RSMC Tokyo for Nowcasting

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Seventh WMO International Workshop on Monsoons (IWM-7)

ONLINE TRAINING WORKSHOP ON

SUBSEASONAL TO SEASONAL (S2S) PREDICTION OF MONSOONS

1-12 NOVEMBER 2021

What is RSMC for Nowcasing

Centres conducting nowcasting shall:

(a) Operate a system, including a web-based or generic graphical service, describing in real time or near-real time the current state of the weather in detail and the prediction of its changes for several hours ahead over their area of interest or parts of that area;

(b) Provide access to this service to National Meteorological and Hydrological Services (NMHSs) whose operational warning services may benefit from it;

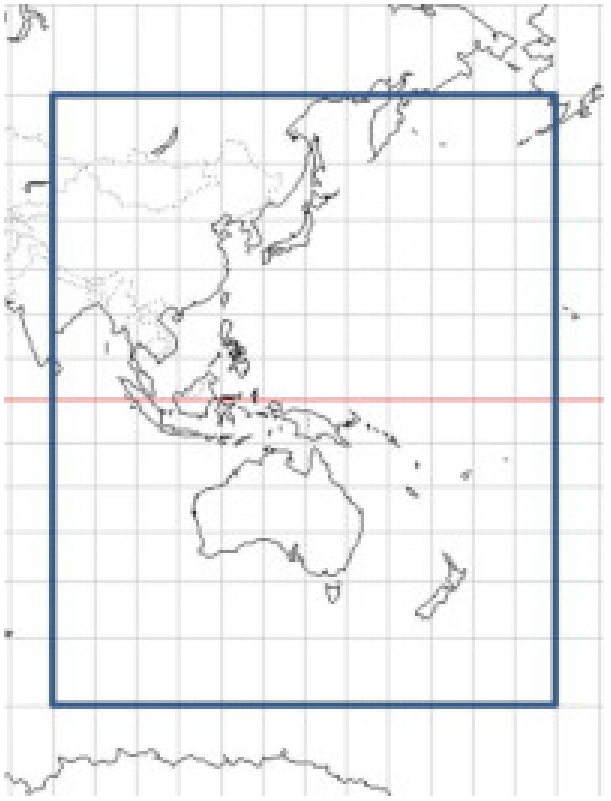
(c) Prepare verification statistics and evaluations of the system

(d) Make available on a website up-to-date information on the characteristics of their systems

RSMC Tokyo for Nowcasing

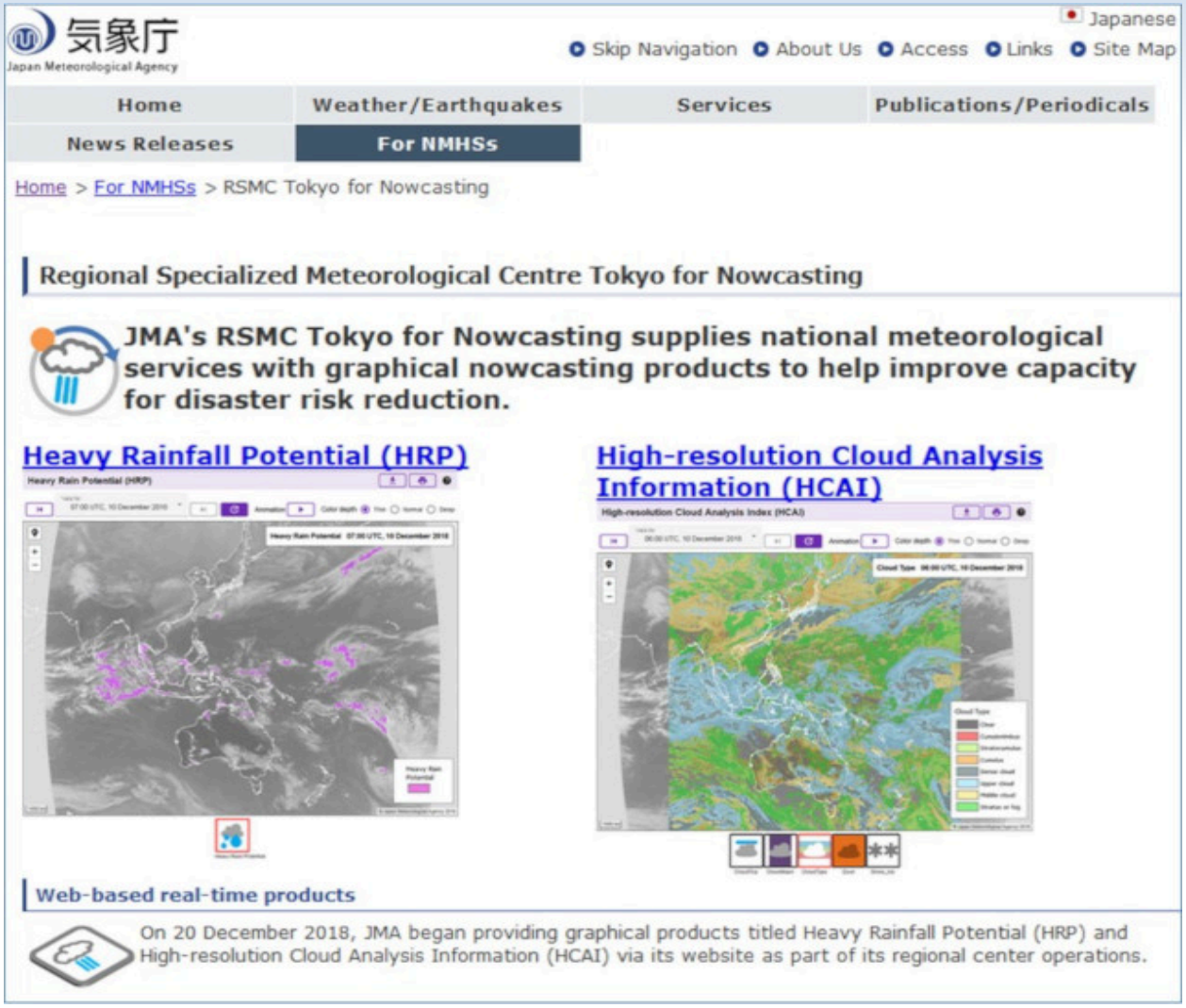
RSMC Tokyo for Nowcasting:

