BMKG

COUNTRY REPORT
INDONESIA

Badan Meteorologi Klimatologi dan Geofisika
(BMKG)
Agency For Meteorology, Climatology, and Geophysics
Republic of Indonesia

DKI Jakarta, Indonesia
Tel. (021) 4246321 Email: pcs@bmkg.go.id

Joint Meeting of RA II WIGOS Project and RA V TT-SU
(AOMSUC-9)
Jakarta, Indonesia / 11 October 2018
BMKG Headquarter

OUTLINE

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II. Satellite data and product requirements, training needs and infrastructure

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a. Background
b. Short description of NMHS activities
c. Current observational system overview
d. Access, processing and application of satellite data and products
e. Satellite data to address regional challenges

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ABSTRACT (UPDATES ON STATUS AND PLAN OF SATELLITE DATA ACCESS, PROCESSING, APPLICATION AND TRAINING)

BMKG as the government institution which has the responsibility to give the information of meteorology, climatology, and geophysics in Indonesia has been using weather satellite data especially geostationer satellite for many years, started from gms, mtsat, and finally Himawari 8/9. Now, BMKG uses the satellite data such as Himawari 8, Fengyun, Terra-Aqua, NOAA, S-NPP which received by receiver antenna and internet service. Furthermore, processing the data into some derived products such as Enhanced Products, RGB Images, Potential Rainfall, RDCA, Hotspot, Smoke, Volcanic Ash, HCAI, etc. And finally disseminate the product to users via website, social media, and ftp. There are some challenges for BMKG such as preparation for GeoKompsat-2A data reception and processing in order to get every 5 minutes observation combined with Himawari-8, and also archiving the large size data came from new generation weather satellite such as Himawari 8/9, Geokompsat-2A, Feng Yun-series, and some polar orbiting satellite data. BMKG hopes there will be increasing the number and the dissemination of level 2 data of geostationary satellite (Himawari 8/9, Geokompsat-2A, and Feng Yun-series) for NMHS in Asia Oceania country, and also more rapidscan satellite data of Himawari 8/9 and Feng Yun Series.The topic of training that BMKG needs are interpreting and adjusting RGBs recipes for tropical environment, training for using updated version of the software for visualizing and investigating the satellite data, the best procedure to validate the quality of the derived product (level 2/ level 3 product), and increasing the human resource capabilities in using and analyzing the integrated data both of geostationary and polar orbiting weather satellite

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SATELLITE DATA AND PRODUCT REQUIREMENTS, TRAINING NEEDS AND INFRASTRUCTURE

- Satellite data and product requirements
  a. Increasing the number and the dissemination of level 2 data of geostationary satellite (Himawari 8/9, Geokompsat-2A, and Feng Yun) for NMHS in Asia Oceania country
  b. Development of satellite climatology products for supporting climate services.
  c. Customized satellite-based products for specific users (oil/gas refinery plant, electric power, mining, aviation) → early detection of lightning, icing, clear-air turbulence
  d. More rapidscan satellite data of Himawari 8/9 and Feng Yun Series
- Training needs
  a. Interpreting and adjusting RGBs recipes for tropical environment
  b. Using the software for visualizing and investigating the satellite data such as updated version of sataid and Mcidas V software
  c. Assimilation the satellite data into NWP
  d. The best procedure to validate the accuracy or quality of the derived product / level 2/ level 3 product
  e. Increasing capabilities in using and analyzing the integrated data both of geostationary and polar orbiting weather satellite
- Technical infrastructure issues to access and process/visualize satellite data
  a. Data receiving system via direct reception, DVB-S2 reception, internet service
  b. Powerful and easy to use software for analyzing and investigating the cloud pattern from satellite data
  c. The software to convert the satellite data from original/unique format (example: sataid format) into netcdf format

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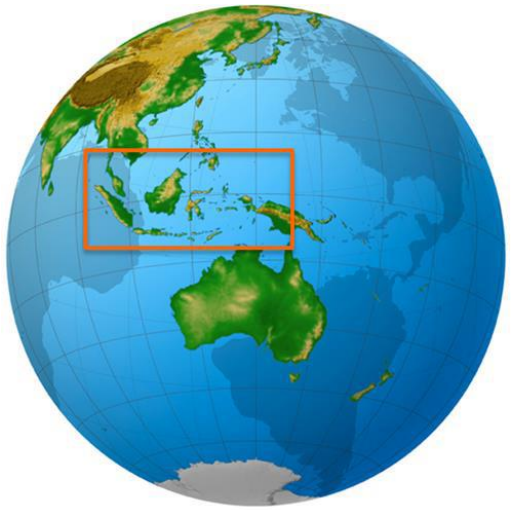
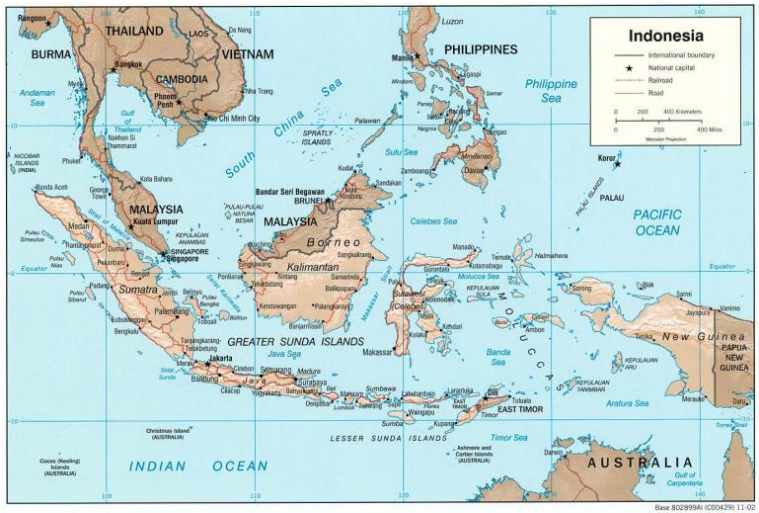
BACKGROUND

