Joint RA II–RA V Coordination Meeting
(18 November 2022, online)

COUNTRY REPORT FOR HONG KONG, CHINA

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WMO OMM

World Meteorological Organization
Organisation météorologique mondiale

Current Satellite Data Reception

1. GEO and LEO satellite data

   (i) Ground reception system (e.g. HimawariCast, CMACast, FY4A, MODIS cum POES)

   (ii) The Internet (e.g. HimawariCloud, GK2A)

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Current Satellite Data Reception

2a. GEO satellite data being received:

- FY-2 series [FY2G, FY2H] & FY-4 series [FY4A] from CMA

  CMACast, antenna

- Himawari-8/9 from JMA

  - HimawariCast: HRIT satellite data from JCSAT-2B

  - HimawariCloud: Standard Data (HSD) from JMA

- GK2A from KMA Internet

- GOES series [GOES-16, -17, -18] from NOAA Internet

- METEOSAT series [MSG-1, -4] from EUMETSAT Internet

Current Satellite Data Reception

2b. LEO satellite data being received:

- FY-3 series [FY3C, FY3D] from CMA

- EOS series [AQUA & TERRA] from NASA

- NOAA series [N-15, N-18, N-19] from NOAA

- SNPP and JPSS1 from NASA

- METOP series [Metop-B, Metop-C] from EUMETSAT

  - Primarily via ground reception system

- COMSIC-2 series from NSPO and NOAA - Internet

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Data Requirements

Satellite data not yet received:

- GK-2B satellite data and products to enhance monitoring of the environment and the ocean. e.g. aerosol optical depth, ocean chlorophyll concentration, total O_3 column, etc.

- Microwave temperature and humidity sounding data from FY3D and FY3E

- Sea surface wind and soil moisture products from WindRAD instrument on-board of FY3E

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Data Utilisation

4. Key applications

- Public (via HKO website & mobile App)
  conventional VIS and IR imageries

- Weather monitoring and forecasting
  VIS, IR, WV and all processed imageries
  - RGB products for environmental monitoring including haze, sandstorms, volcanic eruption, etc.
  - Processed imageries such as blended sandwich, HotTower, D'vorak for monitoring deep convection, tropical cyclones, etc.
  - Highpass filtered WV imageries for diagnosing atmospheric gravity waves
  - Virtual night time visible imagery
  - H-8 B08 time difference imagery

- Nowcasting and Data Assimilation in NWP
  - Satellite derived winds/radar reflectivity

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Showcase

(a) Deep Learning Model for auto-detection of atmospheric gravity waves (AGW)

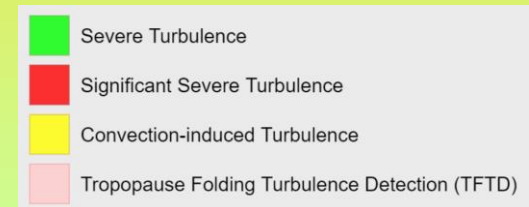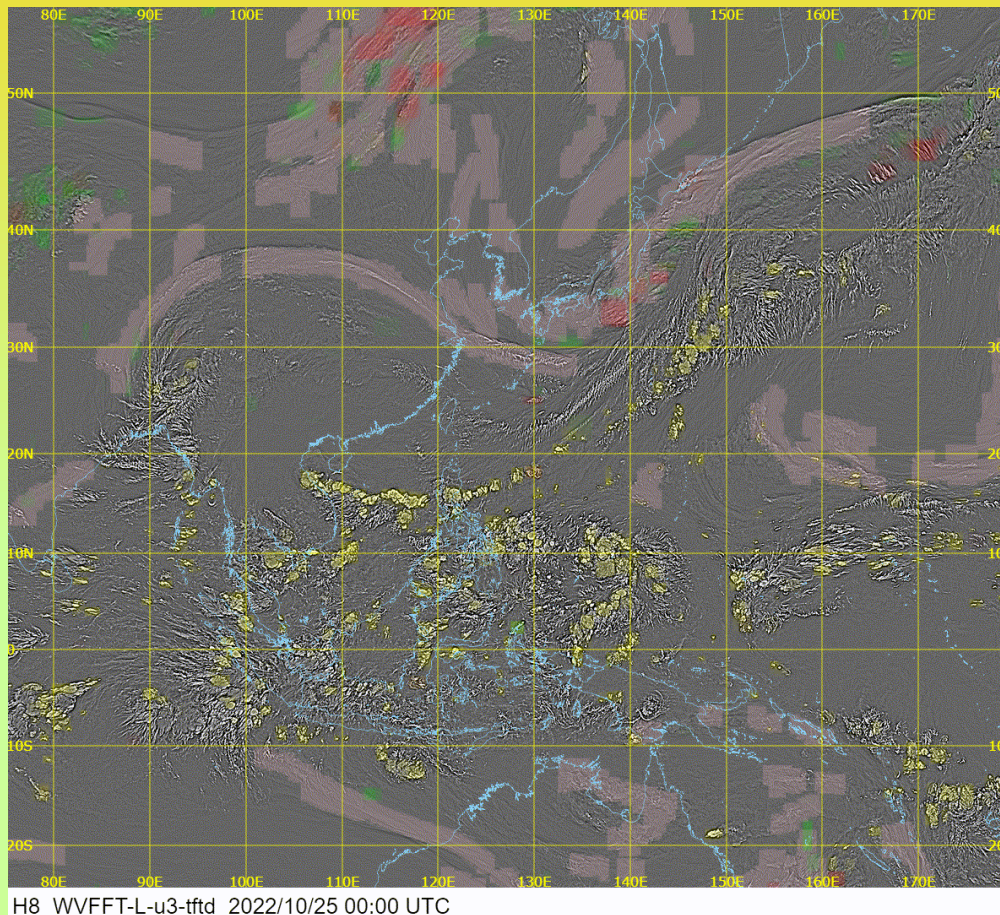**Training Dataset :** **Himawari-8 (H-8) high-pass filtered 6.2µm water vapour satellite imageries.**