- was designated by WMO at the 69th session of its Executive Council (Geneva, May 2017);
- began its operation establishing the website (https://www.jma.go.jp/jma/jma-eng/jma-center/nowcasting/) on 20 December 2018;
- supplies NMHSs in the Asia and Pacific regions with graphical nowcasting products for improving capacity for disaster risk reduction;
- initially provides two Himawari satellite products titled Heavy Rainfall Potential (HRP) (every 10 minutes) and High-resolution Cloud Analysis Information (HCAI) (every 1 hour), respectively.
- These products cover the area of 60° N – 60° S and 80° E – 160° W.



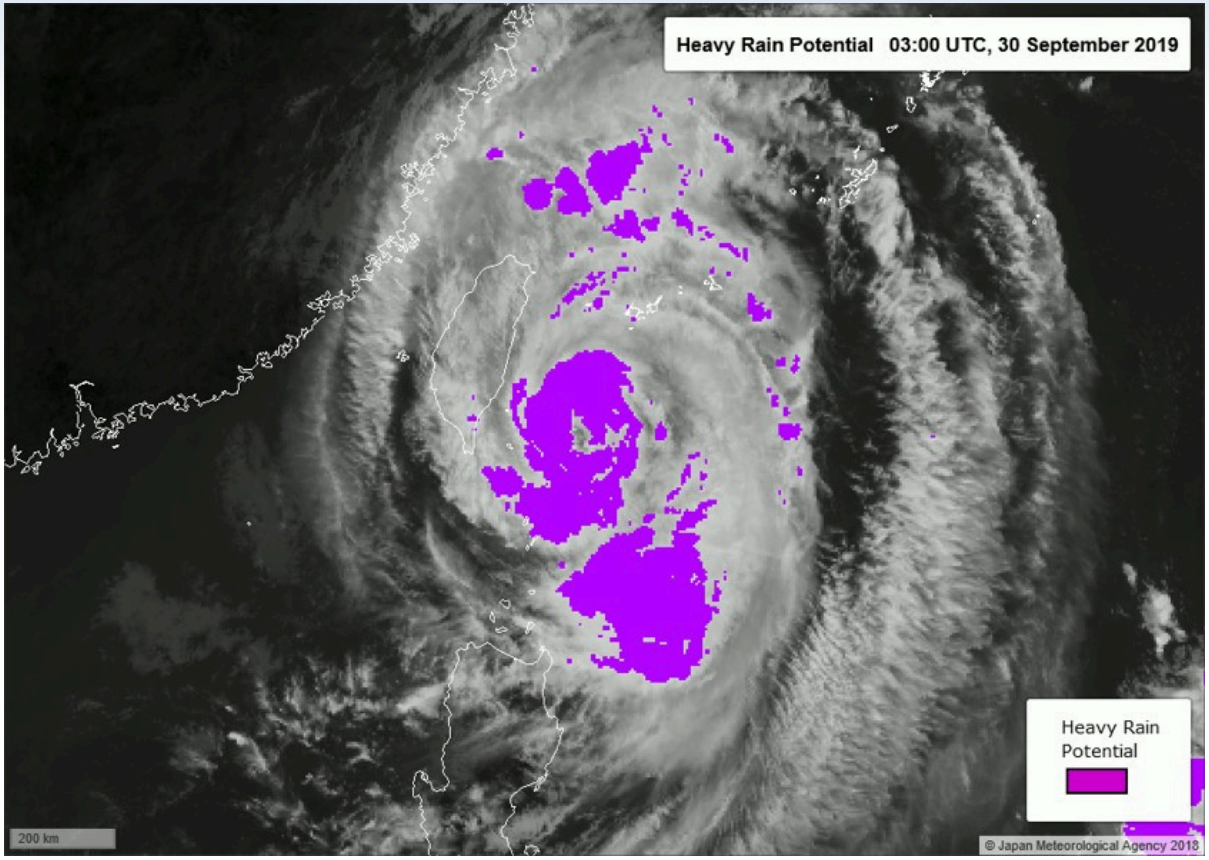
Cover area

RSMC Tokyo for Nowcasting website



https://www.jma.go.jp/jma/jma-eng/jma-center/nowcasting/

Example of Heavy Rainfall Potential (HRP)