COUNTRY OVERVIEW





a. Geography

- Archipelagic Country ± 17,504 islands (10.000 small islands)
- 4 million km^2 area of ocean and 2 million km^2 area of land
- Distance from east to west = 6,000 km
- Coastal length = 80,000 km
- Flanked by 2 ocean (Indian and Pacific Ocean) and 2 continents (Australia and Asia
- Lays above 3 plates moving on different speed of creeping --> Prone to earthquake and tsunami

COUNTRY OVERVIEW

b. Population

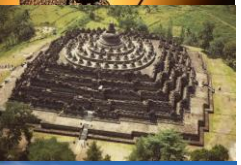
- Fourth-largest number of people in the world
- estimated population ± 245 million
- Indonesia ranks after China, India and the United States of America.

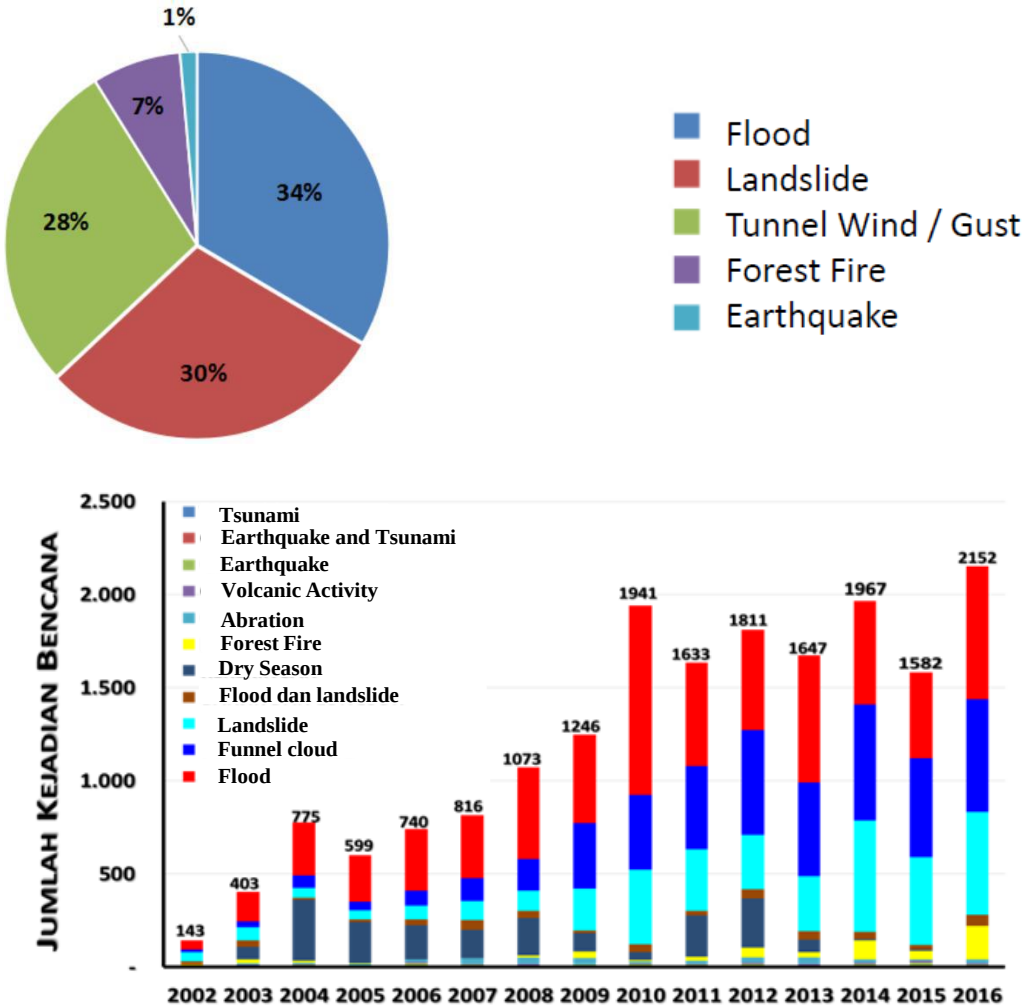
c. Climate

- Tropical climate with the coastal plains averaging 28° C, the inland and mountain areas averaging 26° C, and the higher mountain regions, 23° C
- The area's relative humidity is quite high, and ranges between 70 and 90 percent.
- 3 types of rain – equatorial, moonson, and local
- 2 types of season - dry season (June to September), and a rainy season (December to March).
- more than 220 seasonal variation zones

MAJOR HISTORICAL HYDROMETEOROLOGICAL DISASTERS





Source : BNPB (National Disaster Management Agency of Indonesia

MAJOR NATIONAL ECONOMIC SECTORS RELYING ON NMHSs

ECONOMIC SECTORS RELYING ON NMHSs

Agriculture

Fisheries

Alternative Energy

Transportation

Tourism

Mining

Forestry

Construction

Farming

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SHORT DESCRIPTION OF NMHS ACTIVITIES

