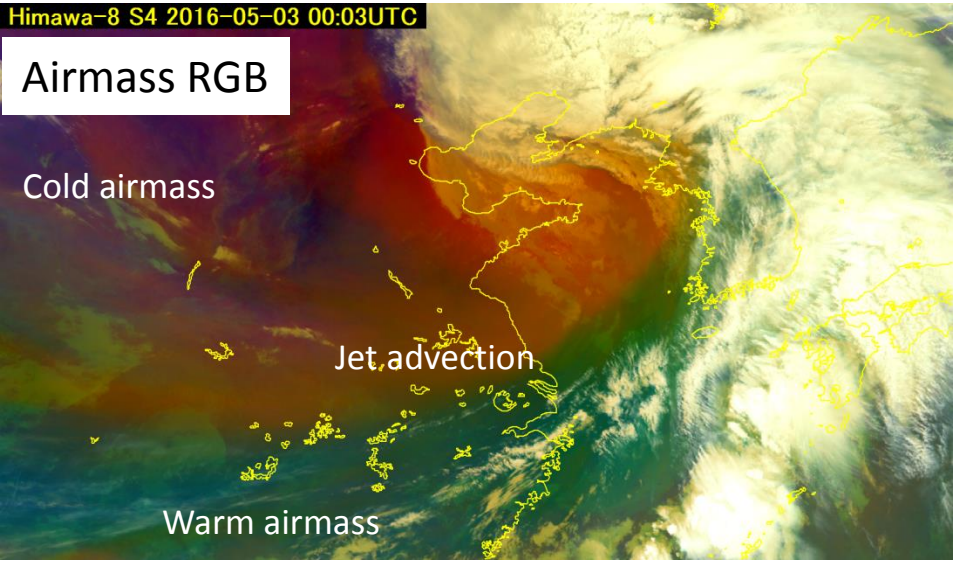
New recipes of RGB composite images from Himawari-8

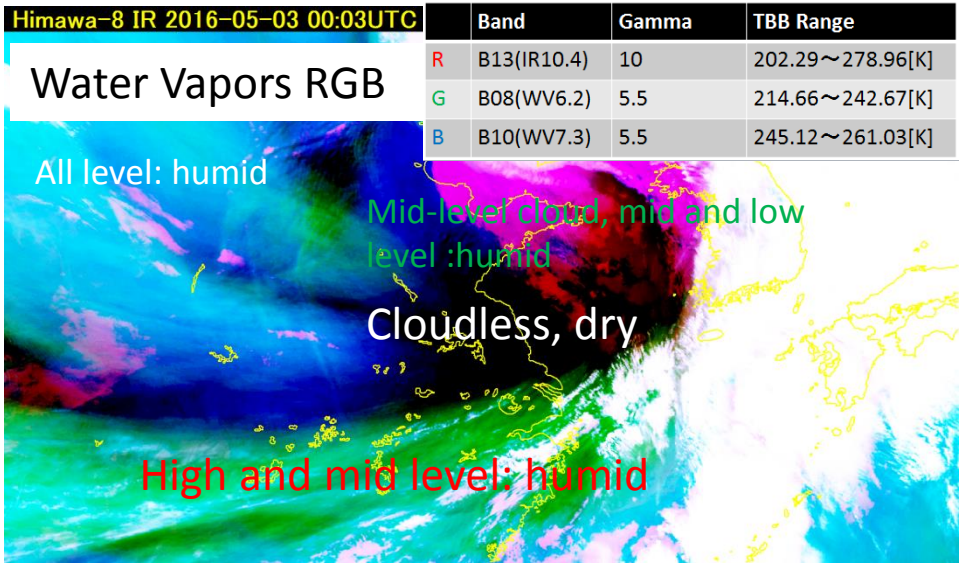
A summary from the JMA presentation "New recipes of RGB composite images from Himawari-8 developed by JMA" as presented at AOMSUC-7 and other references.

Index

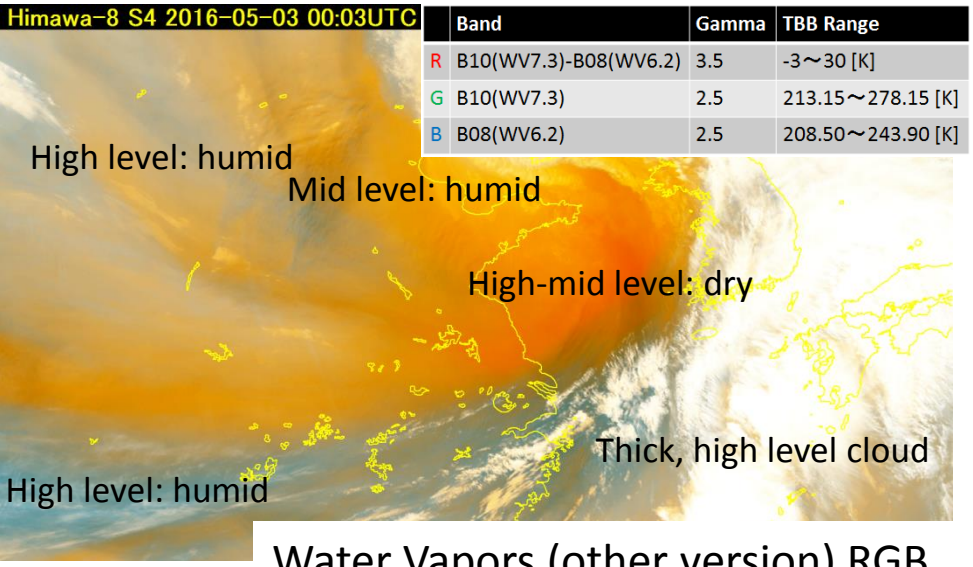
from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA

Part 1: Water Vapor RGBs products compared to Airmass RGB





	Band	Gamma	TBB Range
R	B13(IR10.4)	10	202.29～278.96[K]
G	B08(WV6.2)	5.5	214.66～242.67[K]
B	B10(WV7.3)	5.5	245.12～261.03[K]



	Band	Gamma	TBB Range
R	B10(WV7.3)-B08(WV6.2)	3.5	-3～30 [K]
G	B10(WV7.3)	2.5	213.15～278.15 [K]
B	B08(WV6.2)	2.5	208.50～243.90 [K]

Water Vapors (other version) RGB

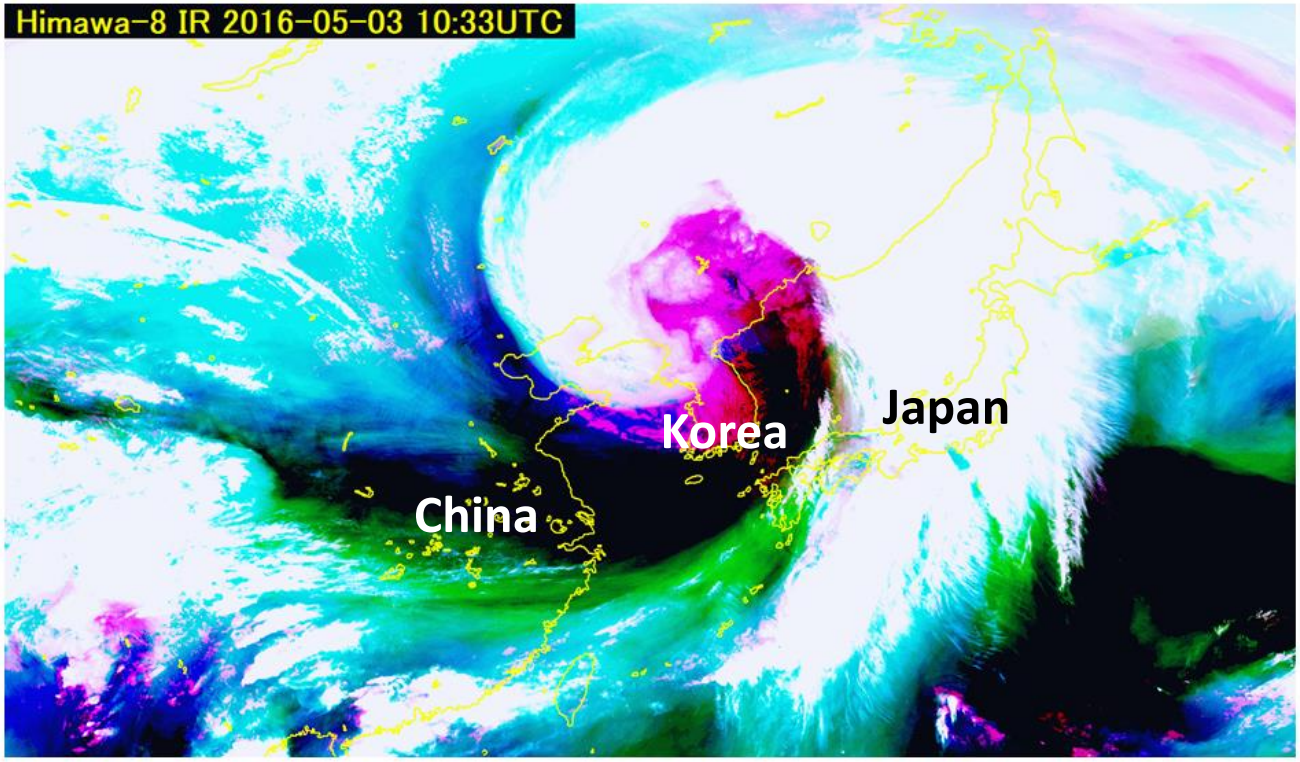
Airmass RGB is useful to grasp the distribution of air masses and the flow of air currents.