TY 1918 (Mitag)
03:00UTC, 30 Sep. 2019

Heavy Rainfall Potential (HRP)

- Focusing on deep convective clouds that may cause heavy rainfall (20mm/hr or more).
  - Target rainfall data is GSMaP produced by JAXA

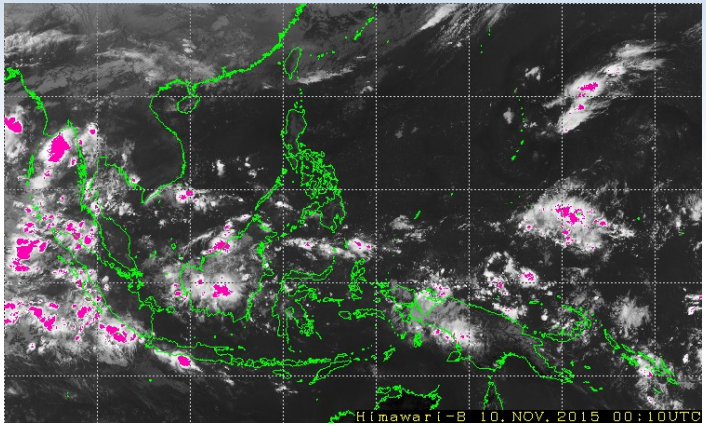
- 3 Brightness Temperature of Himawari-8/9 are used.
  - B08: 6.2 µm
  - B13: 10.4 µm
  - B15: 12.3 µm

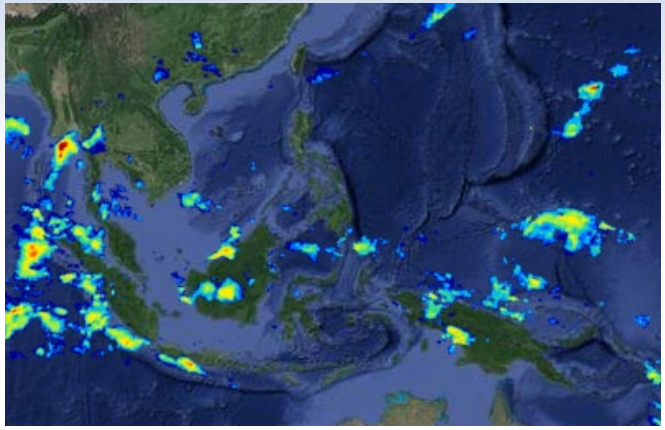
- Updated every 10 minutes.

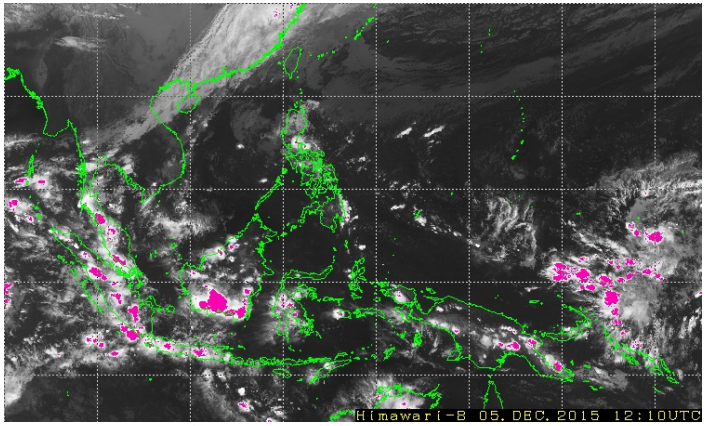
- This product means “potential” area, so doesn’t always correspond to areas of actual rainfall.

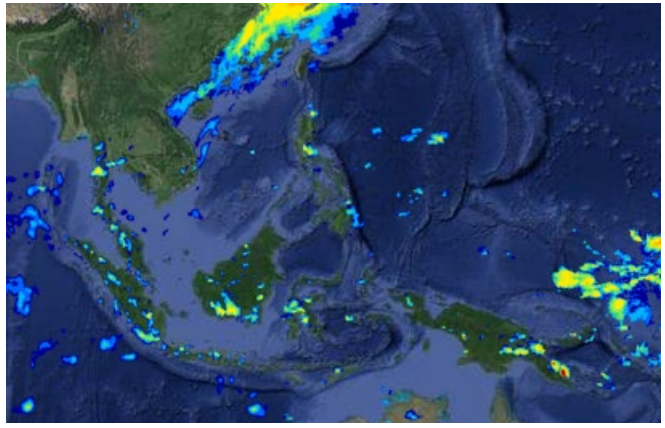
For more information, refer to Users’ Guide to Imagery Heavy Rainfall Potential Areas (https://www.data.jma.go.jp/mscweb/data/himawari/Users_Guide.pdf).