Deep Learning Model: **Object detection using Faster Region-based Convolutional Neural Network (RCNN)**

Output : **Polygons to indicate areas of severe turbulence and significant severe turbulence.**

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Showcase

(a) WebGIS display of AGW events triggered by deep convection, jet streams, high mountains.

H8 WVFFT-L-u3-tftd 2022/10/25 00:00 UTC

Legend:
- **Severe Turbulence** (green)
- **Significant Severe Turbulence** (red)
- **Convection-induced Turbulence** (yellow)
- **Tropopause Folding Turbulence Detection (TFTD)** (pink)

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b) Virtual night time visible imagery

Training Dataset:

Himawari-8 imagery of channels VIS, IR1, IR2, IR1-IR2, WV, WV-IR2

Deep Learning Model:

"pix2pix HD" Conditional Generative Adversarial Network (CGAN)
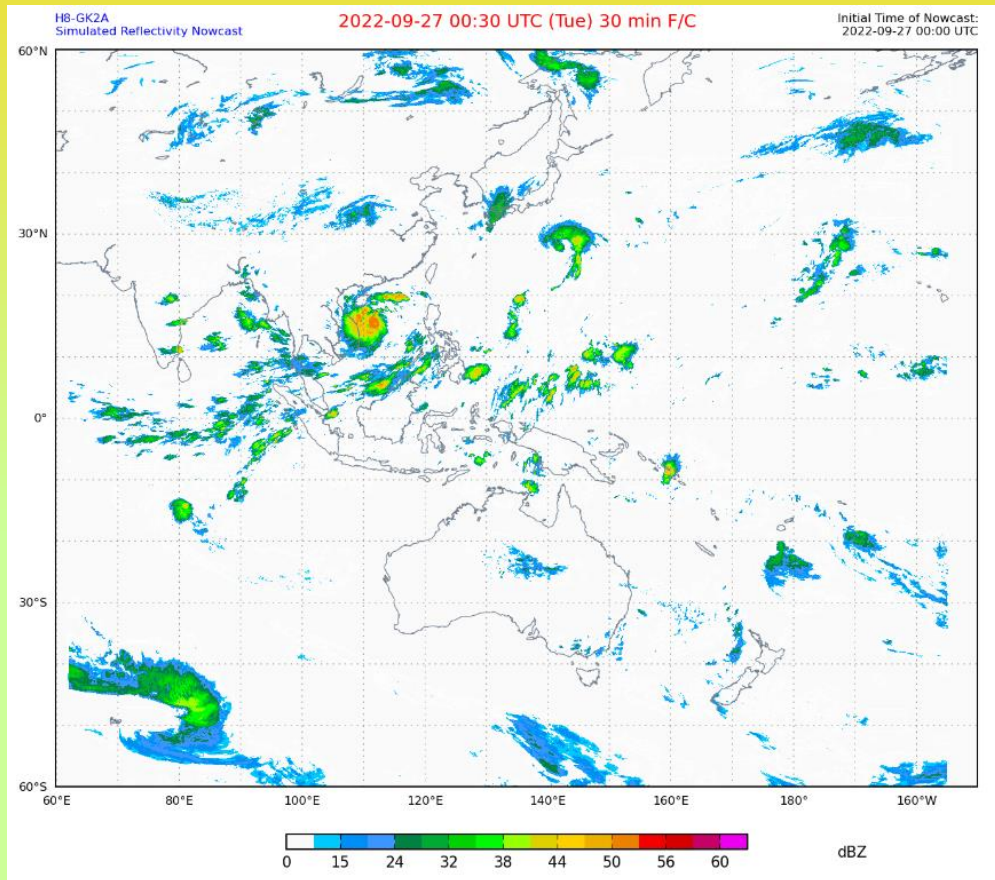
Output: Night time visible imagery

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b) Virtual night time visible imagery