But it is difficult to see the water vapor distribution for each vertical level by using Airmass RGB.

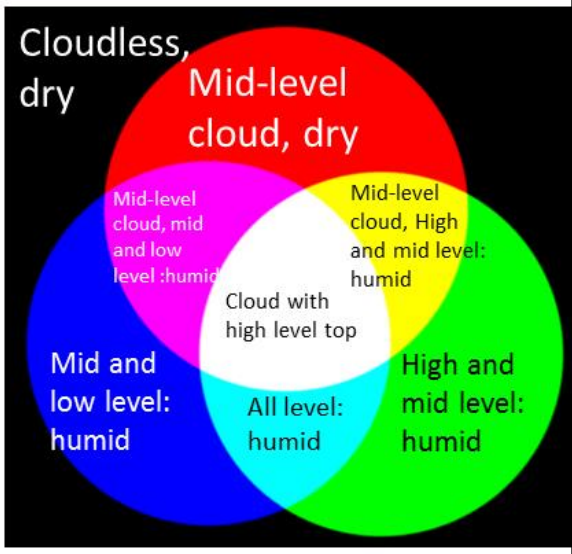
JMA/MSC is going to develop the water vapor RGBs.

Animation 1: Water Vapor RGB version 1, JMA

from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA



Application:
Analysis of water vapor distribution for each level excluding cloud area



	Band	Gamma	TBB Range
R	B13(IR10.4)	10	202.29～278.96[K]
G	B08(WV6.2)	5.5	214.66～242.67[K]
B	B10(WV7.3)	5.5	245.12～261.03[K]

Interpretation (under investigation)

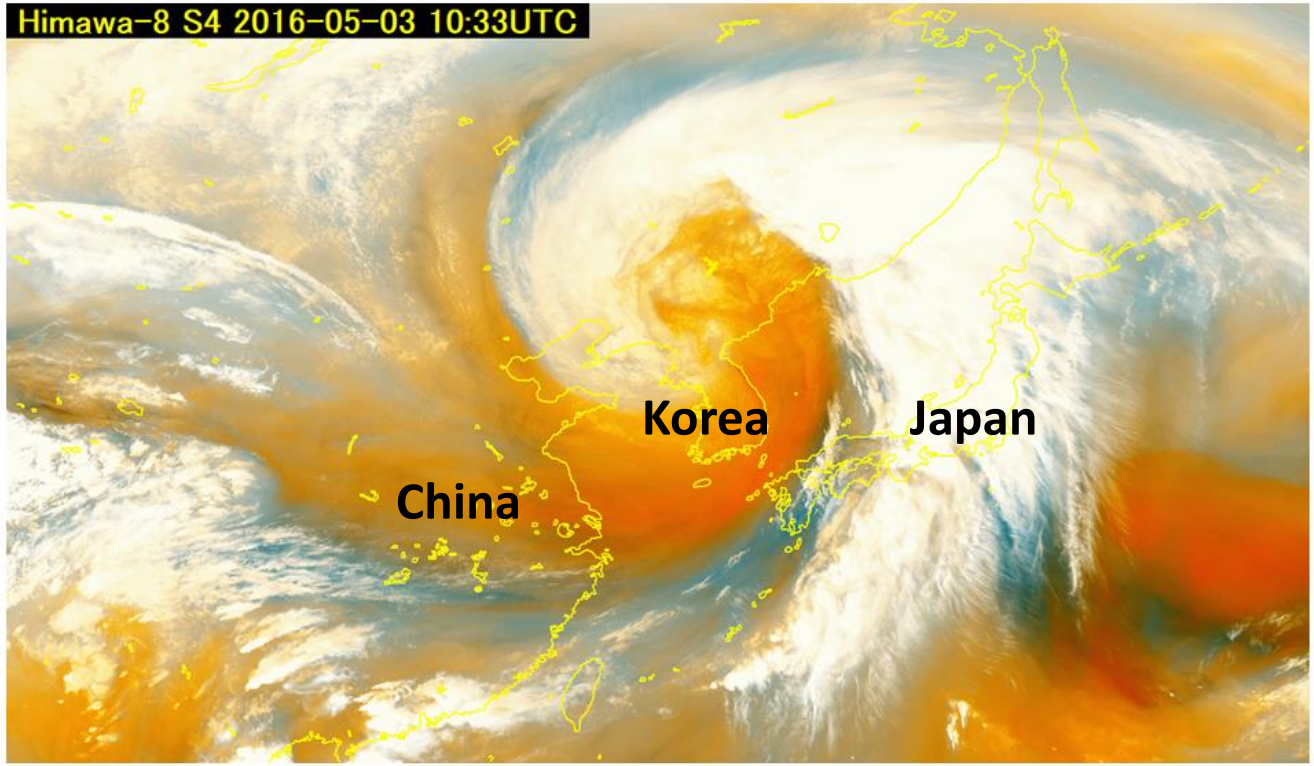
→ Cloud area

→ Upper level water vapor

→ Mid or lower level water vapor

Animation 2: Water Vapor RGB version 2, JMA

from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA



Application:
Analysis of water vapor distribution for high-mid level such as trough, ridge and darkening etc.

Cloud with high level top
High level: humid
High level: dry Mid level: humid
High-mid level: dry

Mid level cloud

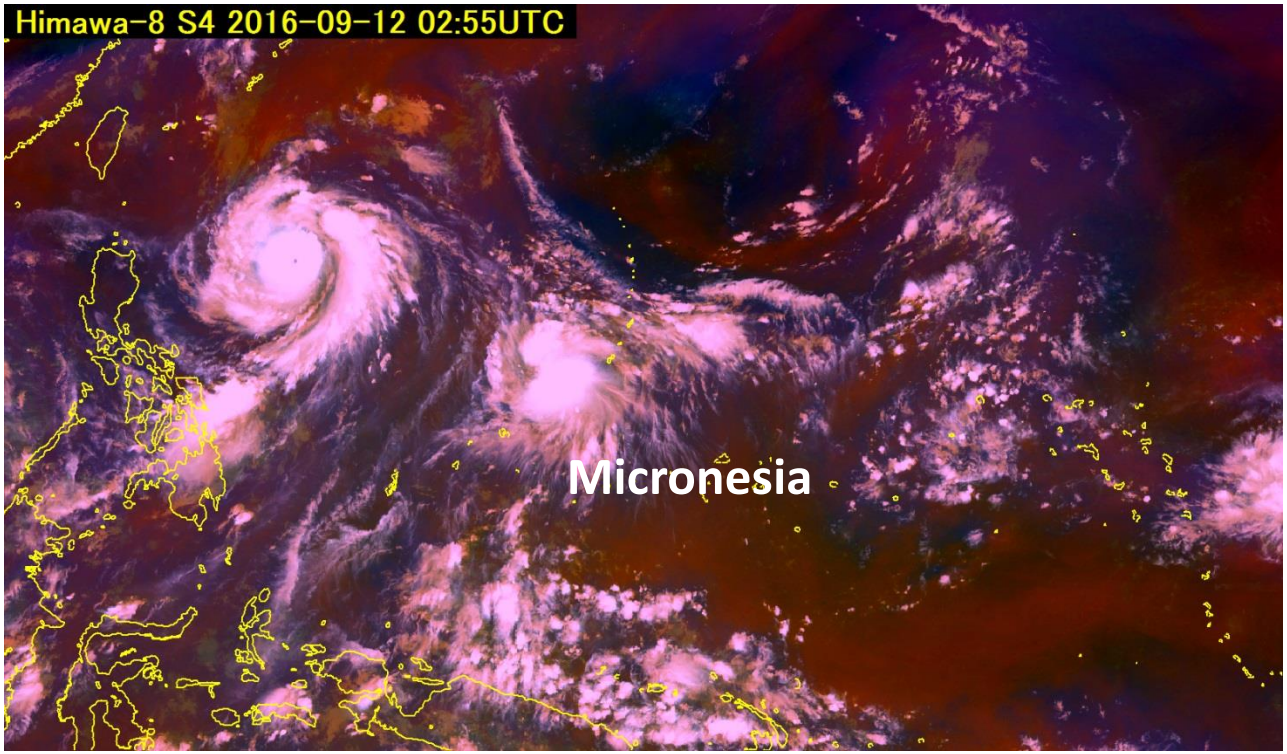
Interpretation
(under investigation)

	Band	Gamma	TBB Range	
R	B10(WV7.3)-B08(WV6.2)	3.5	-3～30 [K]	→ Humid or dry at high-mid level, Thick cloud
G	B10(WV7.3)	2.5	213.15～278.15 [K]	→ Mid level water vapor
B	B08(WV6.2)	2.5	208.50～243.90 [K]	→ High level water vapor