Roughly they look consistent, but not perfect



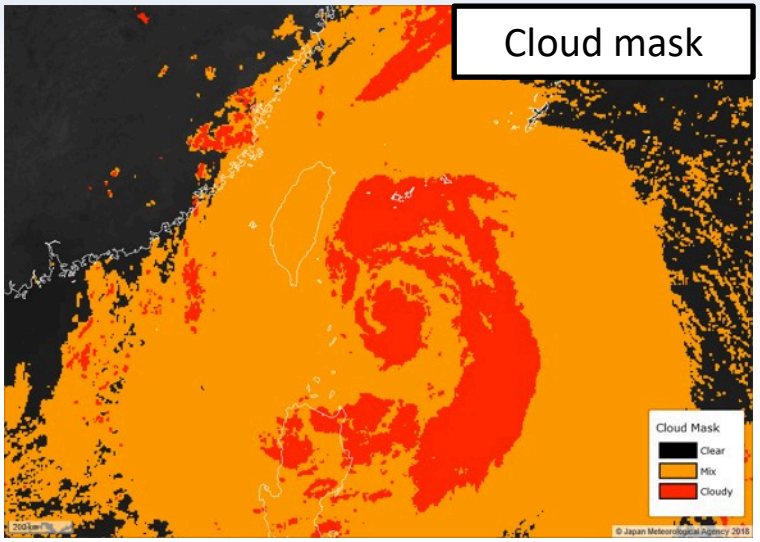


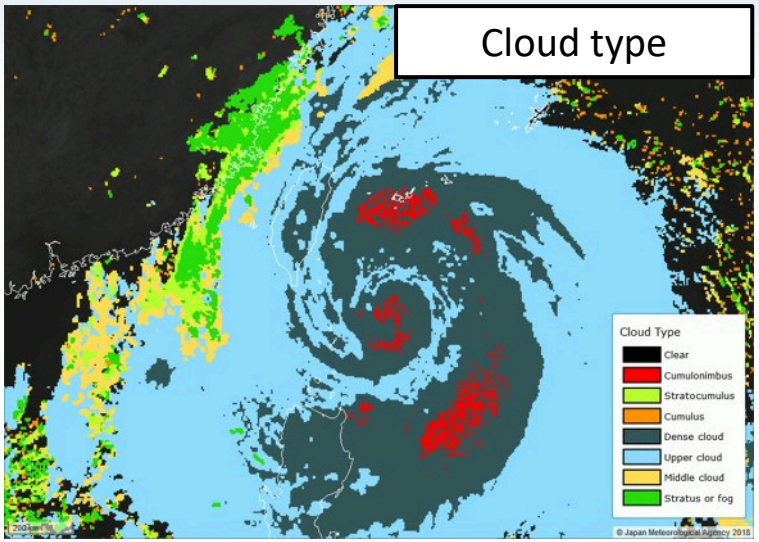


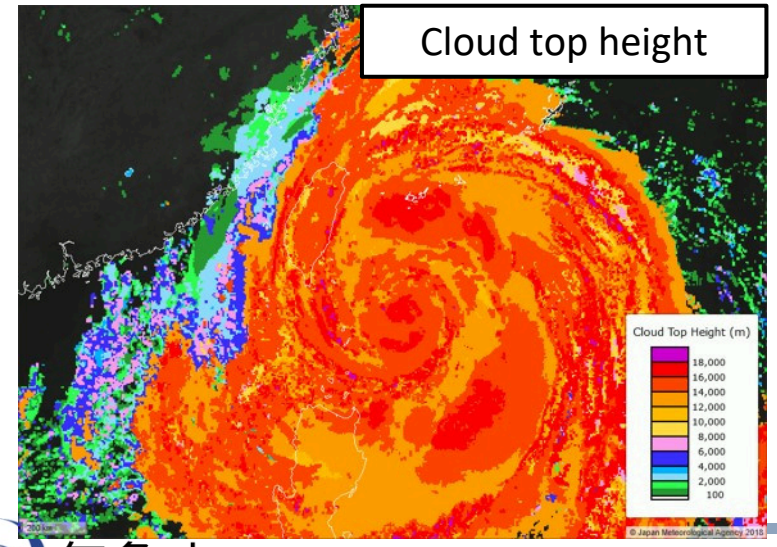


- The imagery is optimized for areas with less than 20mm/h on GSMaP to minimize “missing cases”.

Example of High-resolution Cloud Analysis Information (HCAI)