True colour image

Night time visible image
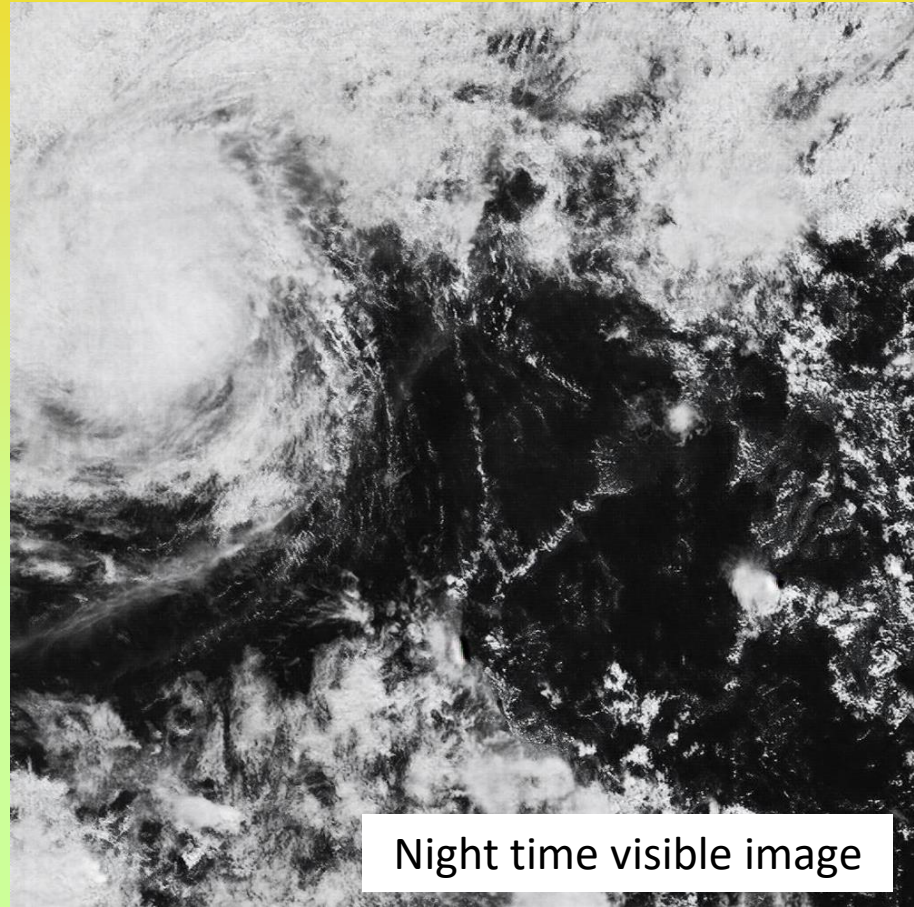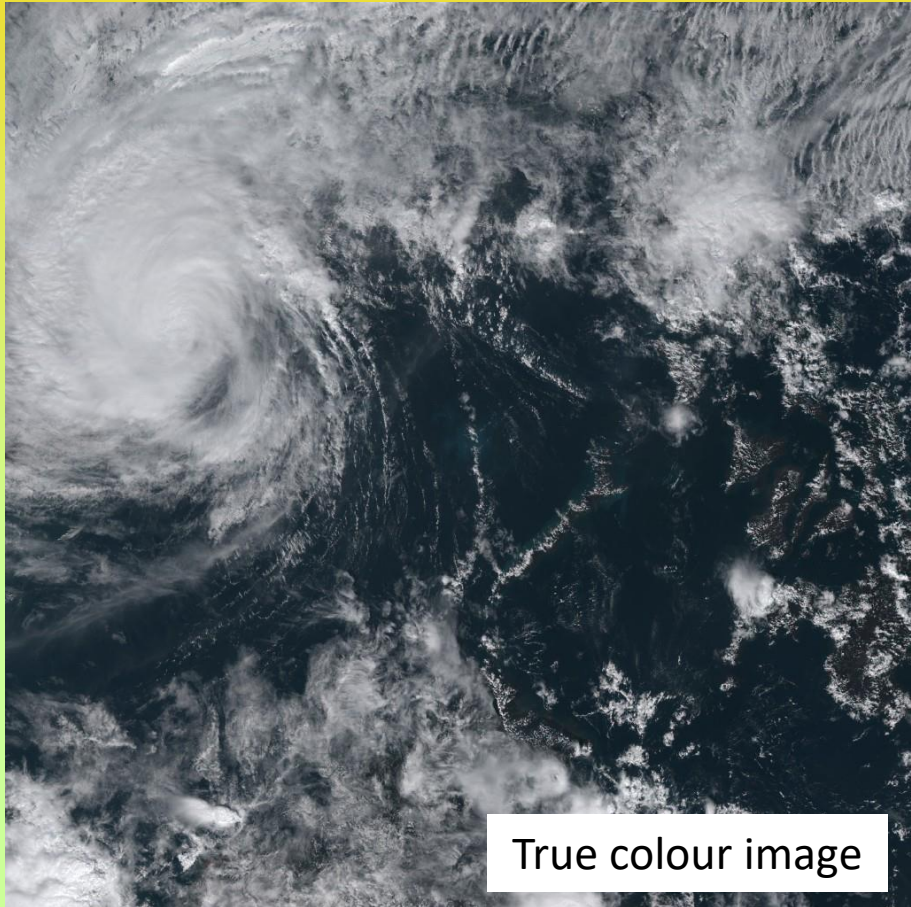
0430UTC, 19 December 2021

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(c) Satellite Nowcast using Generative Adversarial Network (GAN)