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CURRENT MISSION

- Observe and comprehend the weather, climate, air quality, and geophysics phenomena.
- Providing data, information, and services of meteorology, climatology, air quality, and geophysics.
- Coordinate and facilitate activities that are appropriate to BMKG's authority.
- Actively participate in international events

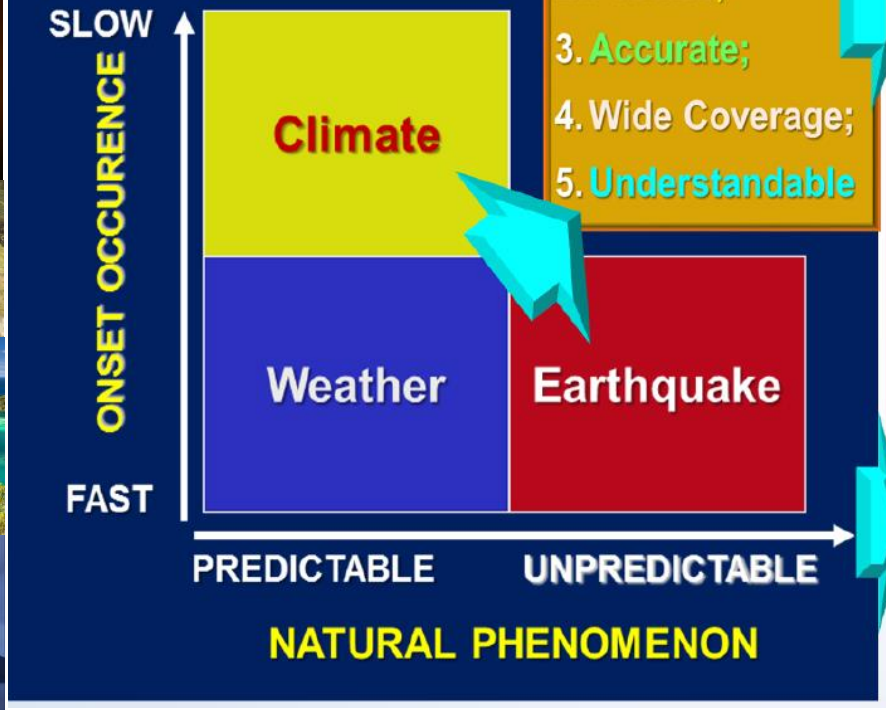
MANDATE OF BMKG

LAW No. 31/09 on METEOROLOGY, CLIMATOLOGY and GEOPHYSICS

DISSEMINATION:
1. Fast;
2. Precise;
3. Accurate;
4. Wide Coverage;
5. Understandable

1. COMPETENCE:
   - — Human Resource;
   - — Organization
2. INFRASTRUCTURE:
   - — Observation;
   - — Telecommunication;
   - — Processing

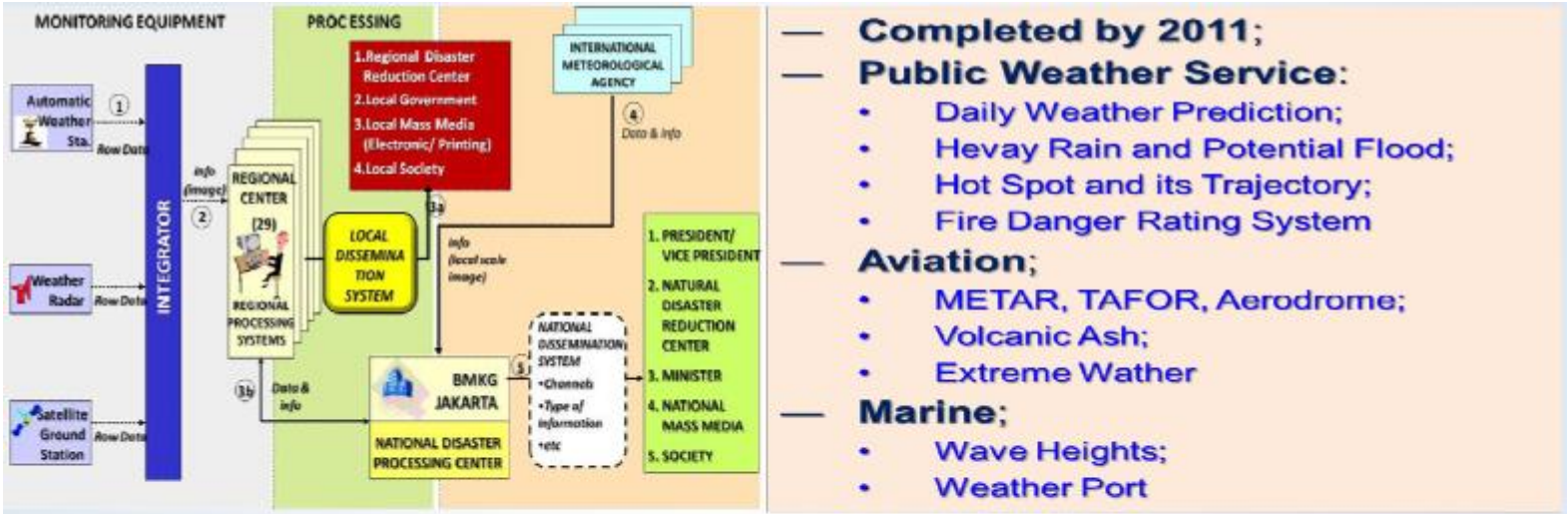
   (Density; Reliable; Standardized)
3. COMPLIANCE:
   - — Regulation;
   - — Trace-ability;
   - — Procedure



