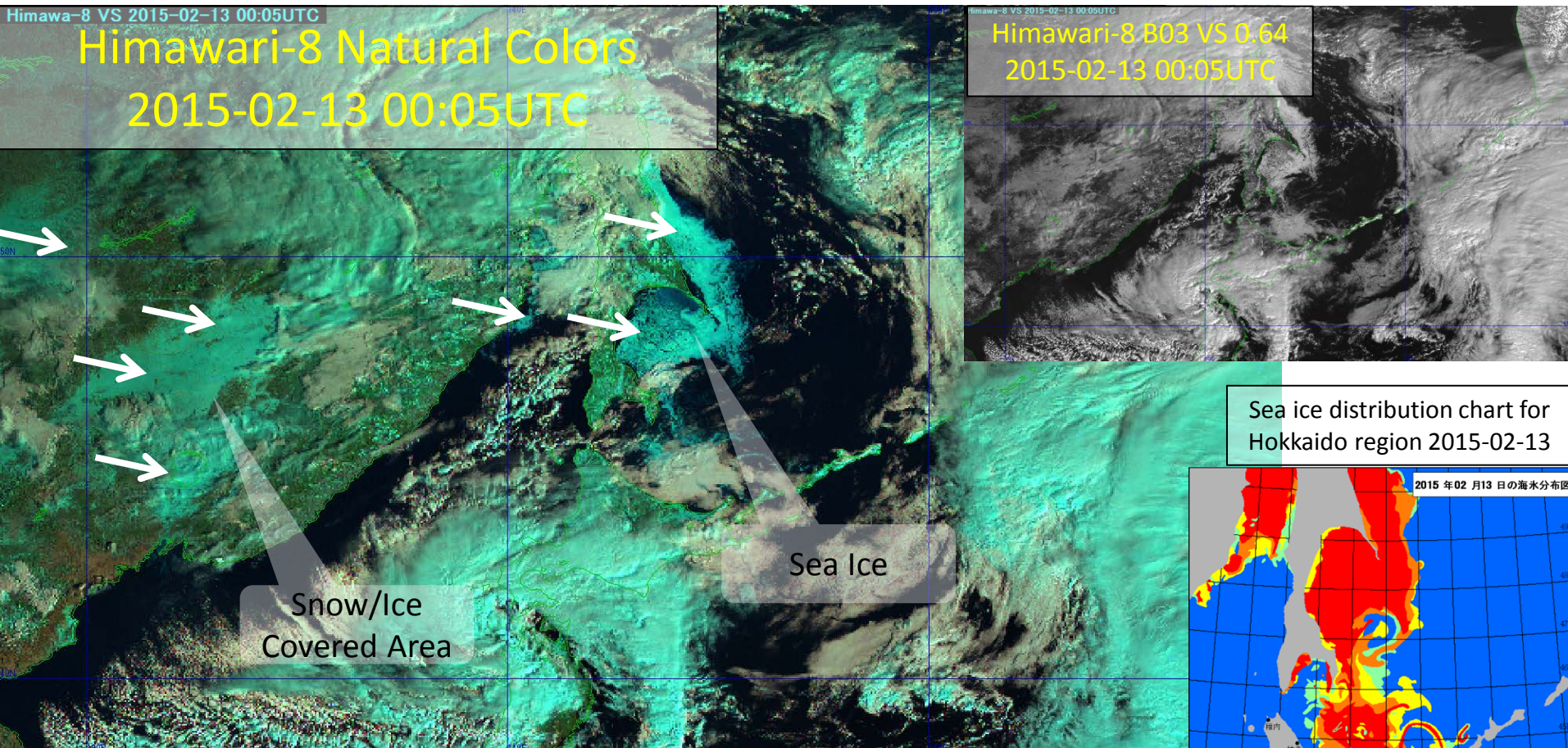
Ocean

Vegetation

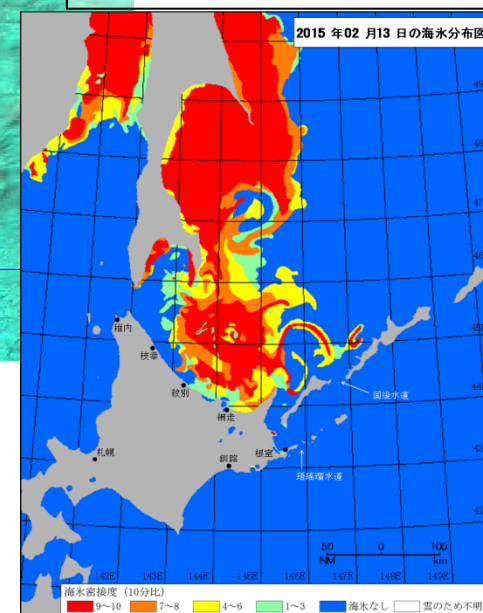
Desert

Snow

Example of Natural Color RGB Sea Ice and Snow/Ice Covered Area