TY 1918 (Mitag)
19:00 UTC, 29 Sep. - 07:00 UTC, 30 Sep. 2019

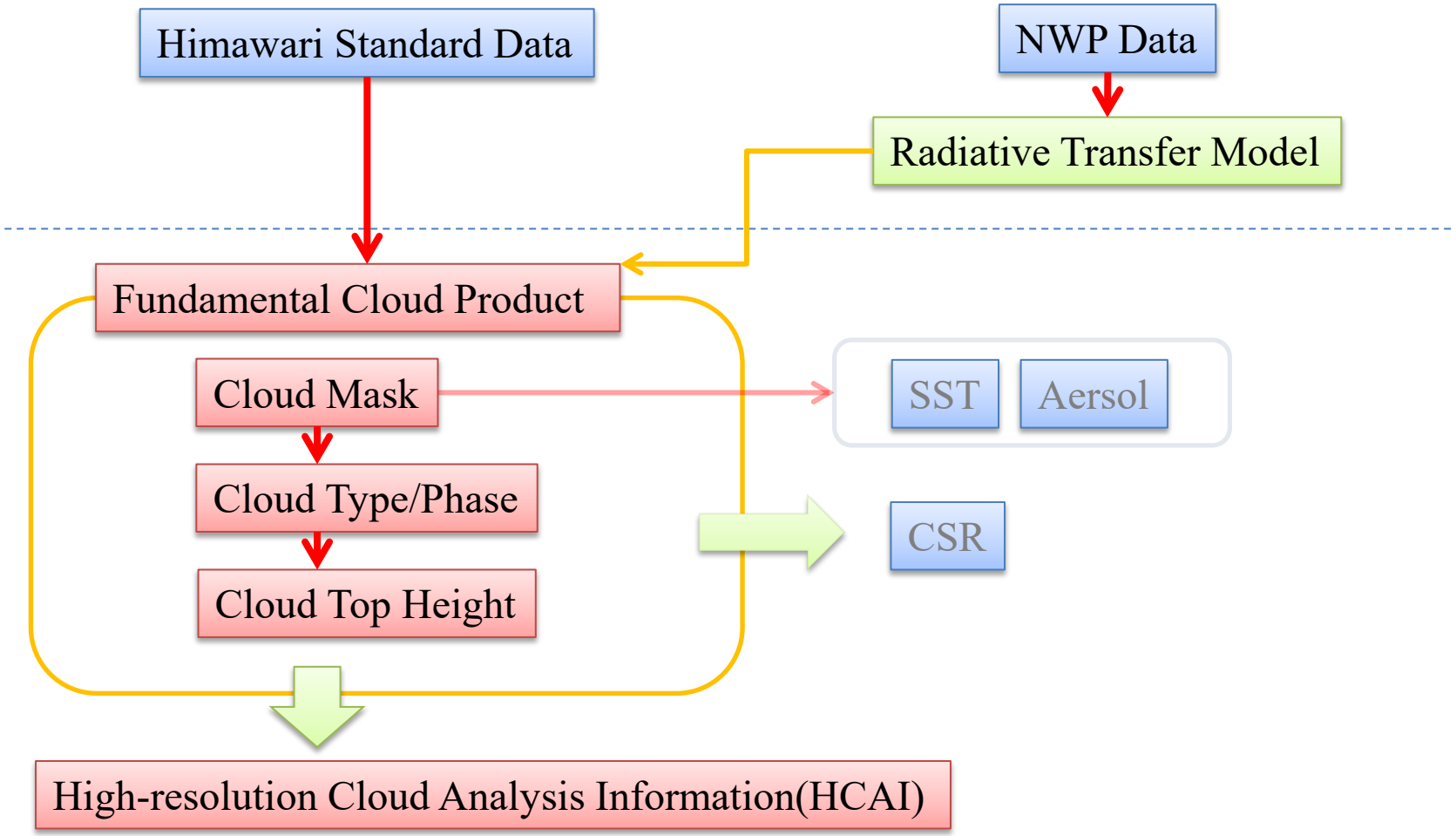
High-resolution Cloud Analysis Information (HCAI)

- 5 elements
  - cloud top height
  - cloud mask
  - cloud type
  - dust mask
  - snow/ice mask

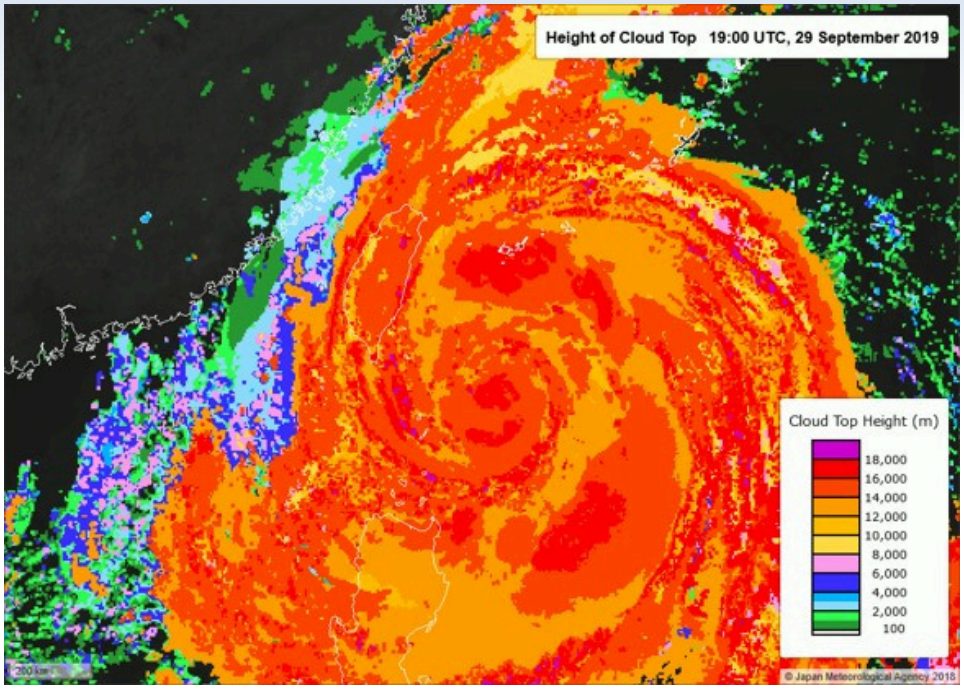
- Update every hour

For more information, refer to HCAI specifications
https://www.data.jma.go.jp/mscweb/en/product/product_HCAI.html