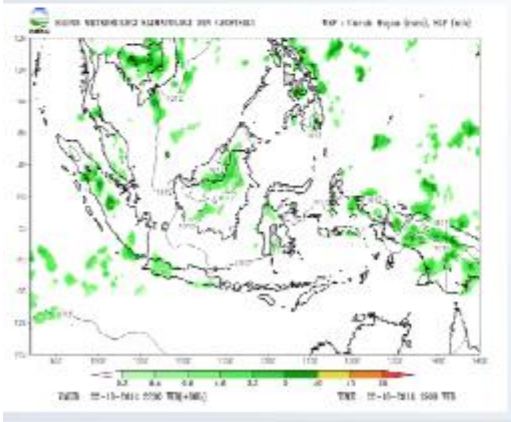
1. Ina-TEWS (2008);
2. Ina-MEWS (2011);
3. Ina-CEWS (2013);

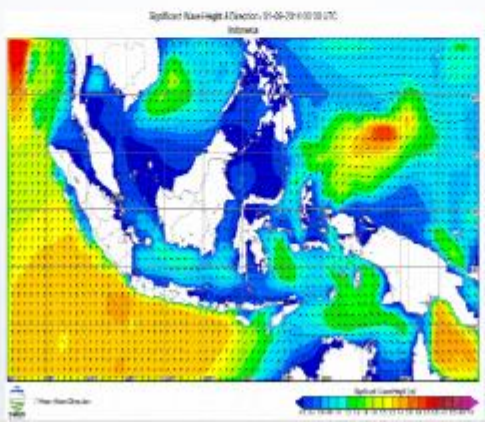
MANDATE OF BMKG

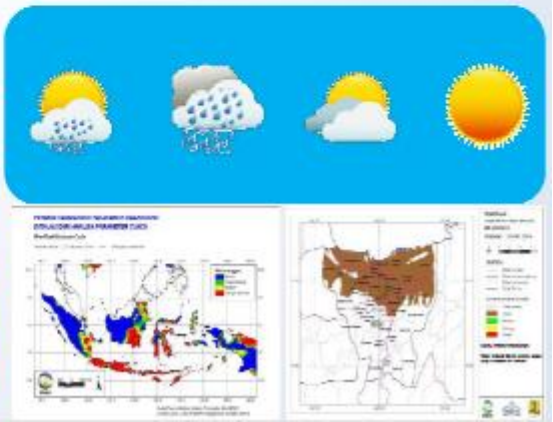
Meteorology Early Warning System



- **Completed by 2011;**
- **Public Weather Service:**
  - Daily Weather Prediction;
  - Hevay Rain and Potential Flood;
  - Hot Spot and its Trajectory;
  - Fire Danger Rating System
- **Aviation;**
  - METAR, TAFOR, Aerodrome;
  - Volcanic Ash;
  - Extreme Wather
- **Marine;**
  - Wave Heights;
  - Weather Port







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PUBLIC WEATHER AND CLIMATE SERVICES

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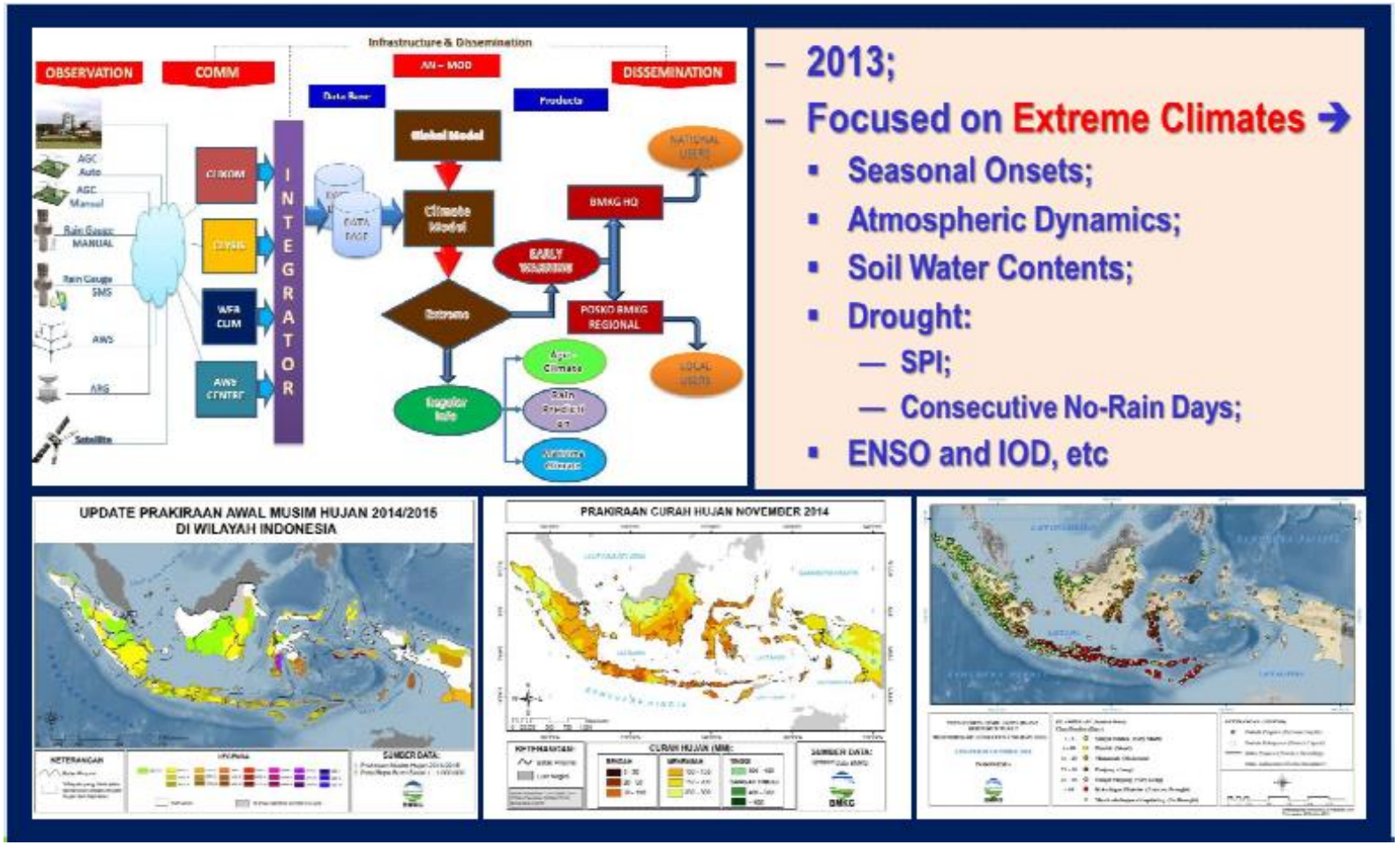
Climatological Early Warning System