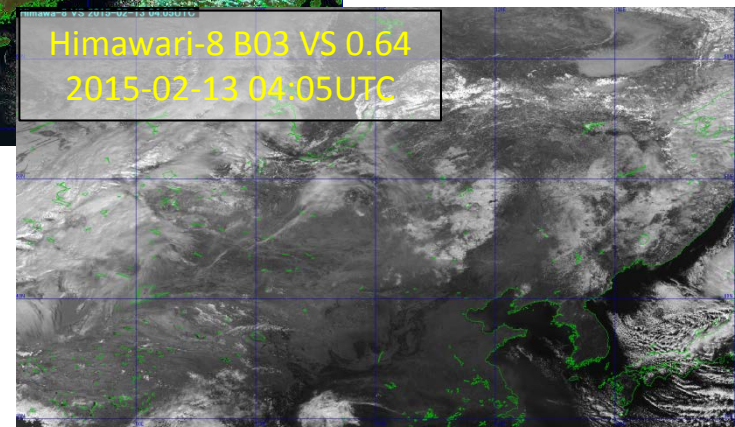
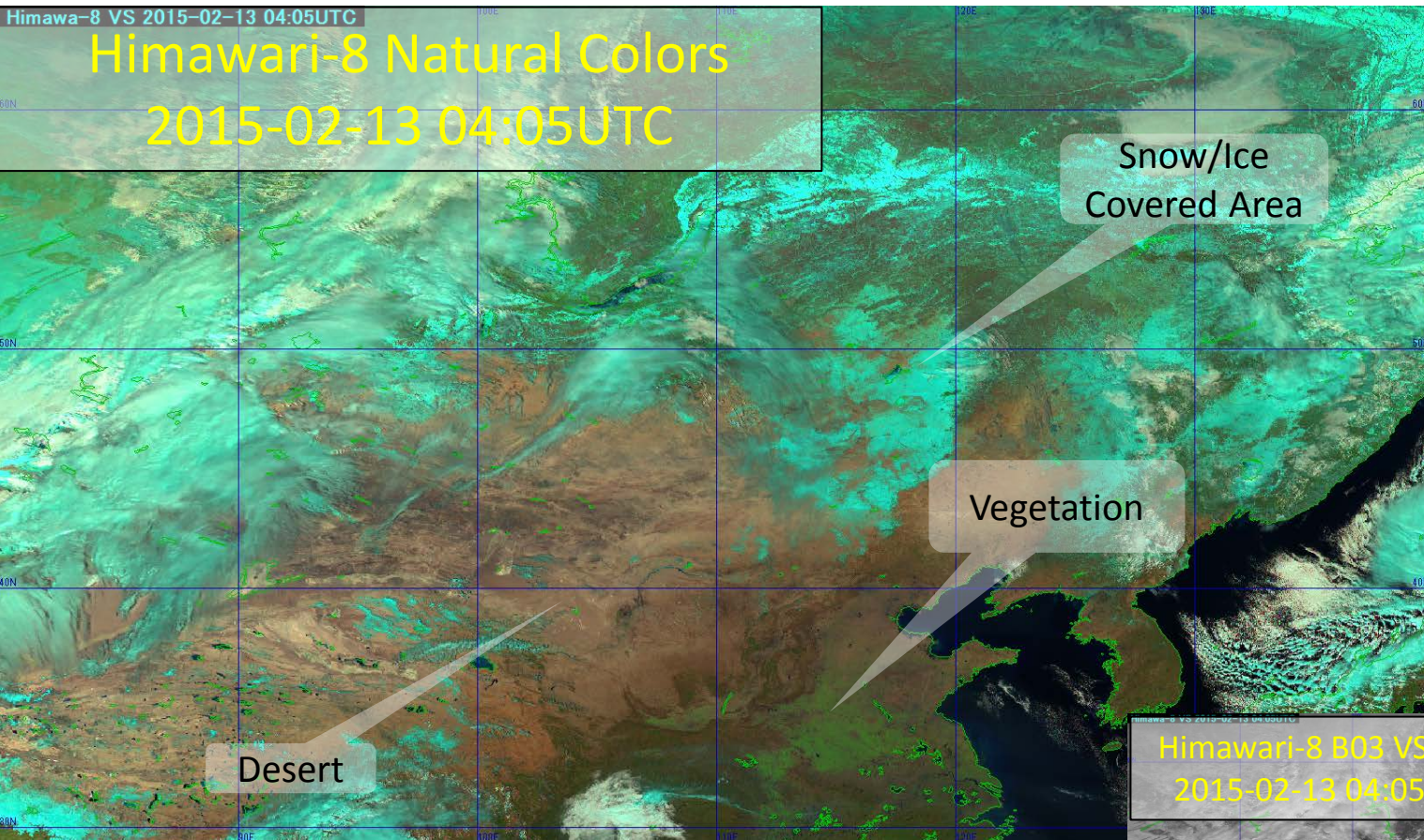
Sea ice distribution chart for Hokkaido region 2015-02-13