Part 1: Tropical Airmass RGB

Application for AHI/Himawari-8 (based on EUMETSAT article)

http://www.eumetsat.int/website/home/Images/ImageLibrary/DAT_2861499.html



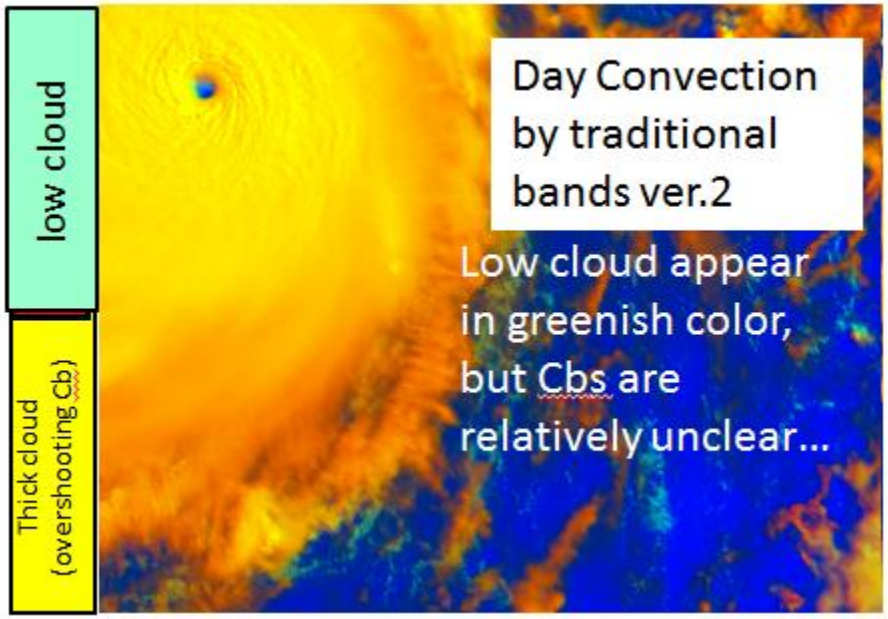
cold, high clouds
(overshooting top)

A part of Interpretation
(under investigation)

	Band	Gamma	TBB/Reflectivity range
R	B10(W3 7.3)-B08(WV6.2)	1.0	0.6～26.2 [K]
G	B13(IR 10.4)-B12(O3 9.6)	1.0	-26.2～27.4[K]
B	B08(WV6.2)	1.0	208.5～243.9 [K]

from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA

Part 2: Variations to the Day Convection RGB product



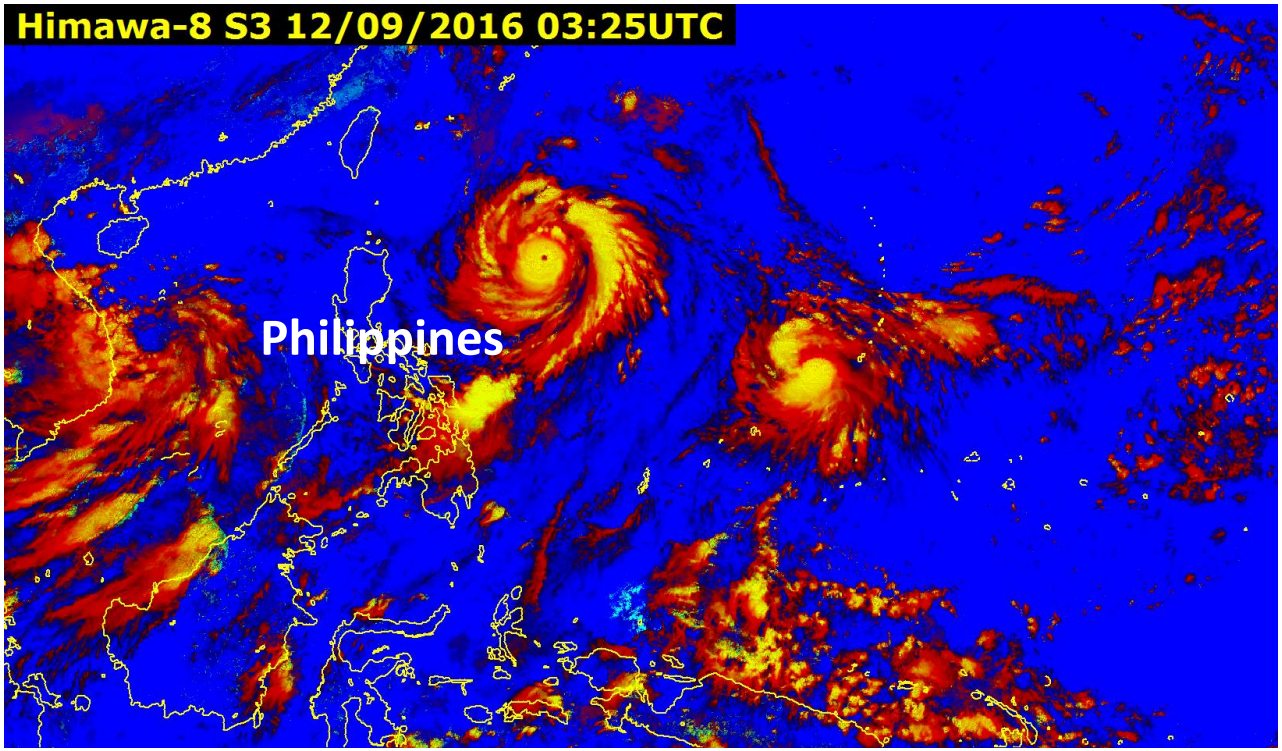
WIS (WMO Information System) users can access only five (traditional) bands (0.64, 3.9, 6.2,10.4, 12.4μm) data (SATAID format).

For the WIS users, the RGB recipes by the five bands have been developed.

from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA

Day Convection version 1

by traditional bands (for WIS users)



Thick cloud, overshooting Cb

Thick cloud

Thin high cloud

Ocean

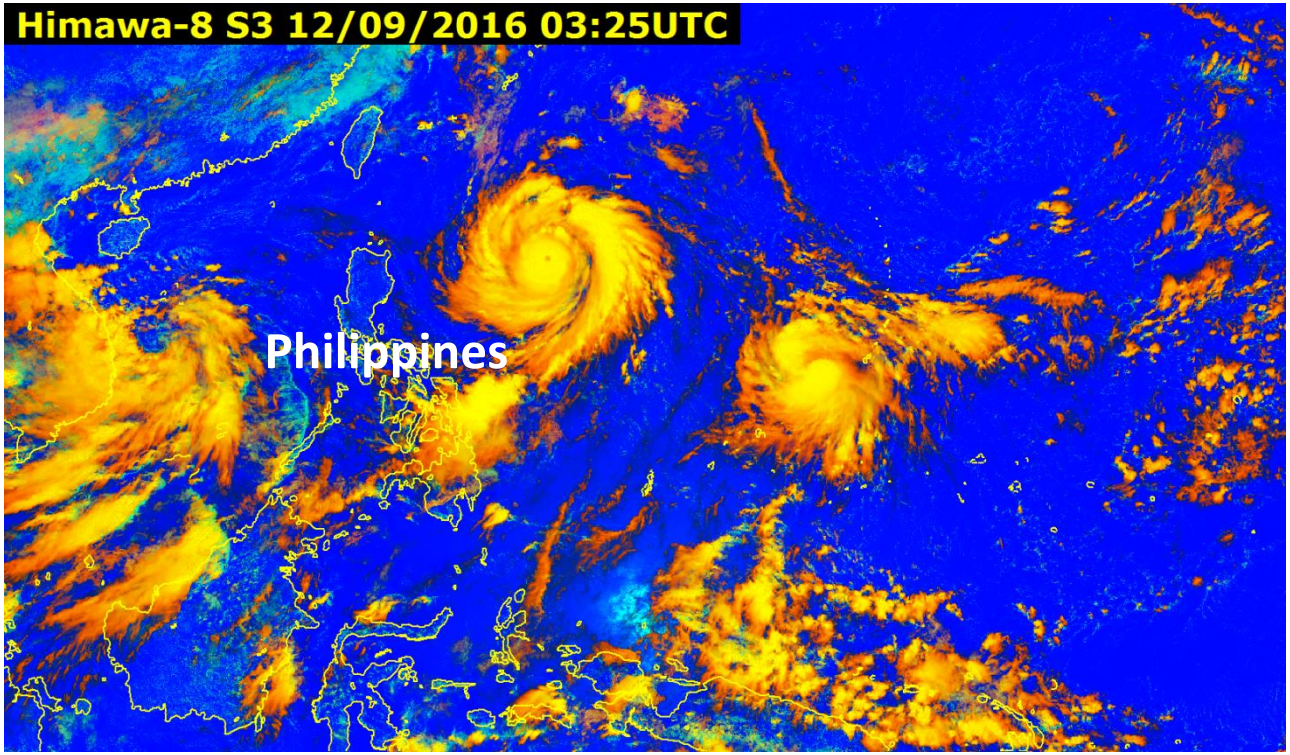
Interpretation
(under investigation)