- H8-GK2A satellite simulated reflectivity as input
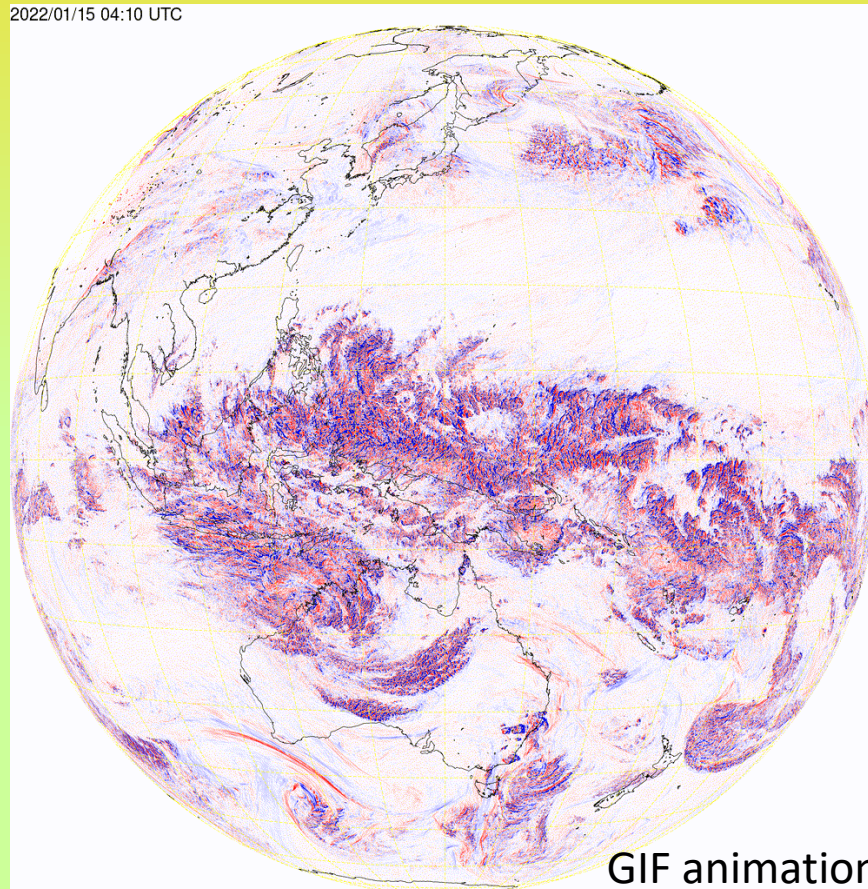- F/c up to next 4 hours

Showcase

(d) H-8 B08 Time Difference imagery

Two consecutive Himawari-8 low-level WV images (B08, 6.25μm)
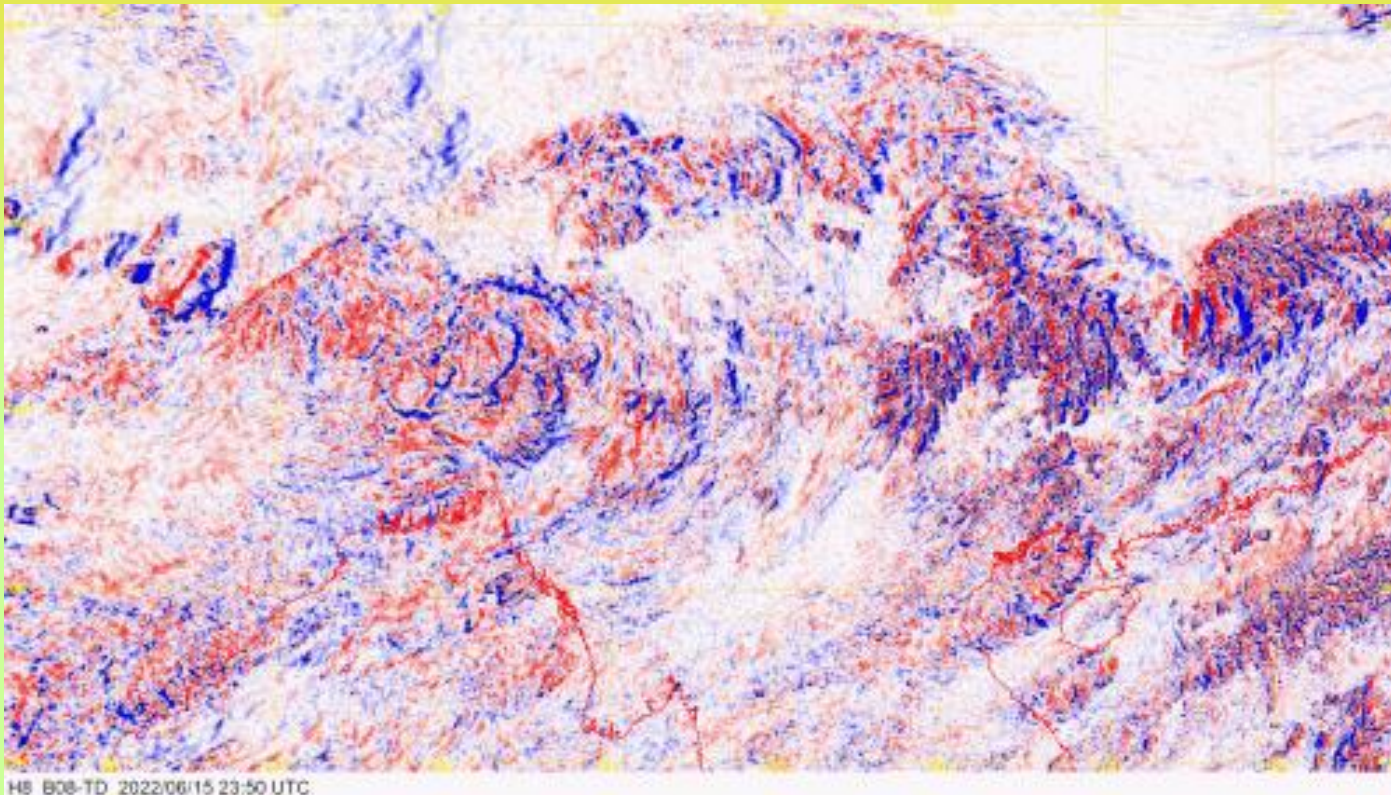(i) Monitoring shock wave induced by intense volcanic eruption