Sea ice and snow/ice covered area appear in cyan color!

Example of Natural Color RGB

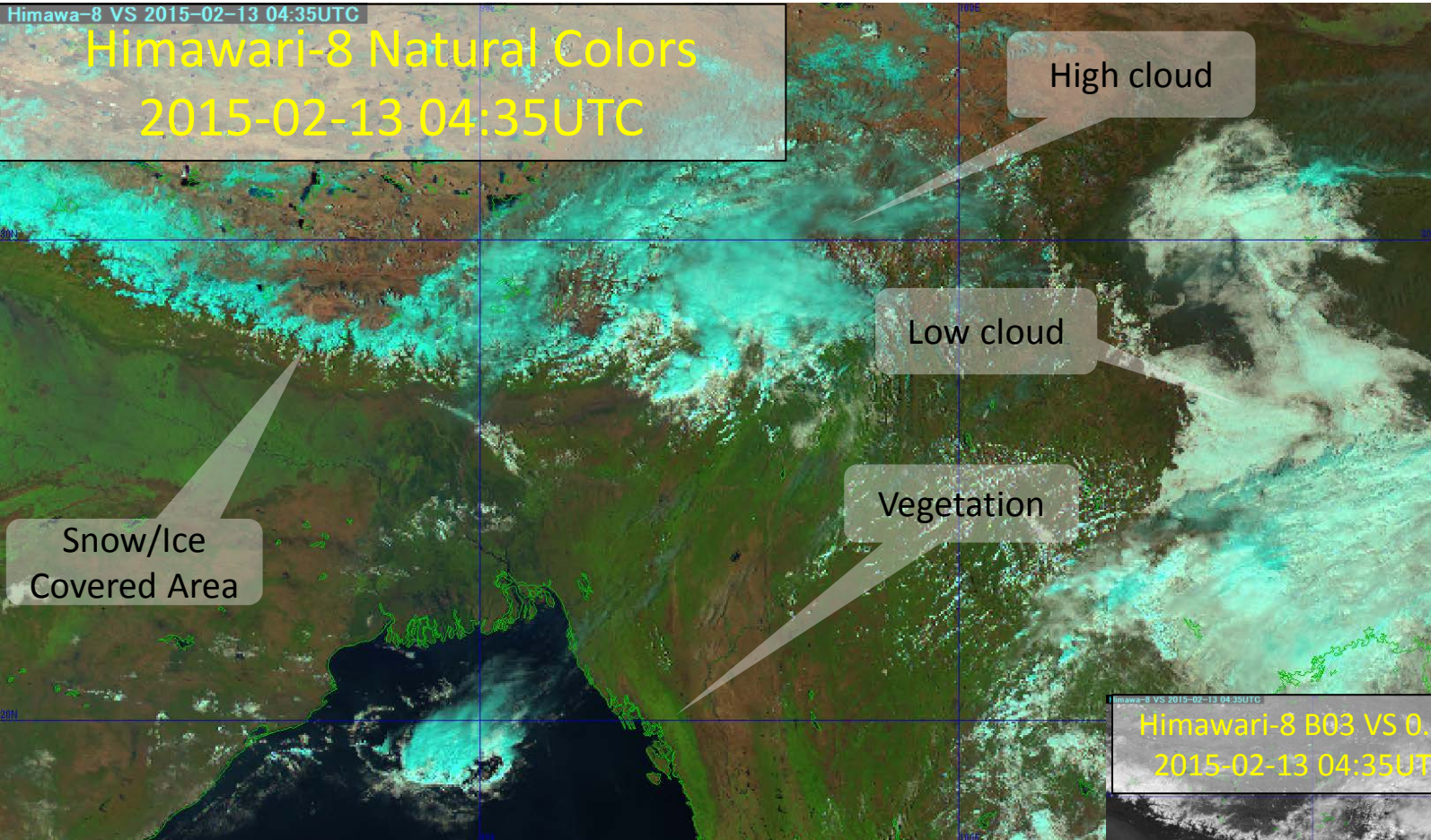
Vegetation, Snow/Ice Covered Area (Vicinity of China and Mongolia)



Vegetation appears in green,
 desert or bare ground appear in brown!