	Band	Gamma	TBB/Reflectivity range
R	B13(IR 10.4)-B08(WV6.2)	1.0	-5.0～35.0 [K]
G	B03(VS 0.64)	1.0	0.7～1.0
B	B13(IR 10.4)	1.0	243.6～292.6 [K]

from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA

Day Convection version 2

by traditional bands (for WIS users)



Thick cloud (overshooting Cb)

Low cloud

Thin high cloud

Ocean

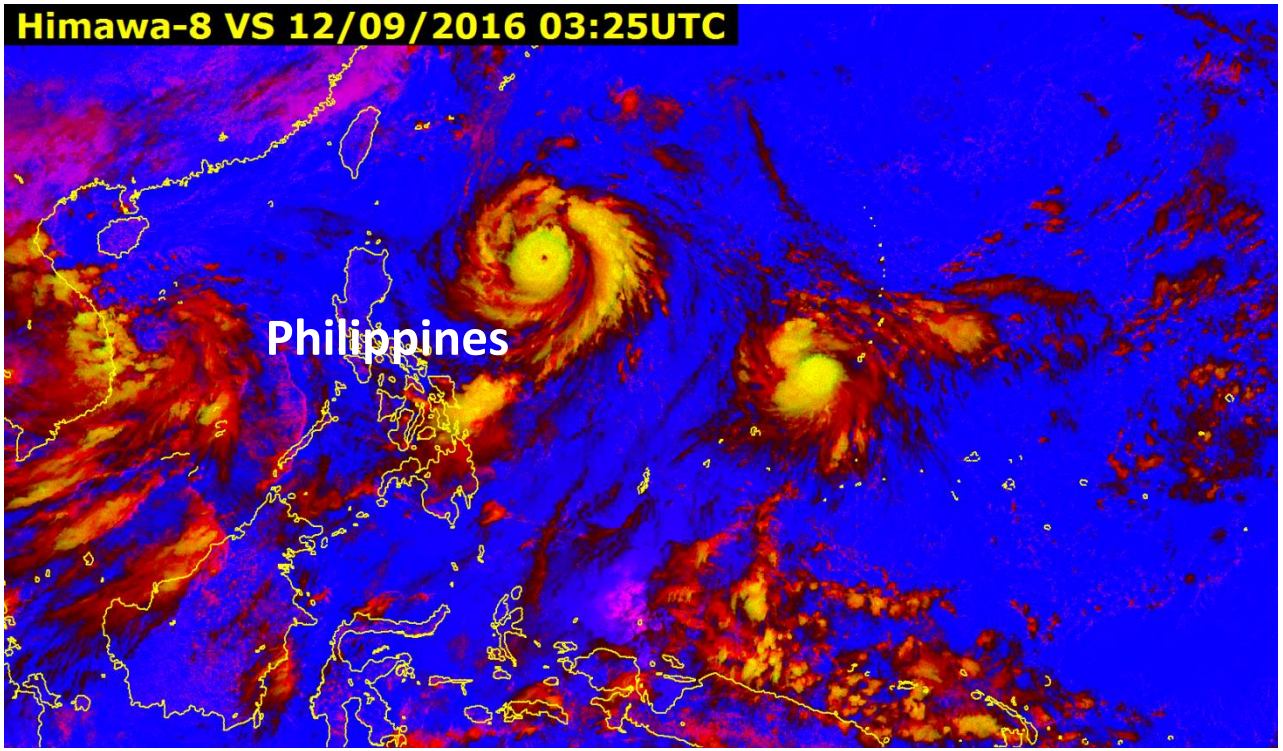
Interpretation (under investigation)

	Band	Gamma	TBB/Reflectivity range
R	B13(IR 10.4)-B08(WV6.2)	2.5	-5.0～40.0 [K]
G	B03(VS 0.64)	1.0	0.0～1.0
B	B13(IR 10.4)	1.0	243.6～292.6 [K]

from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA

Day Convection version 3

by traditional bands (for WIS users)



Thick cloud, overshooting Cb

Thick cloud

Low cloud

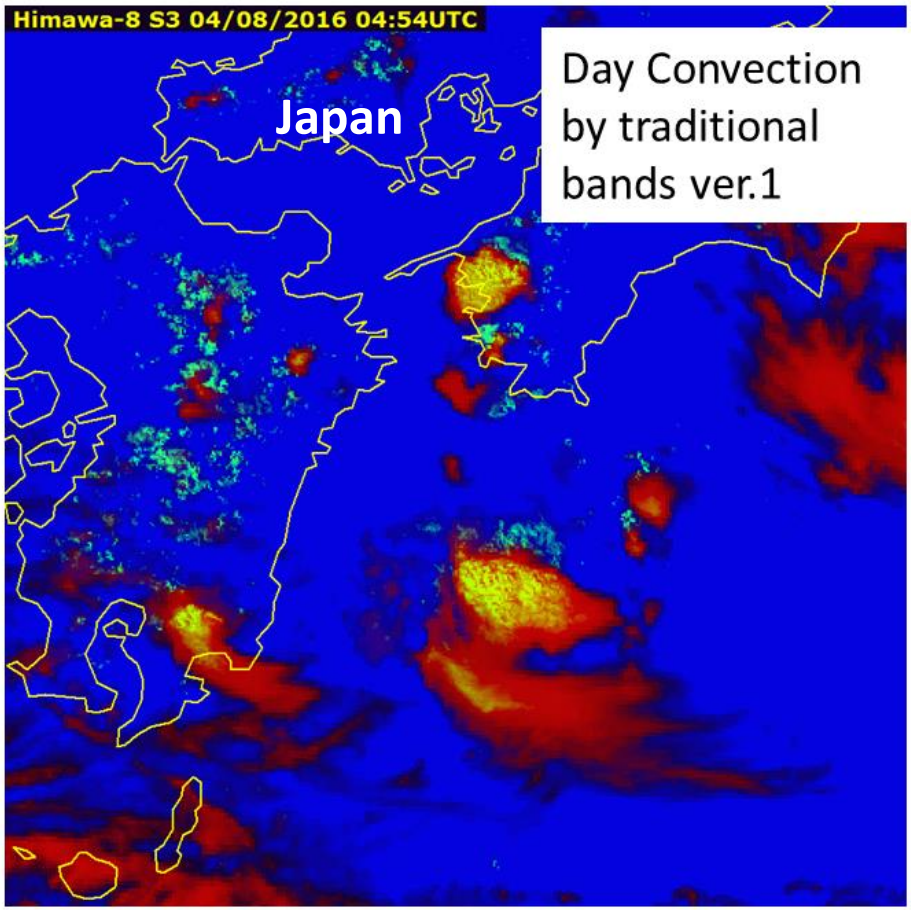
Ocean

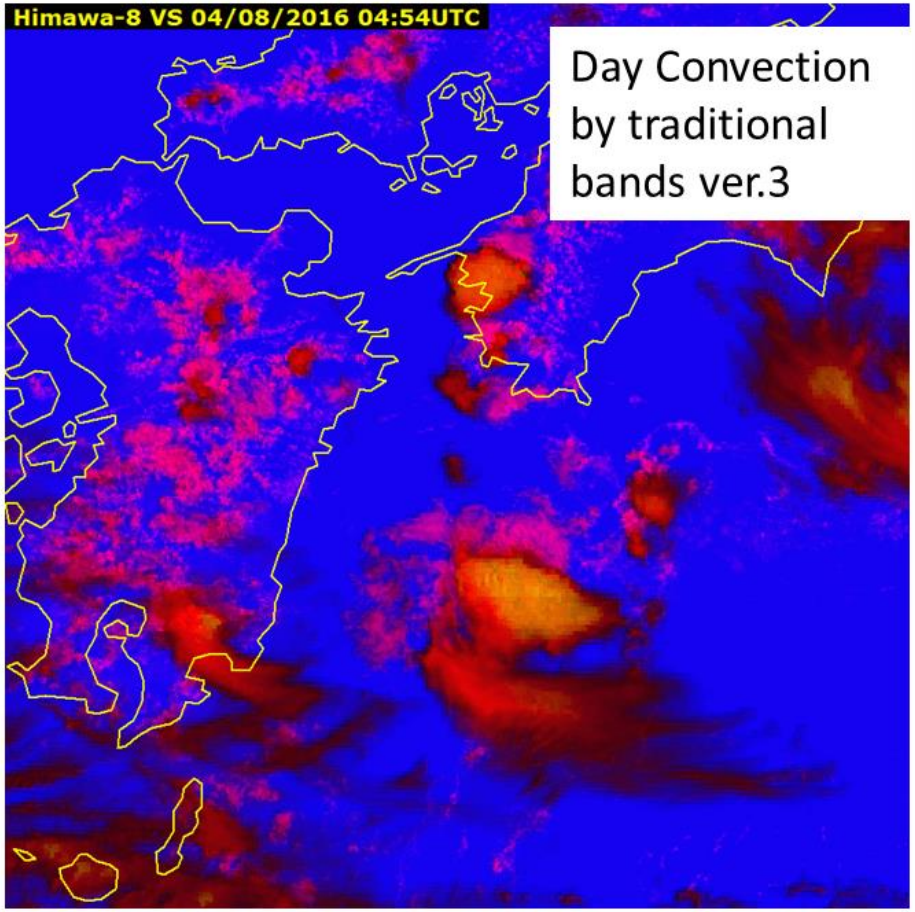
Interpretation
(under investigation)