Process flow of Himawari Products



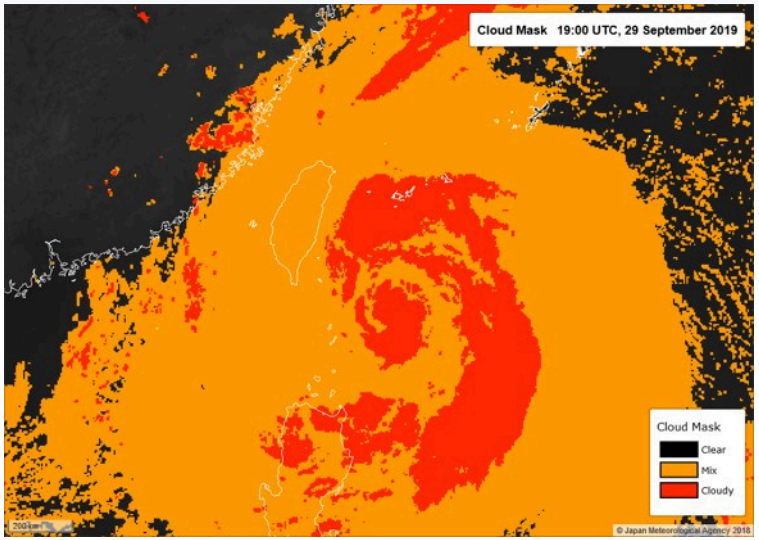
Cloud Top Height



- The Algorithm is almost as same as ABI Cloud Height Algorithm (ACHA) published by NOAA/NESDIS.

- JMA/MSC originally extended 1 layer cloud model to 2 layer cloud model.

Algorithm of cloud mask



Observed value to use for a comparison

Temperature, Reflectance, Emissivity,
Cloud Transmittance, Atmospheric Transmittance