Example of Natural Color RGB

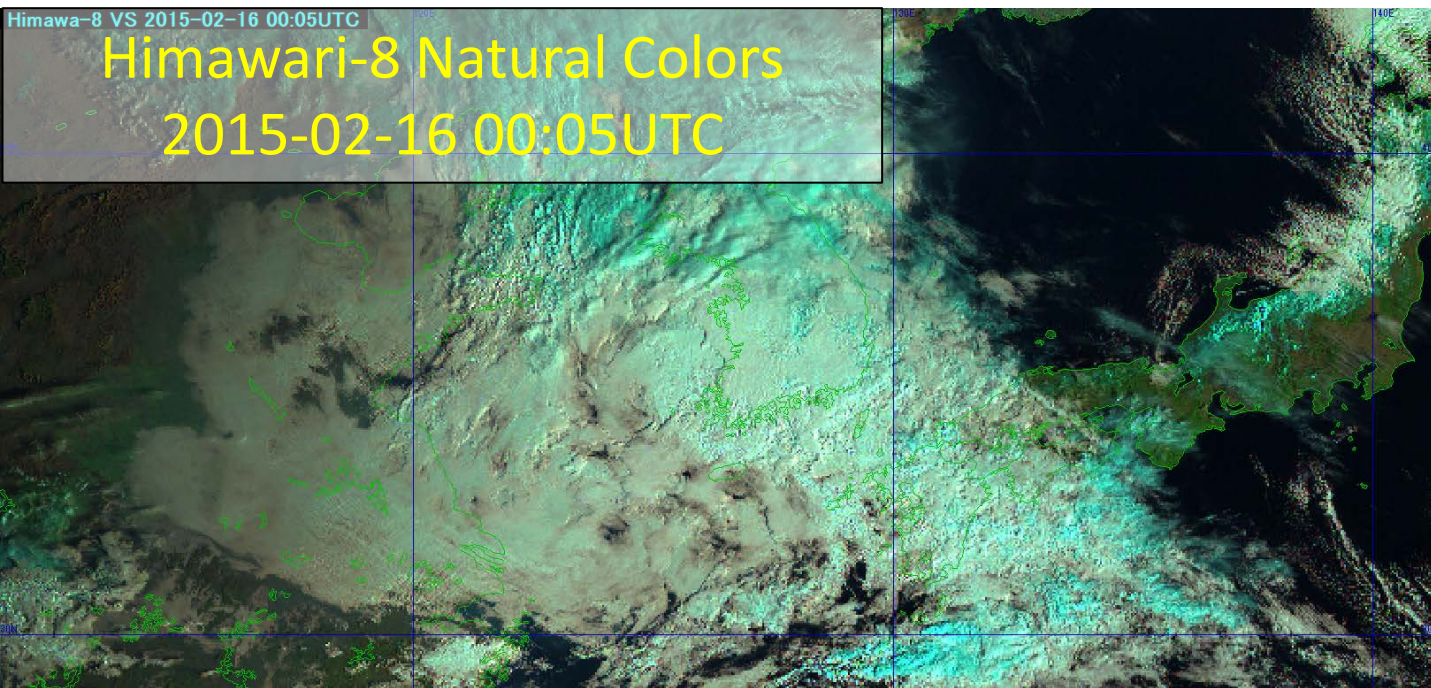
Vegetation, Snow/Ice Covered Area
(Vicinity of Himalayas and Bay of Bengal)



Snow covered area is seen along Himalayas!
Vegetation areas spread widely on the south of the mountains!