	Band	Gamma	TBB/Reflectivity range
R	B03(VS 0.64)	1.0	0.0～1.0
G	B13(IR 10.4)-B08(WV6.2)	1.0	0.0～7.0 [K] (mid latitude, summer) -3.0～4.0 [K] (Tropical area)
B	B13(IR 10.4)	1.0	243.6～292.6 [K]

from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA

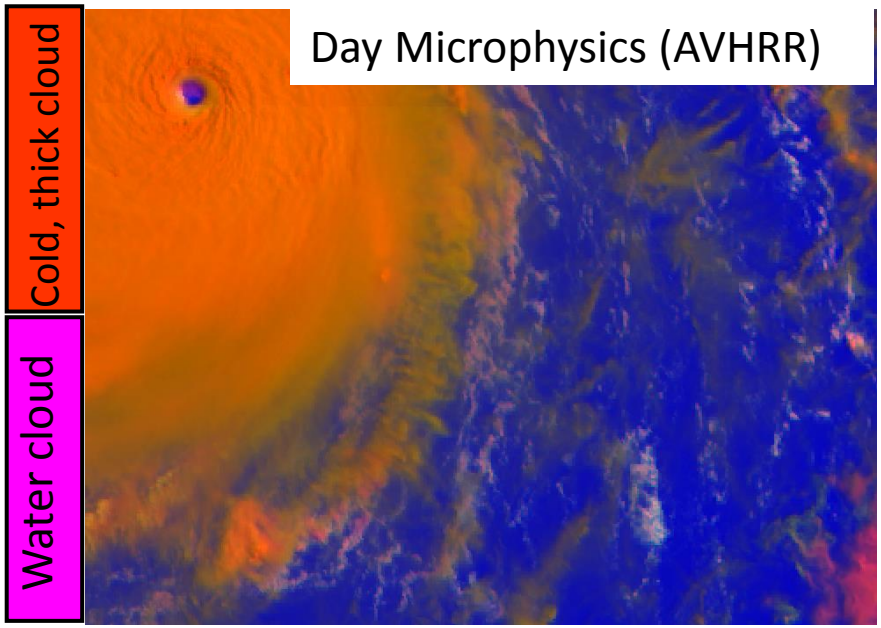
Comparing the Day Convection RGB new versions 1 and 3

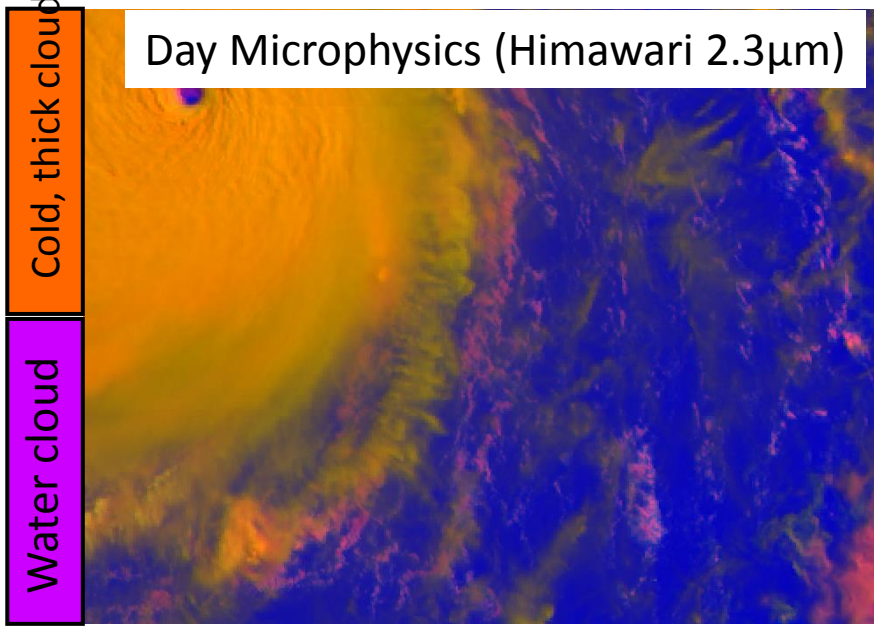


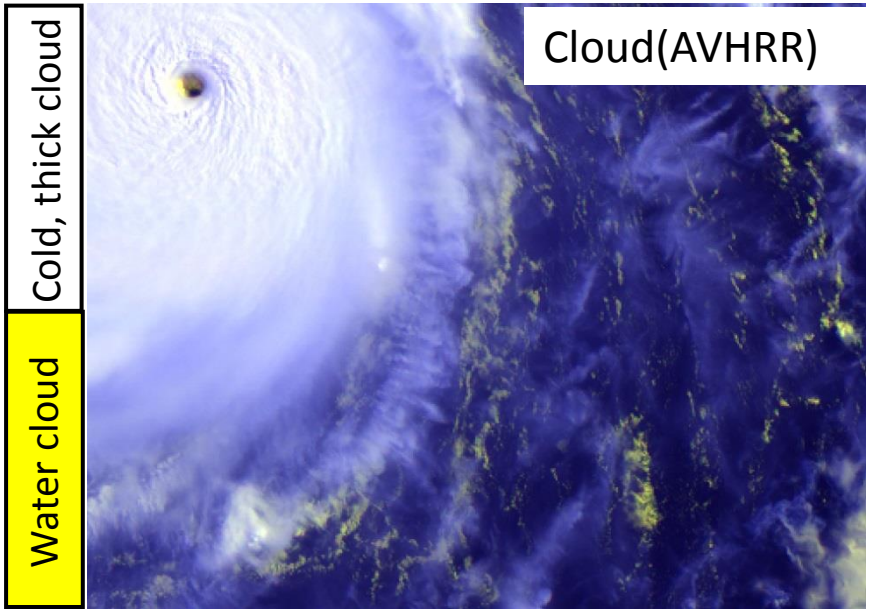


As for Cb detection, Ver.1 looks better than ver.3.
Low clouds are clear on ver.3 image.

Topic 3: Variations to the Day Microphysics RGB product using the 2.3 micron channel







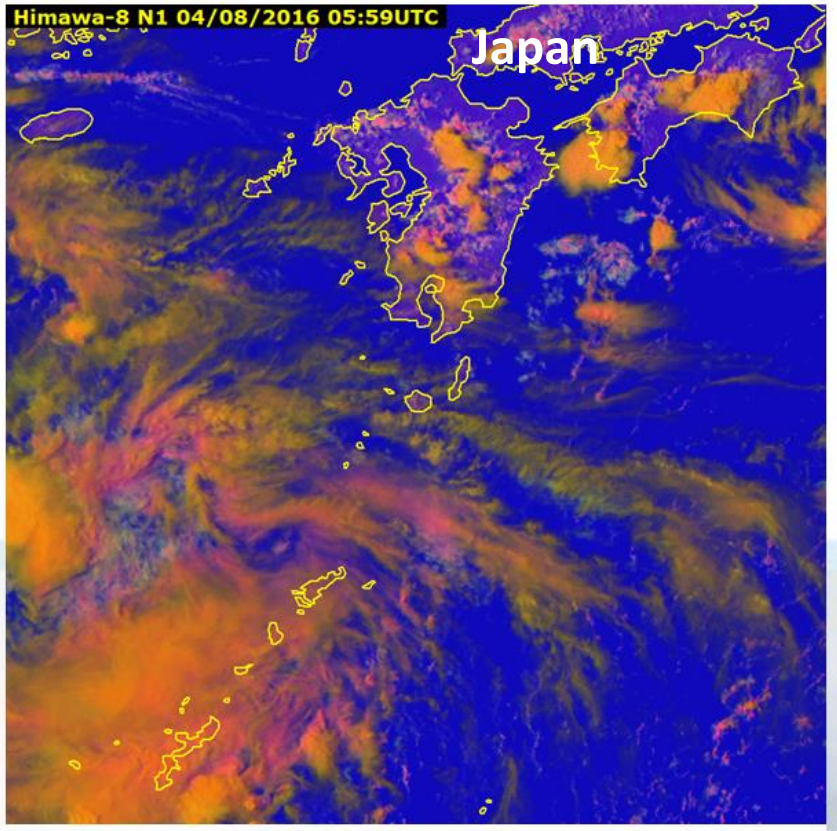
Some useful RGB recipes by MetOp/AVHRR imagery are able to apply to Himawari/AHI imagery.

The recipes don't use reflection component of 3.9 µm, so it will be simple to create RGB composite imagery.

Day Microphysics (Himawari 2.3µm) is similar to Day Microphysics (AVHRR), but it contains 2.3µm instead of 1.6µm.
However, this RGB recipe is under investigation.