2022/01/15 04:10 UTC

GIF animation

Showcase

(d) H-8 B08 Time Difference imagery

Two consecutive Himawari-8 low-level WV images (B08, 6.25μm)
(ii) Monitoring convection induced gravity waves

HB B08-TD 2022/06/15 23:50 UTC

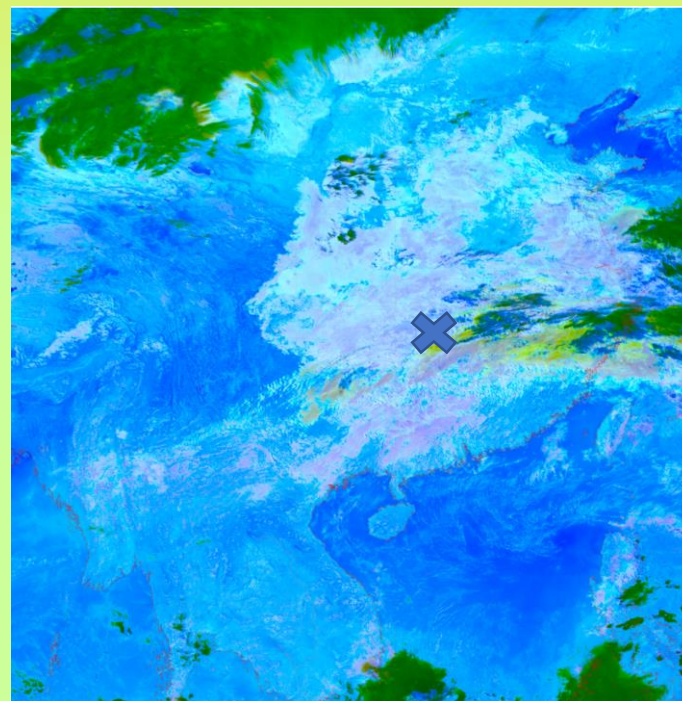**HONG KONG OBSERVATORY**
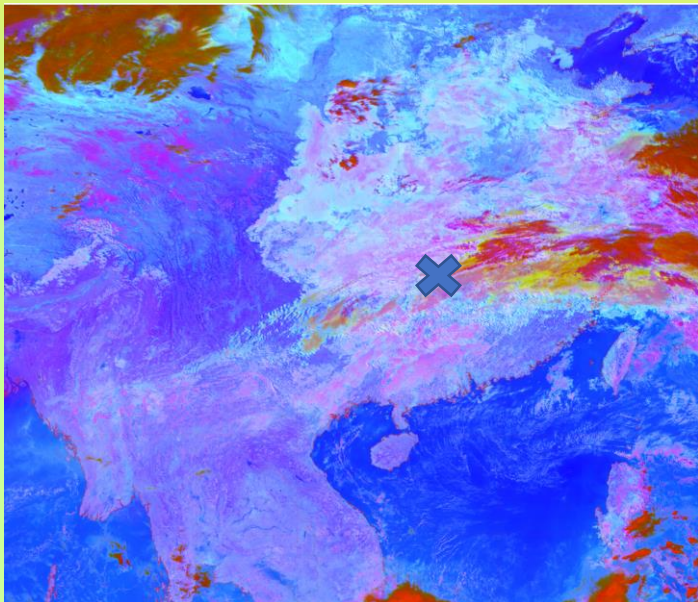香 港 天 文 台

GIF animation

Showcase

(e) Different Day Microphysics schemes for diagnosing icing events

✖ Pilot Report : 05/11/2021 04:48Z Mod to Severe 28.07N 112.21E

B04	VIS 0.8	0 - 1	1.7
B07ref	NIR 3.9ref	0 – 0.3	1.7
B13	IR 10.4	243 - 263	1.7

B05	NIR 1.6	0.25 - 1	3
B07ref	NIR 3.9ref	0 – 0.3	3
B13	IR 10.4	243 - 263	3

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Showcase
(f) Automatic detection of volcanic hot spots