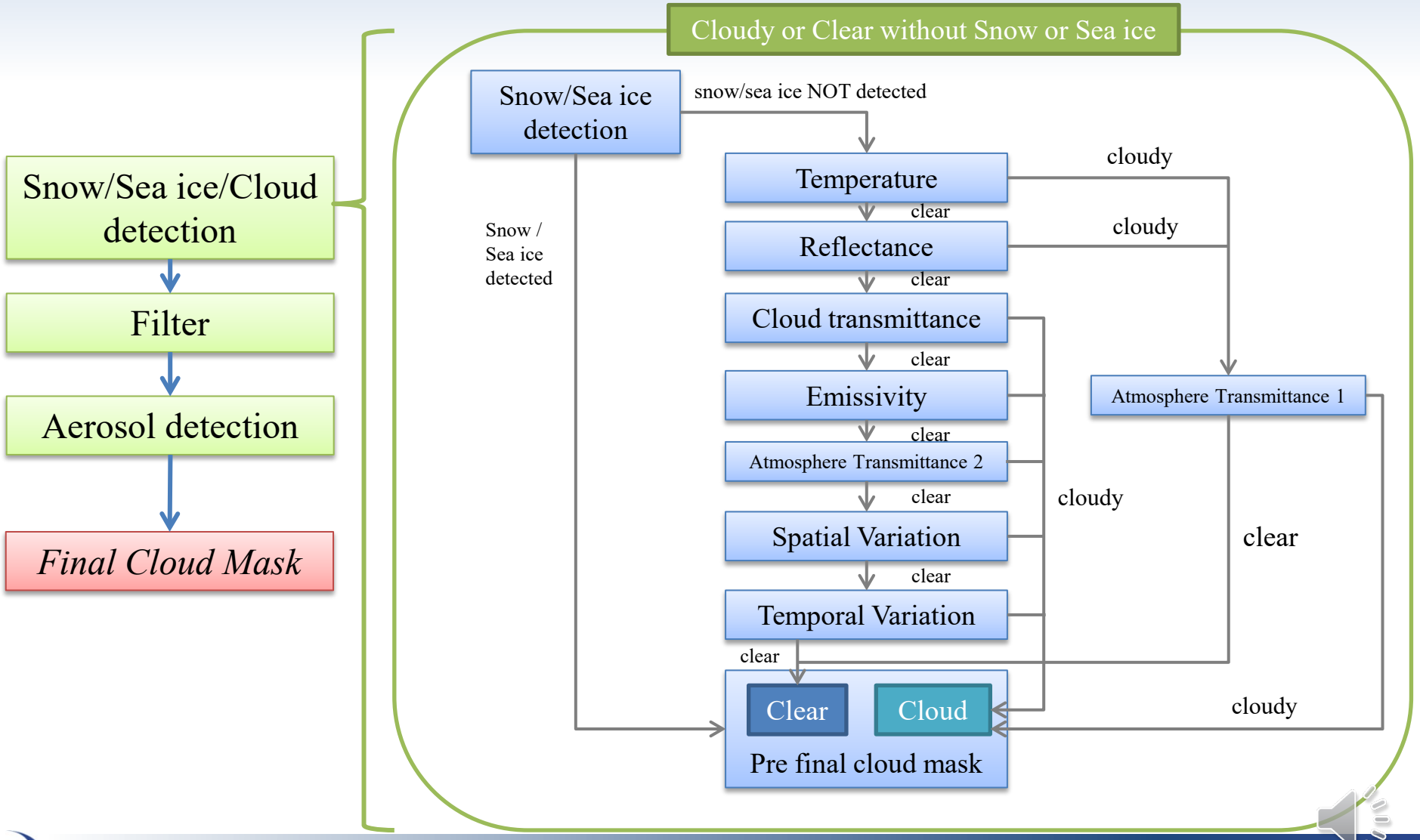
comparison

Threshold value with clear conditions

Calculation result of Radiative transfer model
Climate value, empirical

- Comparing an observed value to a threshold value with clear sky conditions
  - There is a different between an observed value and a threshold value (clear sky) ⇒ Cloudy

Cloud Mask Flow Chart



Cloud Type/Phase
of Fundamental Cloud Product

- The Algorithm is as same as ABI Cloud Type/Phase Algorithm (ACTA) published by NOAA/NESDIS.

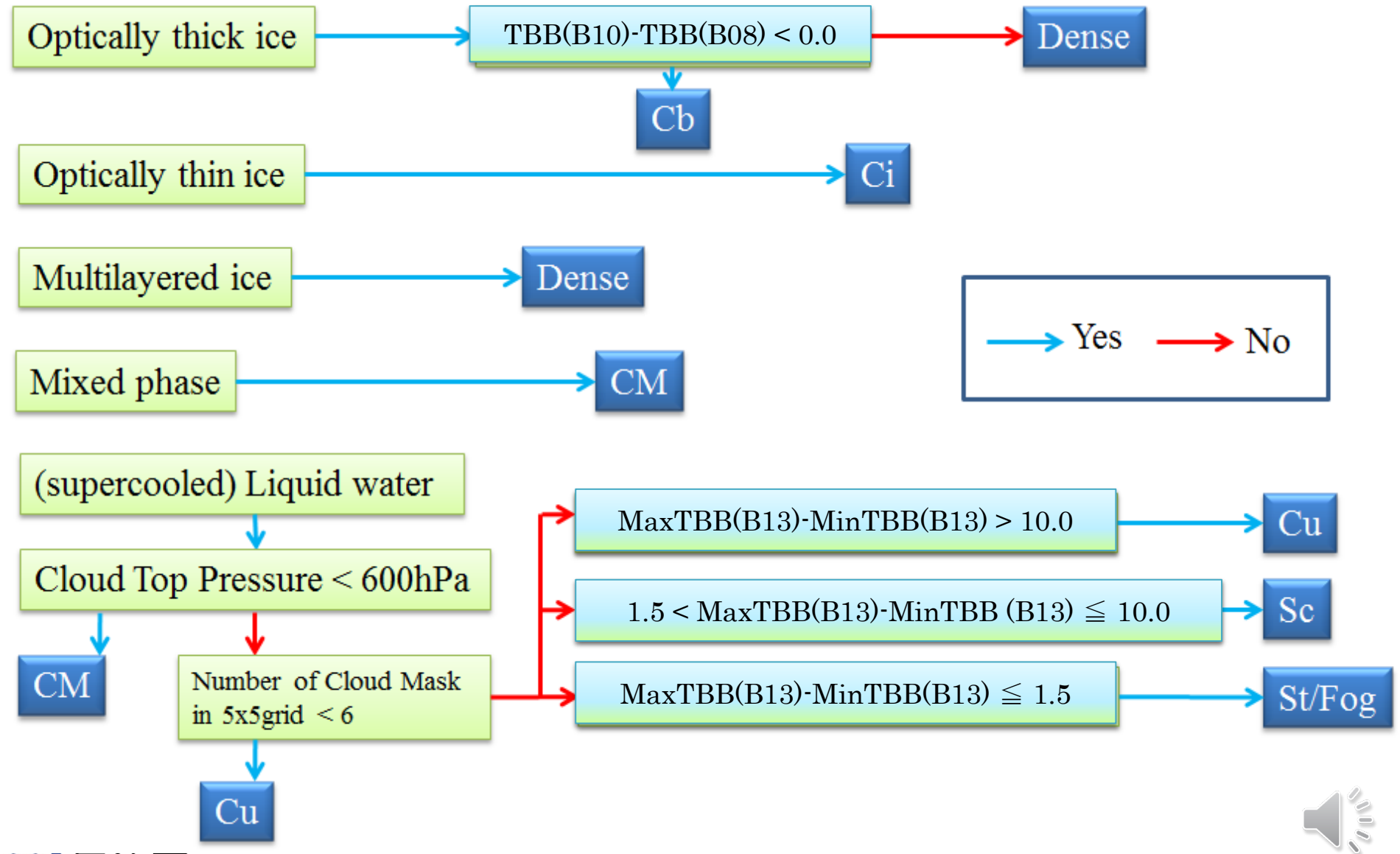
- Cloud Type : Clouds are classified by thickness and its phase.
  - Liquid water / Supercooled liquid water / Mixed phase / Optically thick ice / Optically thin ice / Multilayered ice