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CURRENT OBSERVATIONAL SYSTEM OVERVIEW

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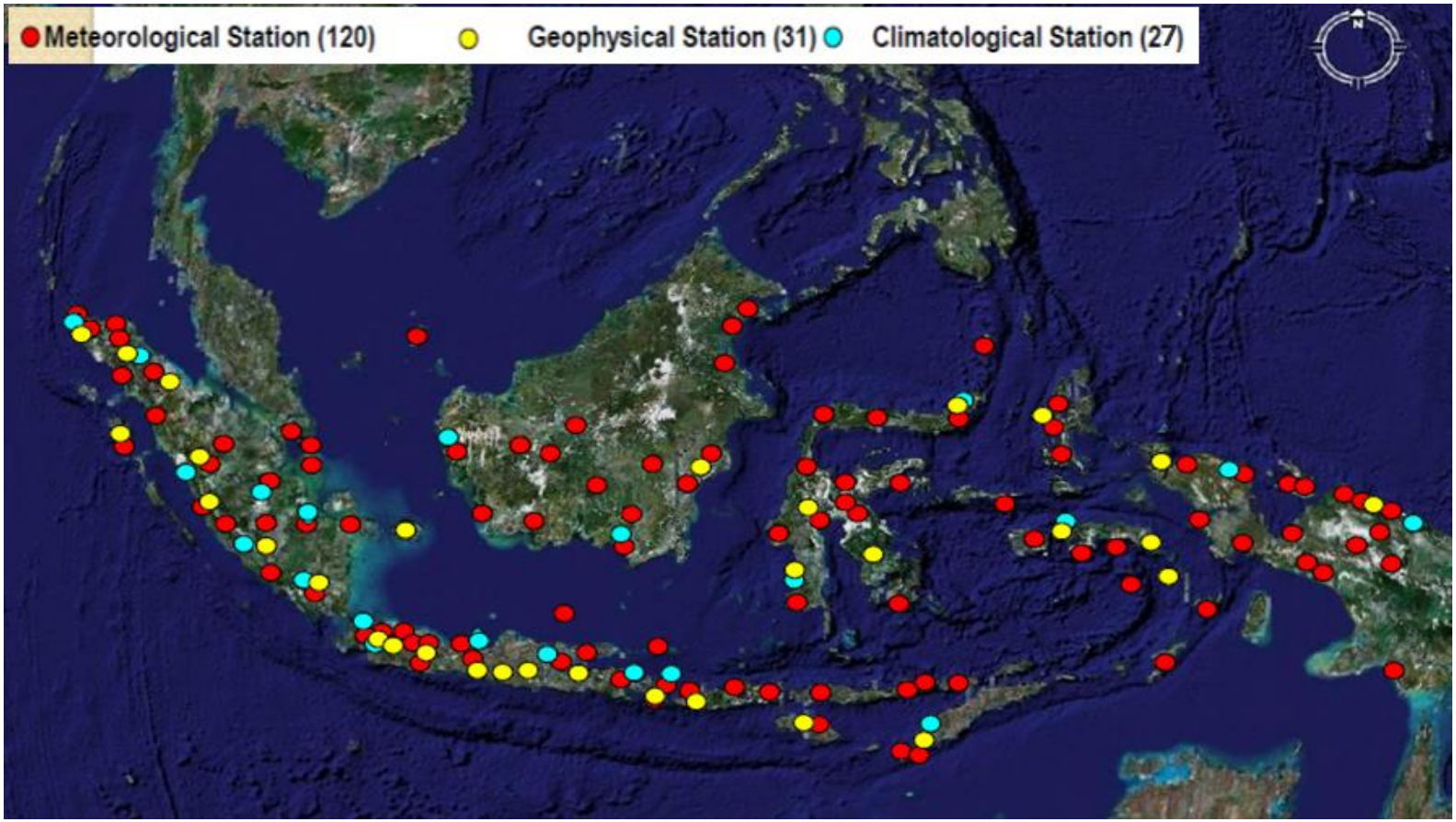
MANNED OBSERVATION STATION