Sakurajima
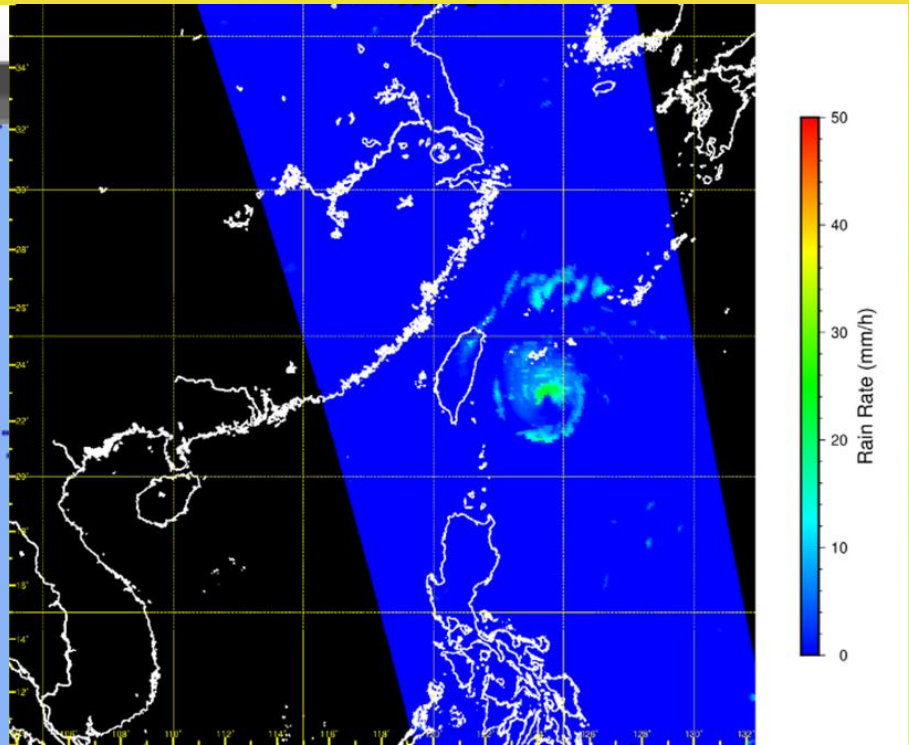(Erupted on 24 July 2022)