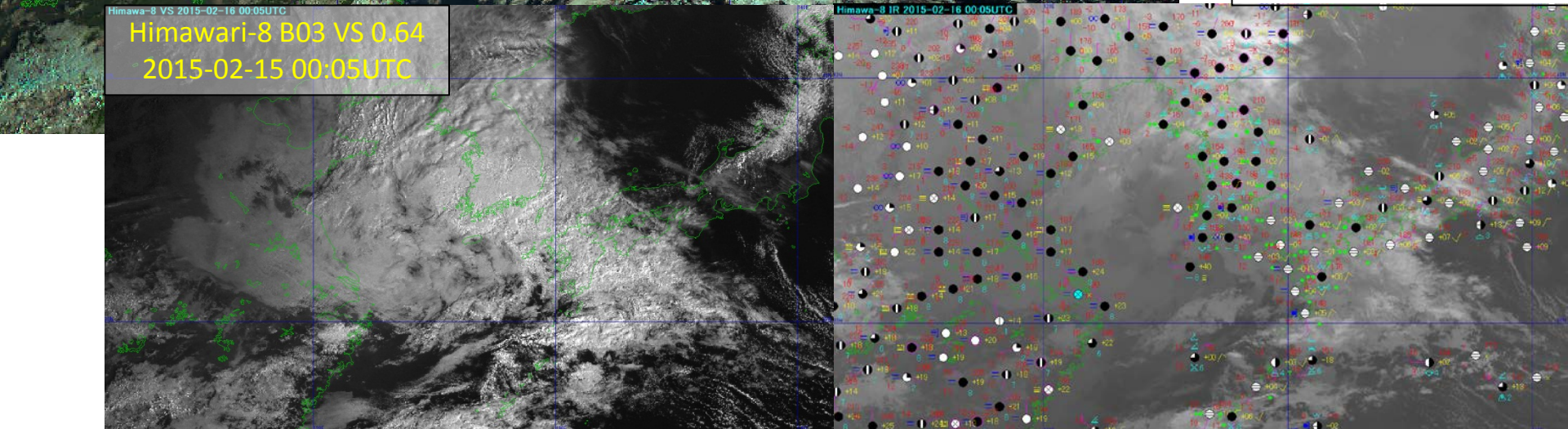
Example of Natural Color RGB

Fog/Low clouds



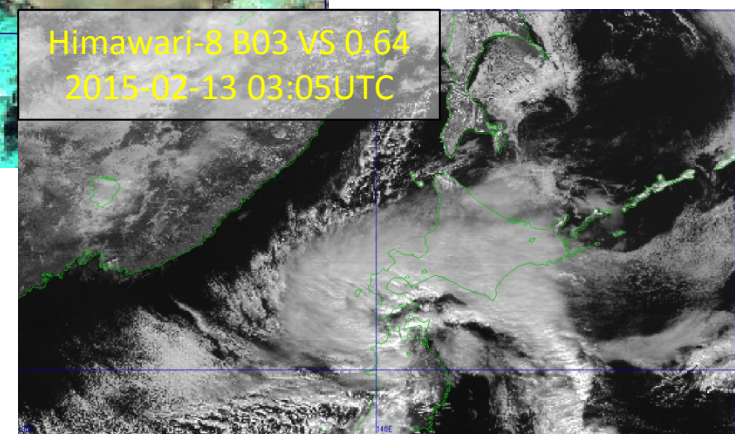