- Cloud Phase : Clouds are classified by cloud particle and phase of cloud top.
  - Liquid water / Supercooled liquid water / Mixed phase / Ice phase

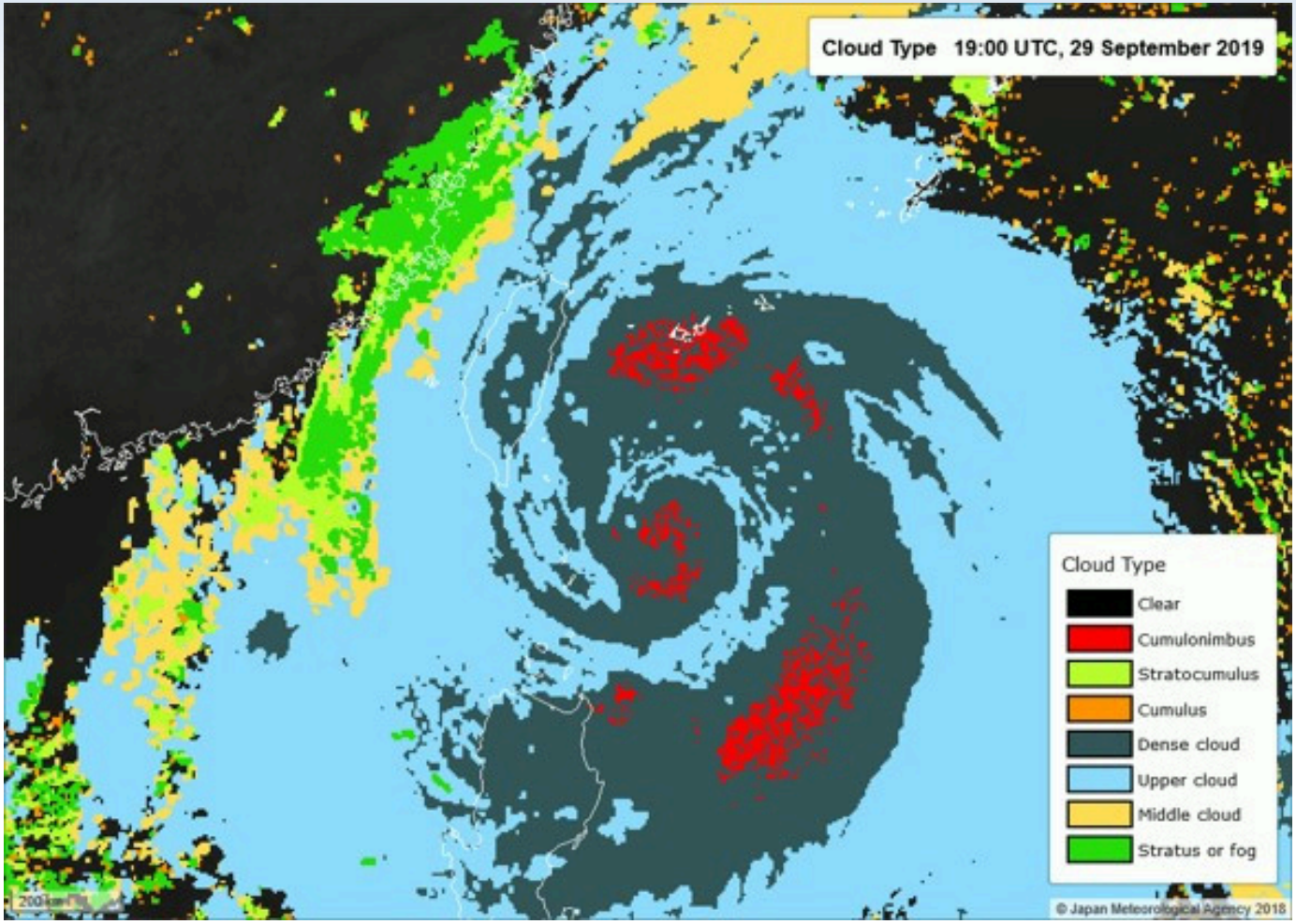
Feature of HCAI cloud type

Cloud type	feature		
Cumulonimbus (Cb)	thick	Overshooting top	
Cumulus (Cu)		lower cloud	ragged cloud top
Upper cloud (CH)	thin	higher cloud	
Middle level cloud (CM)		middle level cloud	
Stratocumulus (Sc)		lower cloud	
Stratus/Fog (St/Fog)		very low cloud	smooth cloud top
Dense	thick	higher cloud	

HCAI Cloud Type Flow Chart



Example of Cloud Type of HCAI



Summary

- RSMC Tokyo for Nowcasting began its operation in 2018.
- It provides NMHSs in the Asia and Pacific regions with graphical nowcasting products for improving capacity for disaster risk reduction including monitoring tropical cyclones and heavy rain.
- Two Himawari satellite products titled Heavy Rainfall Potential (HRP) and High-resolution Cloud Analysis Information (HCAI) are available on its website in real time.
- Users can customize and save the display areas and options according to their needs.