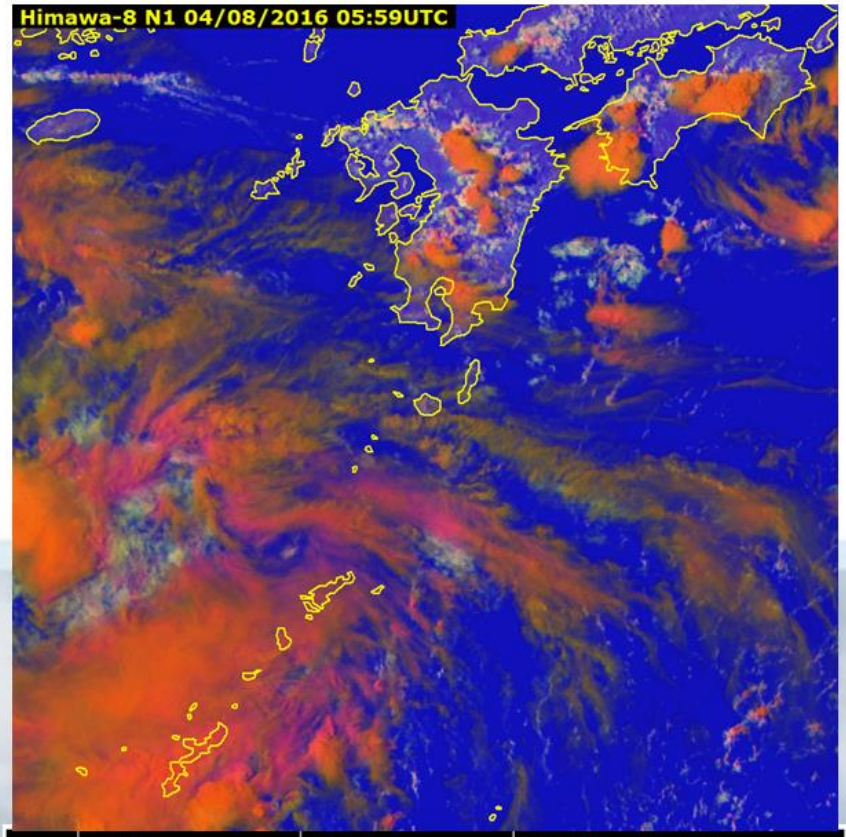
from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA

A: AHI/Himawari-8 (based on EUMETSAT material)



	Band	Gamma	TBB/Reflectivity range
R	B04(N1 0.86)	1.0	0.0～1.0
G	B05(N2 1.6)	1.0	0.0～0.7
B	B13(IR 10.4)	1.0	203.0～323.0 [K]

B: AHI/Himawari-8 (using the 2.3 micron channel)



	Band	Gamma	TBB/Reflectivity range
R	B04(N1 0.86)	1.0	0.0～1.0
G	B06(N3 2.3)	1.0	0.0～0.7
B	B13(IR 10.4)	1.0	203.0～323.0 [K]

Thick, large and cold clouds

Water clouds (thick large droplets)

Water clouds (thick small droplets)

Animation 5: Day Microphysics RGB product

from presentation by JMA

from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA

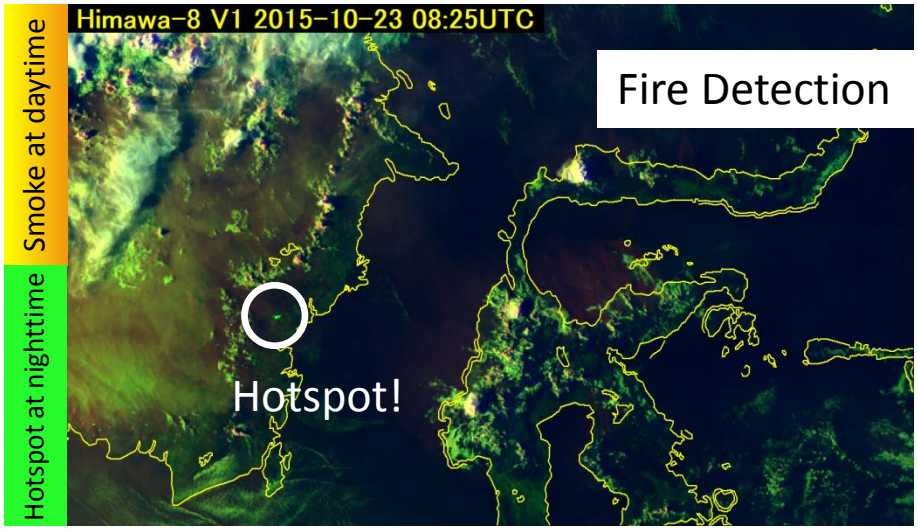
Thick, large and cold clouds

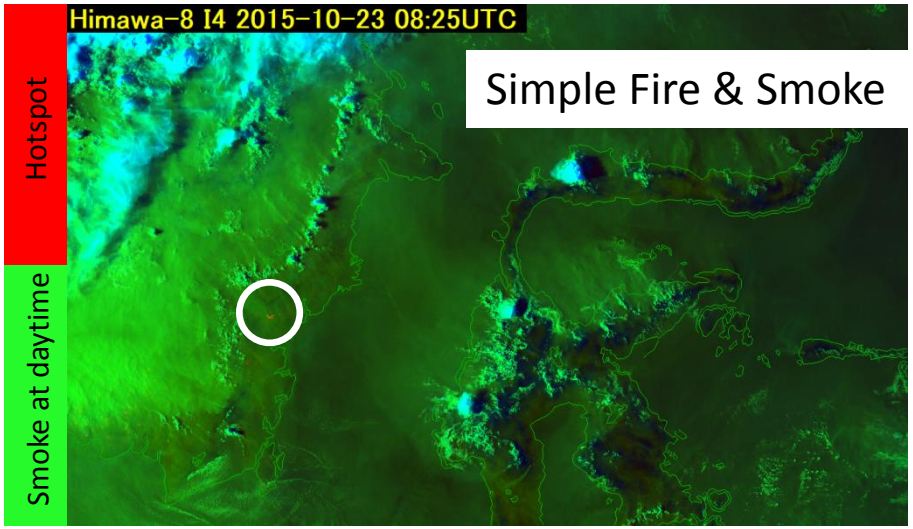
Water clouds (thick large droplets)

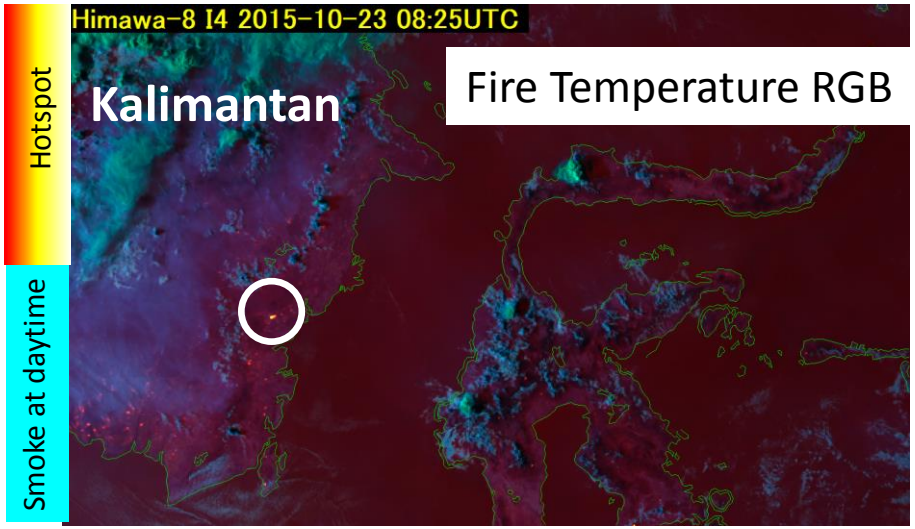
Water clouds (thick small droplets)