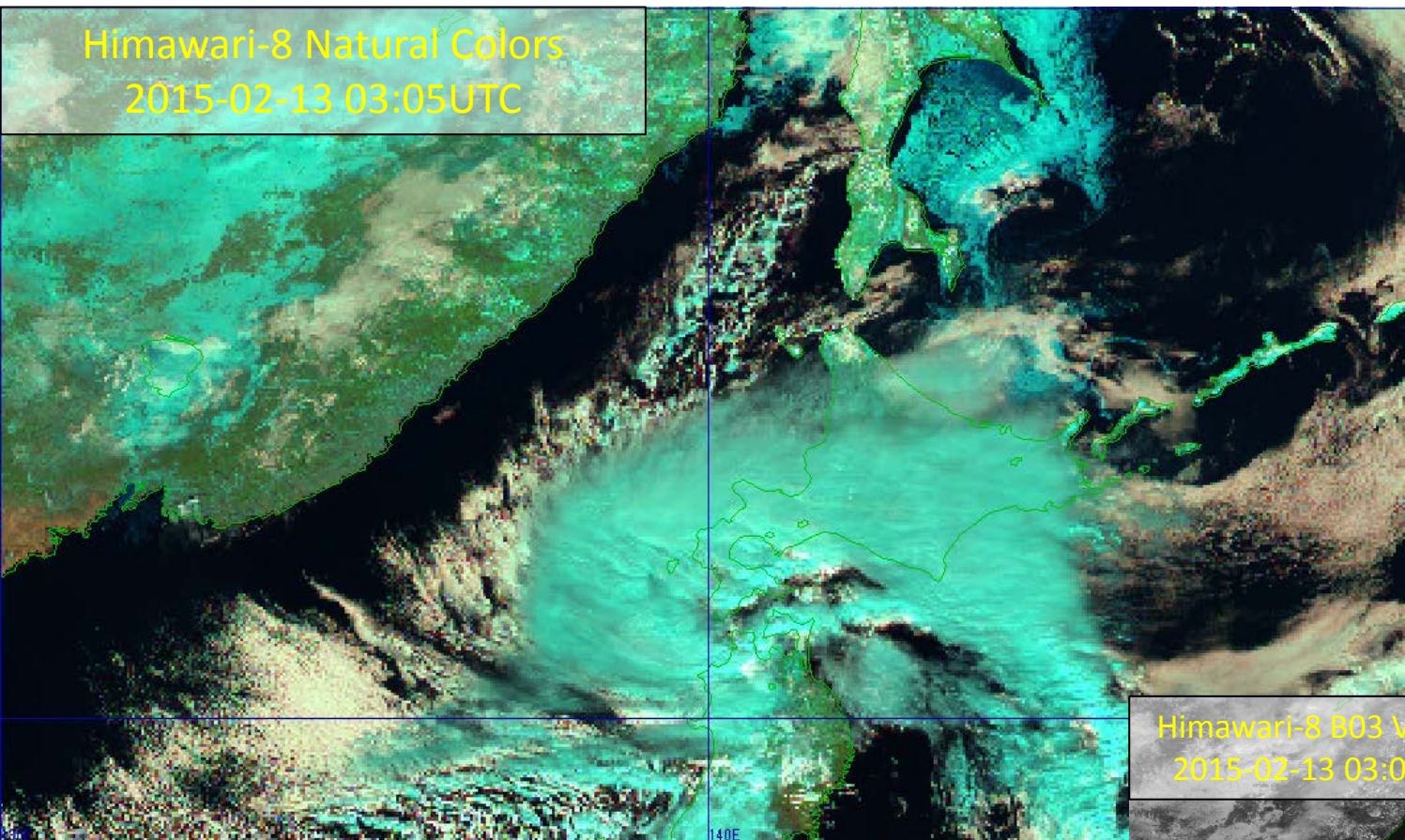
Fog/low clouds on the Yellow Sea and the East China Sea appear in whitish color!