AUTOMATIC WEATHER STATION

AWS Total 361 sites :
178 BMKG Station
183 outside BMKG Station

AERODROME WEATHER OBSERVATION SYSTEM

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AWOS in 91 Airports

UPPER AIR OBSERVATION (RADIOSONDE AND WIND PROFILER)

Total 22 radiosonde station
2 Wind Profiler

AVIATION METEOROLOGICAL SERVICES

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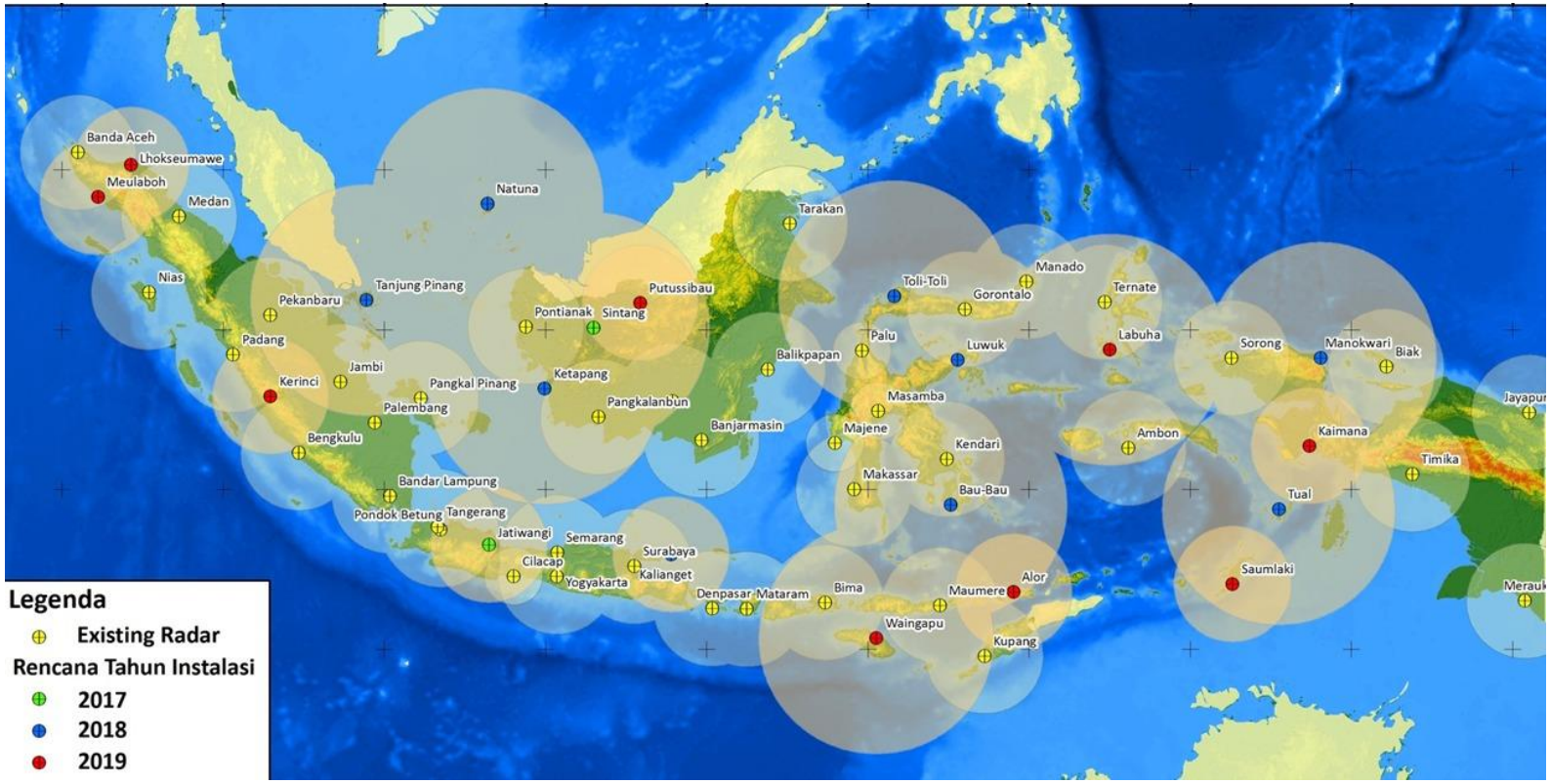
109 meteorological stations in airports and 2 MWO