from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA

Topic 4: Variations to the new Fire/Smoke RGB products



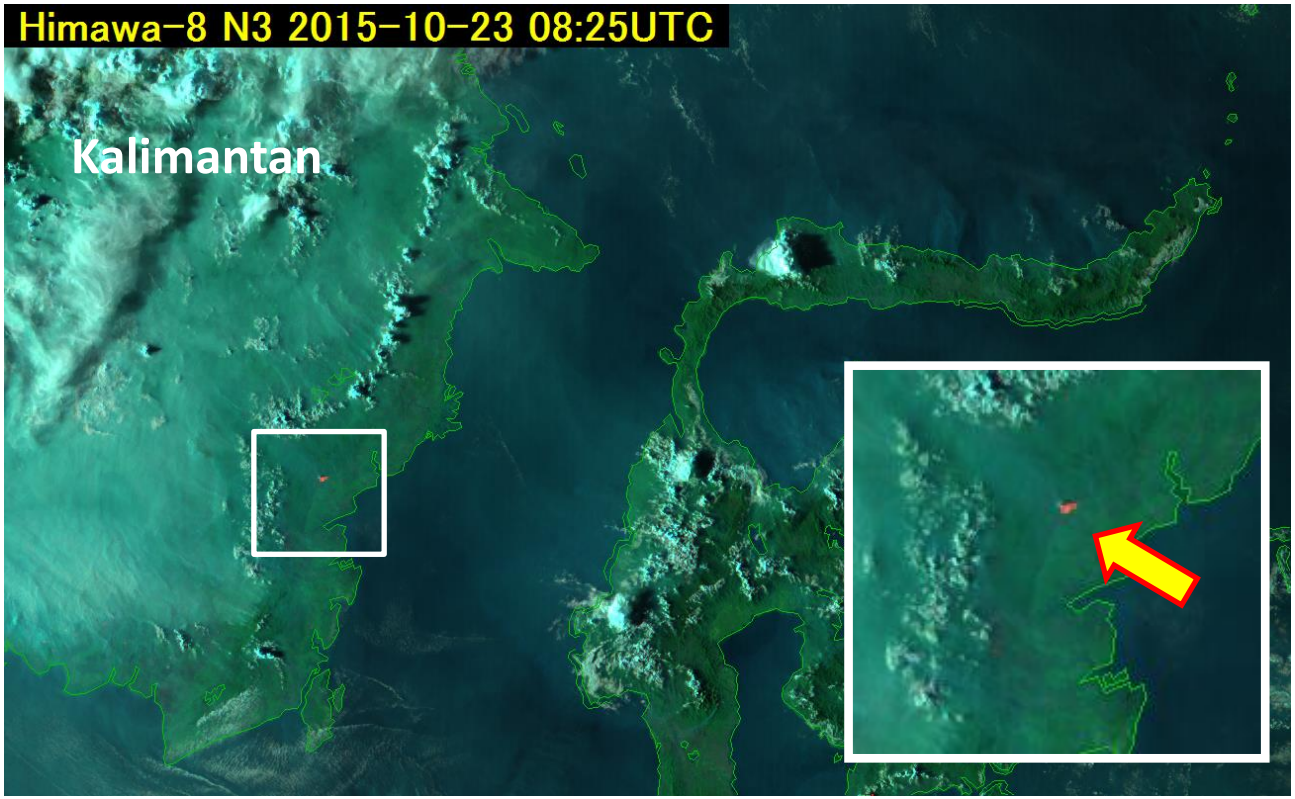




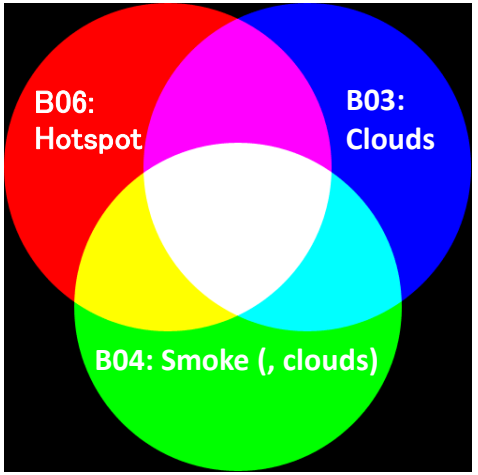
23rd October, 2015 Borneo(Kalimantan) and Sulawesi Isl. Indonesia

from "New recipes of RGB composite images from Himawari-8 developed by JMA", A. Shimizu JMA

CIRA's Natural Fire Color RGB (False color RGB) Application for AHI/Himawari-8 (Reference)



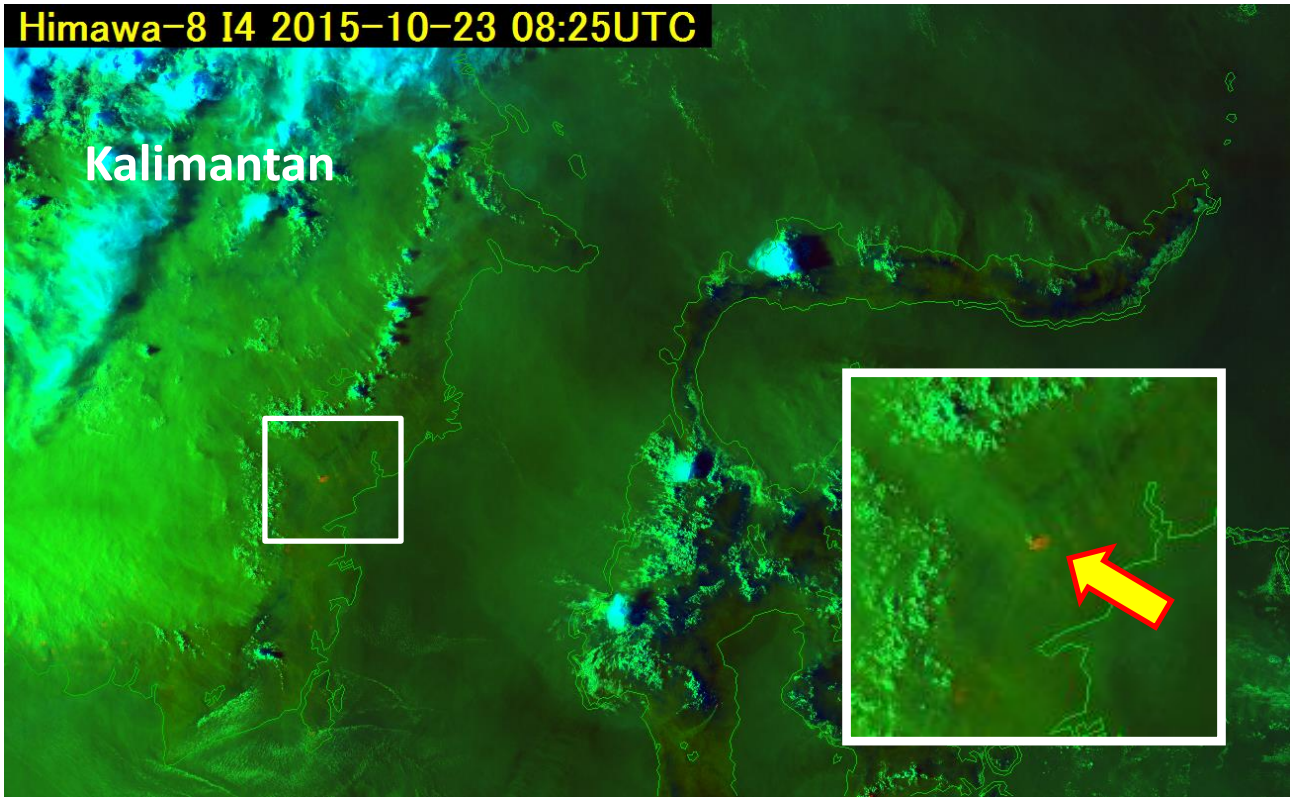
Contribution to RGB Colors



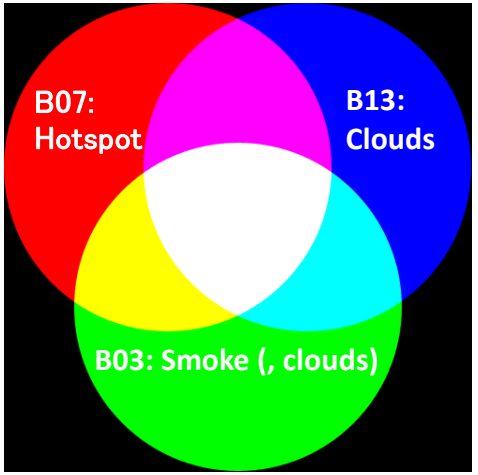
	Band	Gamma	TBB/Reflectivity range
R	B06(N3 2.3)	1.0	0.0～1.0
G	B04(N1 0.86)	1.0	0.0～1.0
B	B03(VS 0.64)	1.0	0.0～1.0

Simple Fire & Smoke RGB

by traditional bands (for WIS users)