Himawari-8 B13 IR 10.4
+ Synop
2015-02-15 00:05UTC



Example of Natural Color RGB

High cloud with ice particles

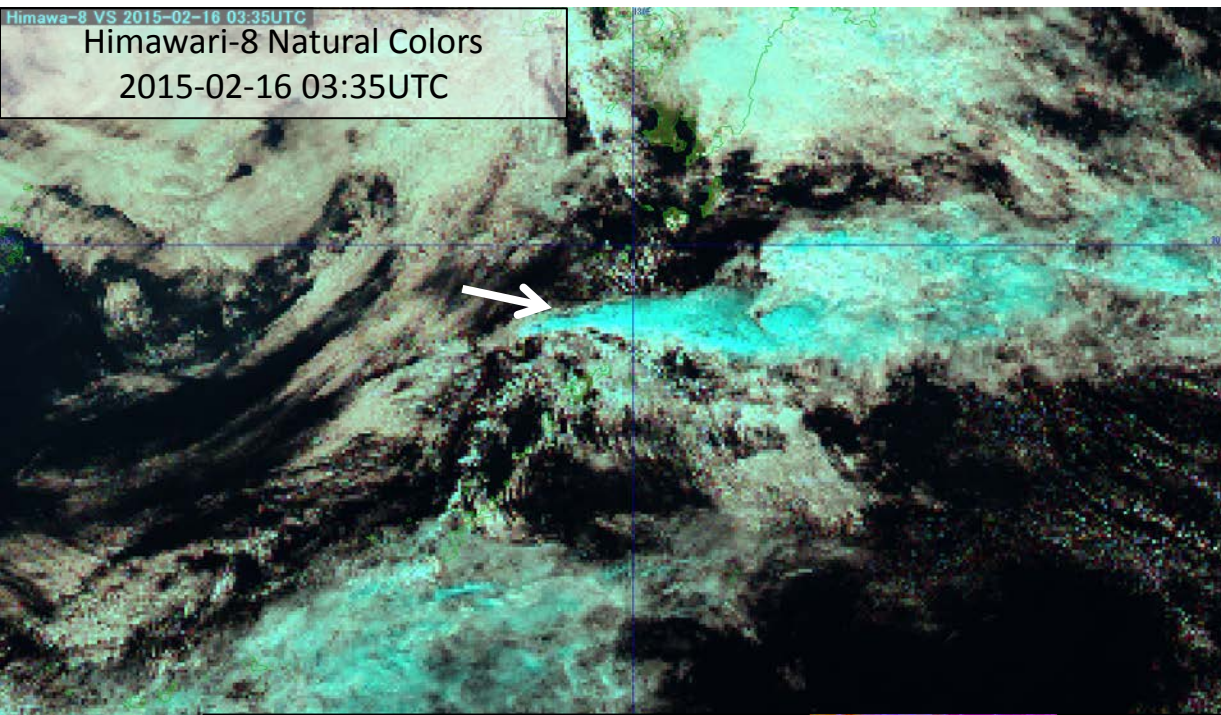


Organized cloud area with Ci is on the North Japan

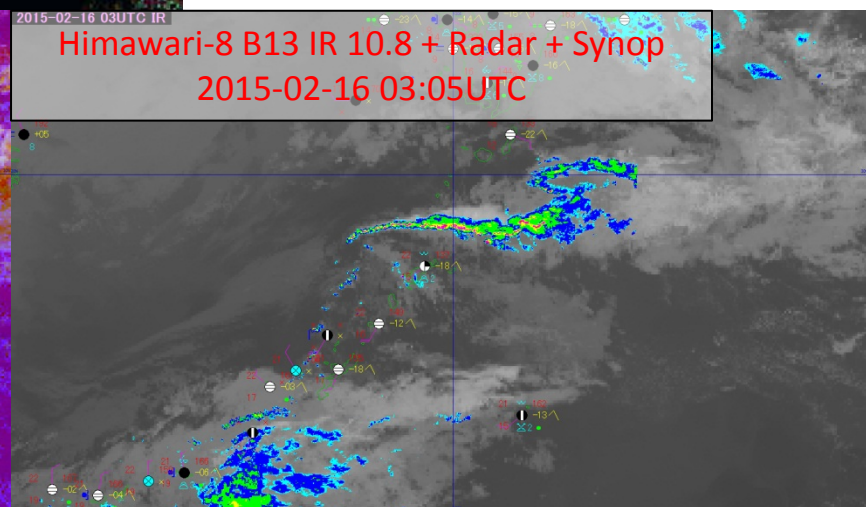
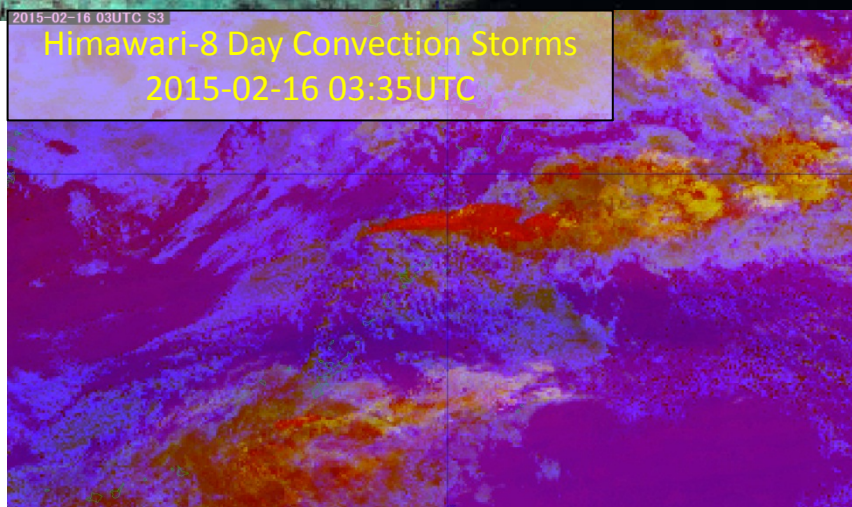
Low clouds and sea ice can be seen through thin high clouds

Example of Natural Color RGB

Tapering cloud with high cloud



High cloud on the developing Cb appears in cyan color



Natural Color RGB

Detection of snow/ice, vegetation and clouds Summary

- ✓ Available to distinguish vegetation, desert and snow/ice
- ✓ Easy to distinguish between high-level ice clouds and low-level water clouds
- ✓ But in day-time only