WEATHER RADAR NETWORK



Total 41 radar (2018)
Observation Range : C-band =150 km ; X-band = 75 km

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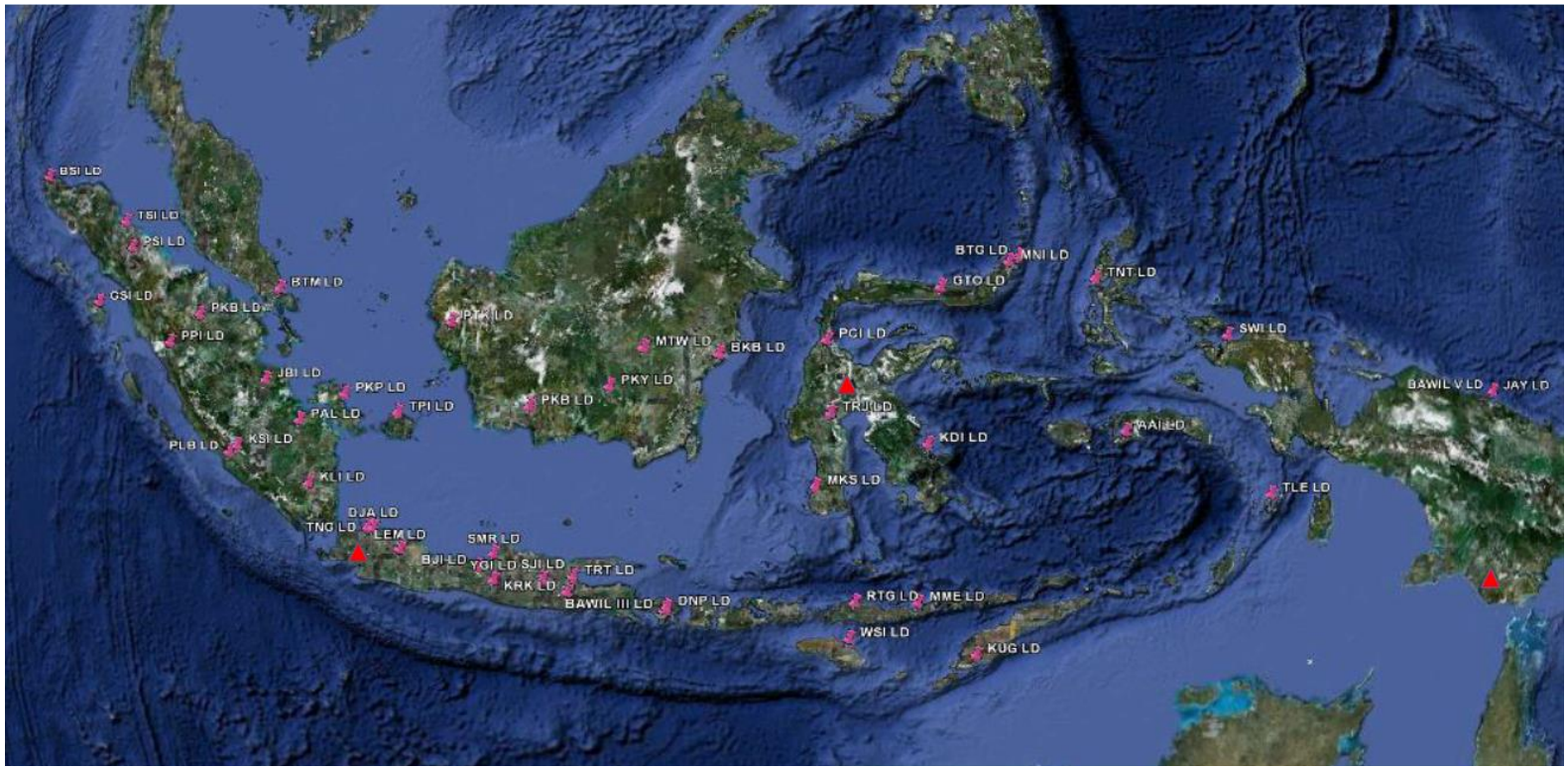
LIGHTNING DETECTION NETWORK



Total 61 locations (since 2003)

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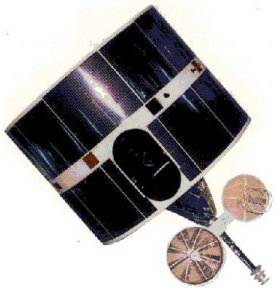
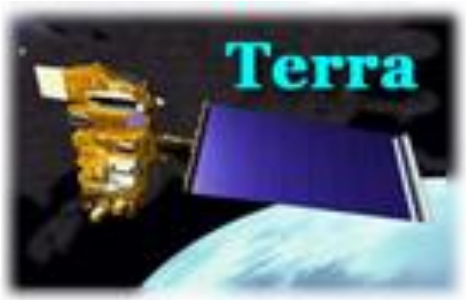
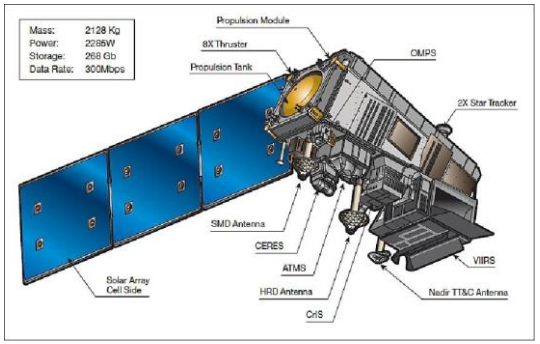
ACCESS, PROCESSING AND APPLICATION OF SATELLITE DATA AND PRODUCTS

List of satellites/instruments currently used operationally for NWP, nowcasting and other applications

- Himawari 8
- FY-2
- Terra and Aqua
- NOAA
- S-NPP







Current capabilities of access, processing and archiving of satellite data and products