H8 Dust 2022/07/24 11:00 UTC
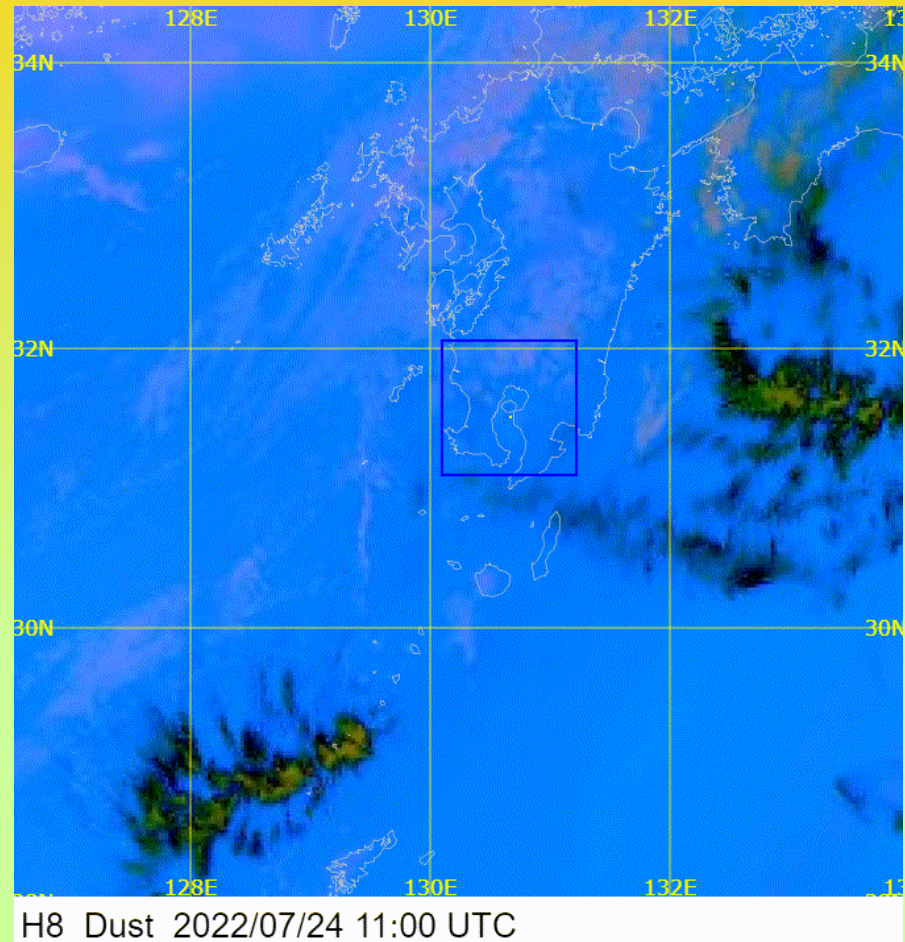
SHOWCASE

(g) FY-3D rain rate (RR)
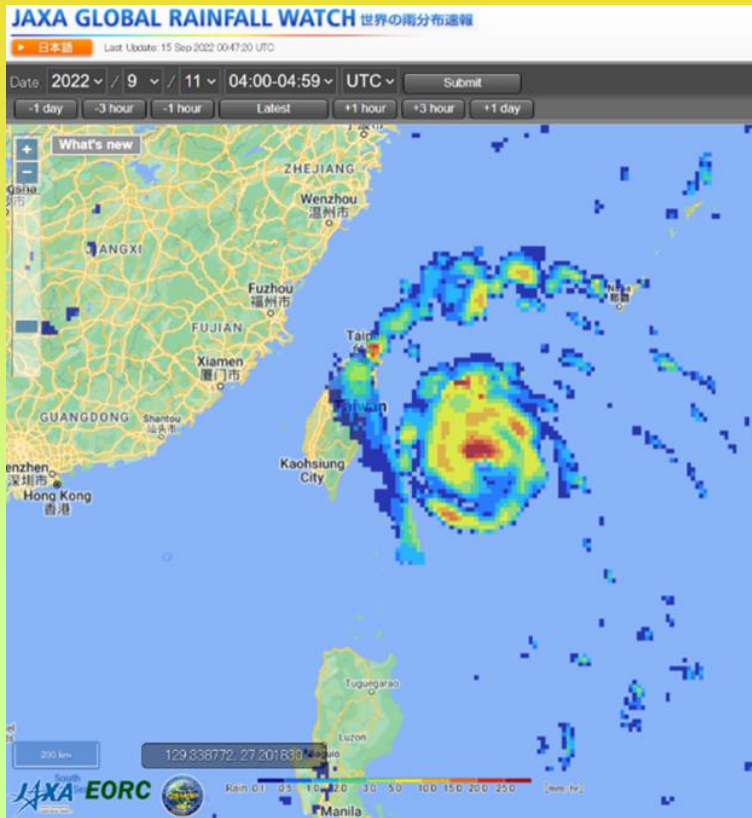
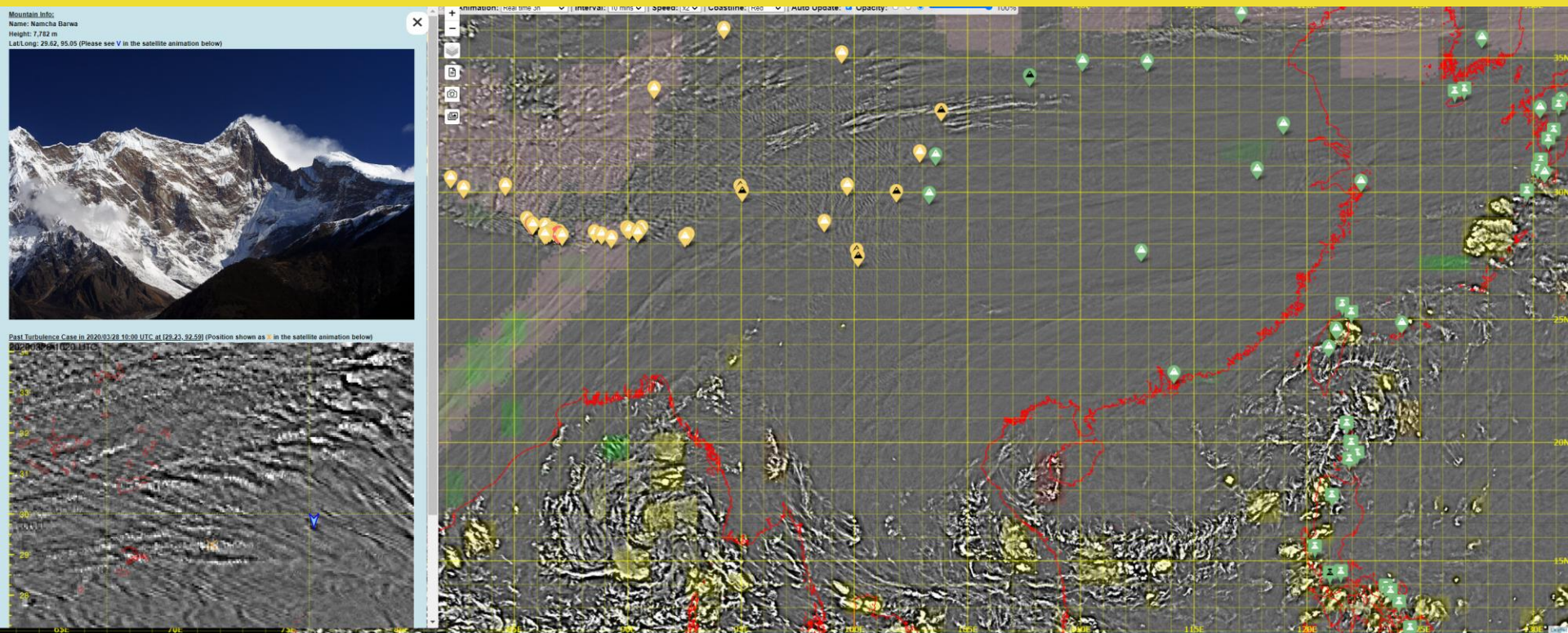0400-0459UTC, 11 Sep 2022
JAXA's Global Rainfall Watch