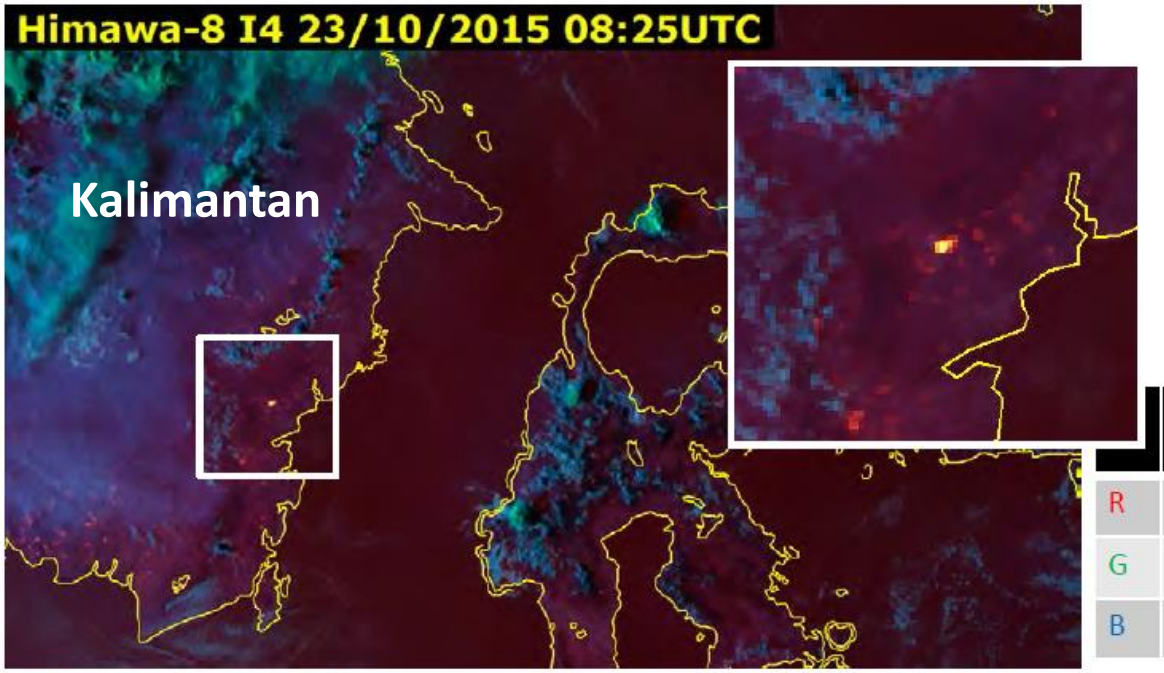


Contribution to RGB Colors



	Band	Gamma	TBB/Reflectivity range	
R	B07(I4 3.9)	1.0	287.02～425.26 [K]	→ Hotspot
G	B03(VS 0.64)	1.0	0.05～0.70	→ Aerosol
B	B13(IR 10.4)	1.0	230.30～302.71 [K]	→ Cloud top

Comparison of Fire Temperature RGBs

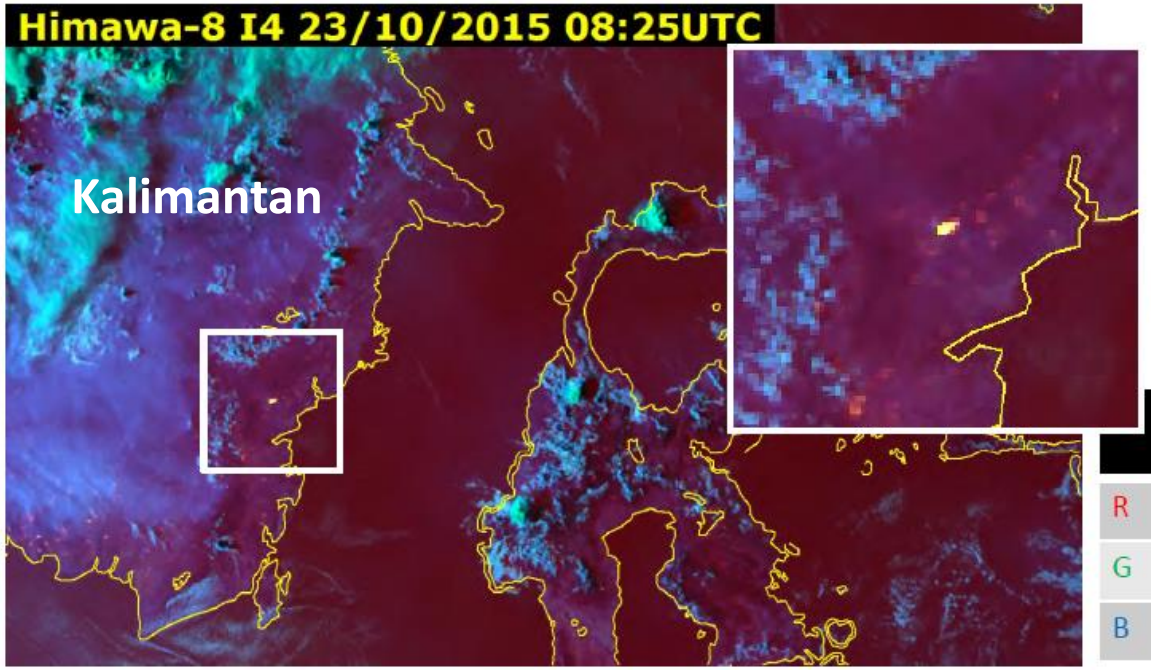


Aki version

	Band	Gamma	TBB/Reflectivity range
R	B07(I4 3.9)	1.0	286.78～345.38 [K]
G	B06(N3 2.3)	1.0	0.0～1.0
B	B05(N2 1.6)	1.0	0.0～1.0

from email correspondence, A.Shimizu, 4 November 2016

Comment from the email: Jochen's version appears to show the smoke from the forest fires more clearly.



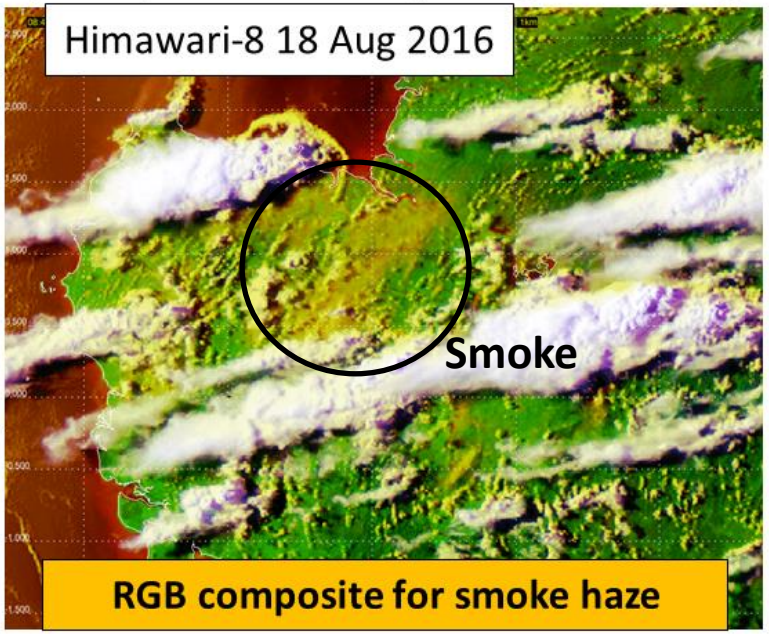
Jochen version

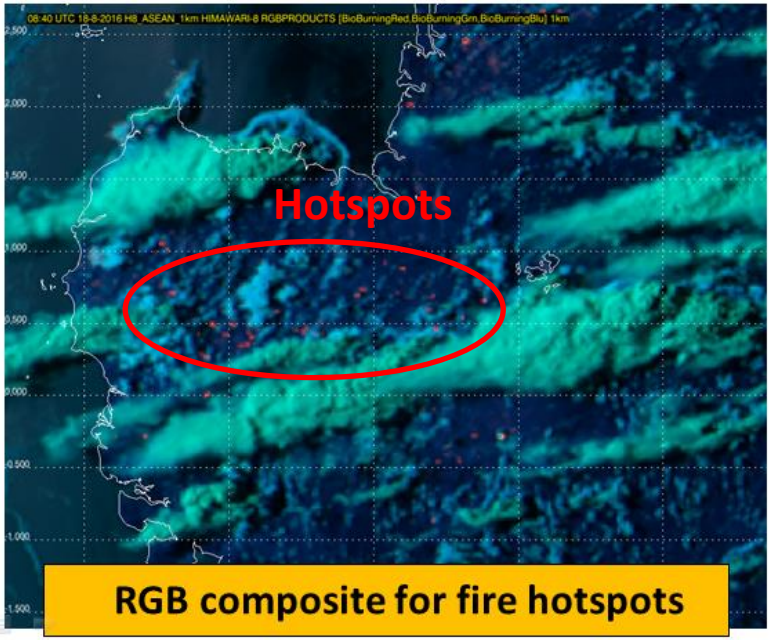
	Band	Gamma	TBB/Reflectivity range
R	B07(I4 3.9)	1.0	273.00～350.00 [K]
G	B06(N3 2.3)	1.0	0.0～0.6
B	B05(N2 1.6)	1.0	0.0～0.6

Tuning of Fire Temperature and Smoke Haze RGB by the National Environmental Agency, Singapore (kindly forwarded by Songhan Wong, NEA)

NEA version of the Smoke Haze RGB*	Range	Gamma
0.64 micron	4 to 90%	1.6
0.86 micron	4 to 90%	1.6
10.4 micron	310 to 230K	1.0

* Small disadvantage, fog looks very similar to smoke in the morning





NEA version of the Fire Temperature RGB	Range	Gamma
3.9 micron	308 to 320K	1.0
2.3 micron	0 to 100% (could try 0-80%)	1.6*
1.6 micron	0 to 100% (could try 0-80%)	1.6

* Not required if you do solar zenith correction angle

Principal Reference

Meteorological Satellite Center (MSC) of JMA

New recipes of RGB composite images from Himawari-8 developed by JMA

-Introduction of Experimental New RGBs by Himawari-8/AHI-

Meteorological Satellite Center
Japan Meteorological Agency

Akihiro SHIMIZU

2016 EUMETSAT METEOROLOGICAL SATELLITE CONFERENCE
26 - 30 September 2016, Darmstadt, Germany