0453UTC, 11 Sep 2022

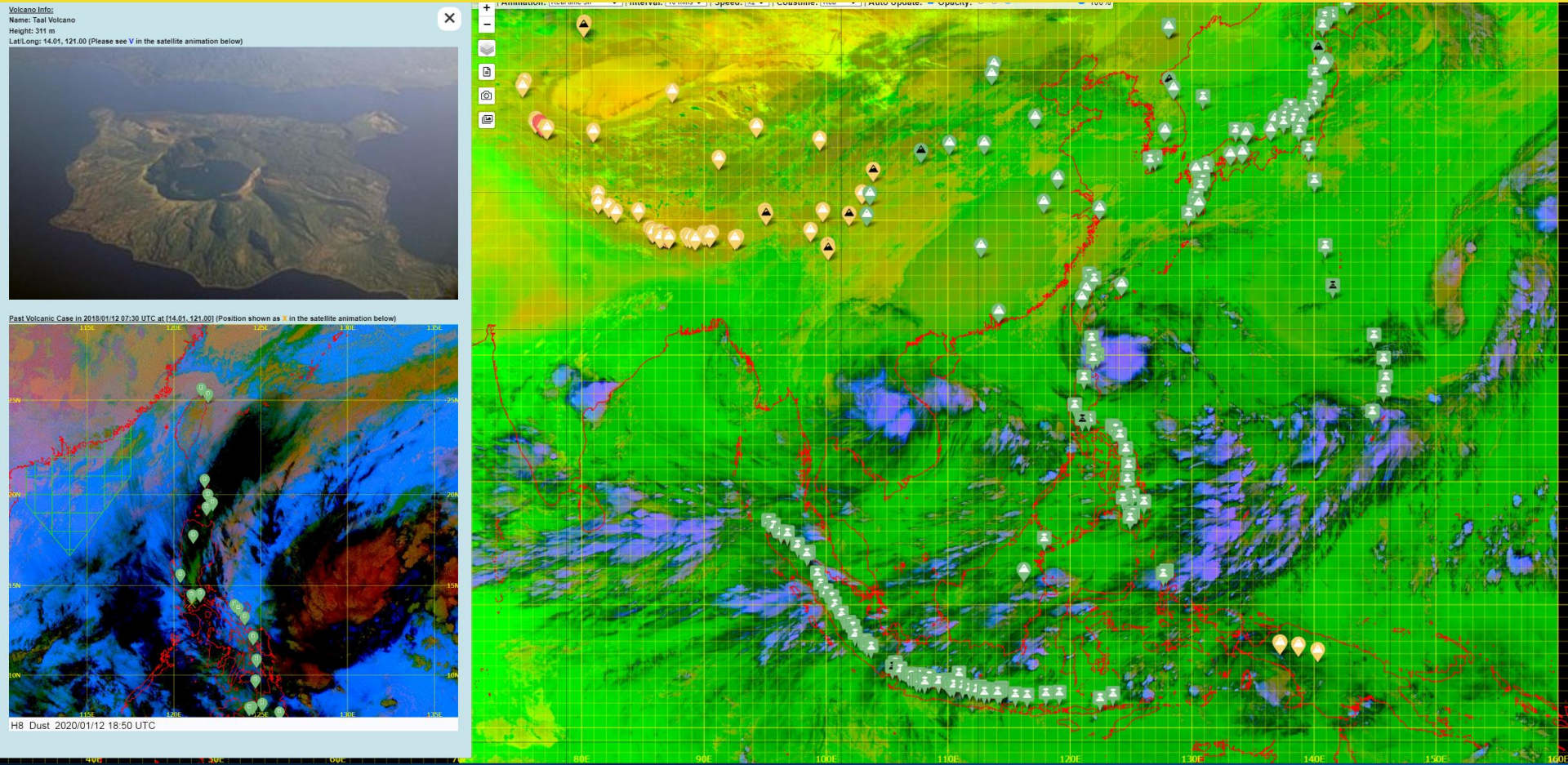# Better Visualization

(h) WebGIS display of past mountain-triggered AGW events

Better Visualization

(h) WebGIS display of past volcanic eruptions

Further Enhancement on Data Utilisation

- Enhance WebGIS display of satellite products

- Promulgate the use of Radio Occultation data (applications in NWP)

- Applications of RGB products e.g. diagnosing icing

- Satellite-derived radar reflectivity (deep learning techniques)

- Lightning detection

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Other needs, challenges and requirements

1. Cloud services for reception of satellite data

2. Reception via GeoNetCast satellite imageries including GOES-E, GOES-W and next generation METEOSAT for generation of global mosaics at half-hourly intervals.

3. Rapid scan (1-2 minutes) satellite imagery for monitoring of inclement weather

4. Satellite nowcasting using deep learning methods

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THANK YOU

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TEMPS CLIMAT EAU

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