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Data Acquisition

- Himawari-8
- FY-2
- Terra, Aqua
- NOAA, NPP
- GSMaP
- Others

Delivery System

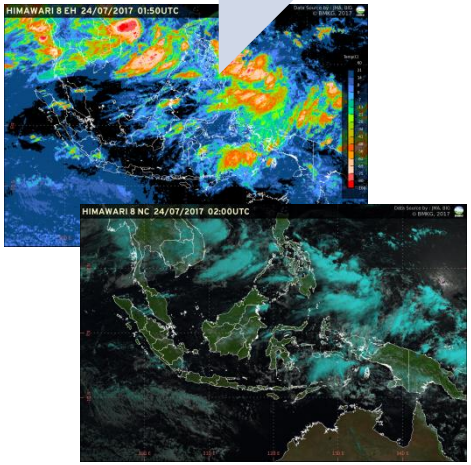
- Website
- Media Social

User

- Public
- Forecaster
- Research Institution
- Disaster Mitigation
- University

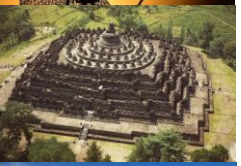
Image Processing

- Enhanced Products
- RGB Images
- Potential Rainfall
- RDCA
- Hotspot and Smoke
- Volcanic Ash
- HCAI
- Others



Current satellite data applications
Key application areas






Aviation Sector:

a. Infrared Enhanced
b. Water Vapour Enhanced
c. HCAI Cloud Type
d. RDCA
e. Volcanic Ash RGB

Maritime Sector:

a. Infrared Enhanced
b. Water Vapour Enhanced
c. HCAI Cloud Type
d. RDCA
e. Rainfall Potential GSMAP

Environment Sector:

a. Geohotspot
b. Terra-Aqua and S-NPP Hotspot
c. Volcanic Ash RGB

Agriculuture Sector:

a. Rainfall Potential GSMAP

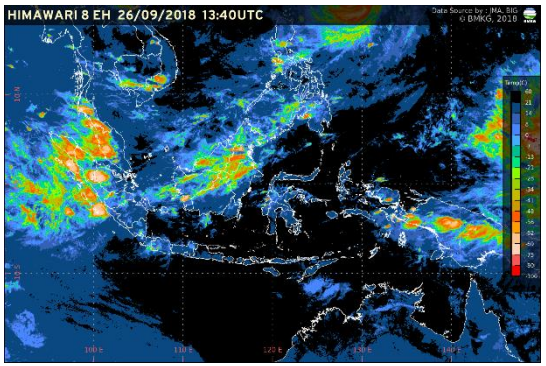
Current satellite data applications
Satellite-based products

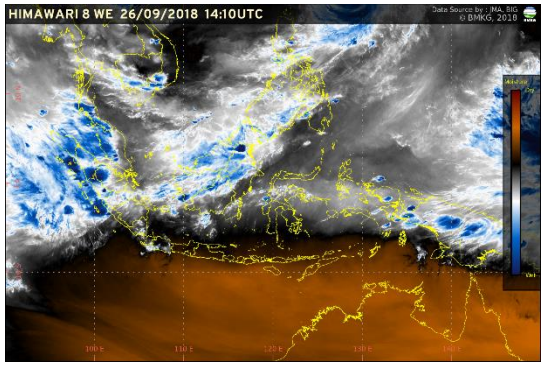
Infrared Enhanced

shows the cloud top temperature obtained from observations of radiation at a wavelength of 10.4 micro meters which are then classified by colour, which black or blue shows there are not many cloud formation (clear), while the cooler the cloud top temperature, which the color become orange, shows significant cloud growth and the potential for formation of Cumulonimbus clouds.

Water Vapour Enhanced:

displays atmospheric humidity conditions in the middle to upper layers obtained from infrared radiation at a wavelength of 6.2 micro meters. This product can show the humidity condition of the air as a material for cloud formation, where the brown area shows dry air and blue conditions indicating wet conditions.





Current satellite data applications
Satellite-based products

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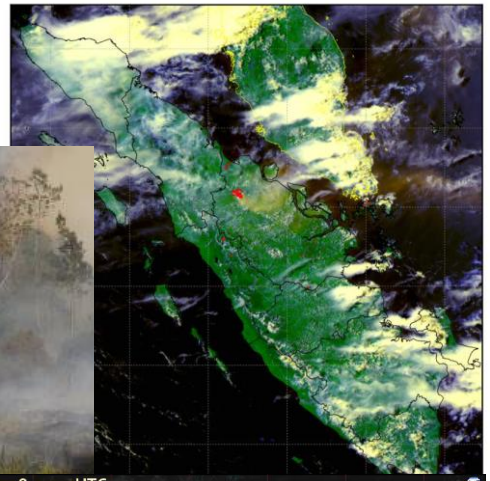
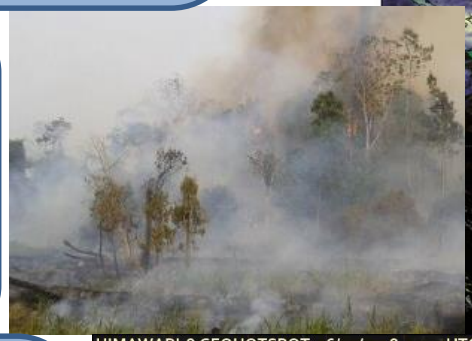
GeoHotspot 4.0 is a product that utilizes geostationary weather satellite data that is used to detect potential forest and land fires based on temperature anomalies that are hotter than around. There are two informations displayed on GeoHotspot, thera are the distribution of hot spots (red dots) and RGB images to detect smoke distribution. This product updates every 10 minutes.

GeoHotspot 4.0

http://www.bmkg.go.id/satelit



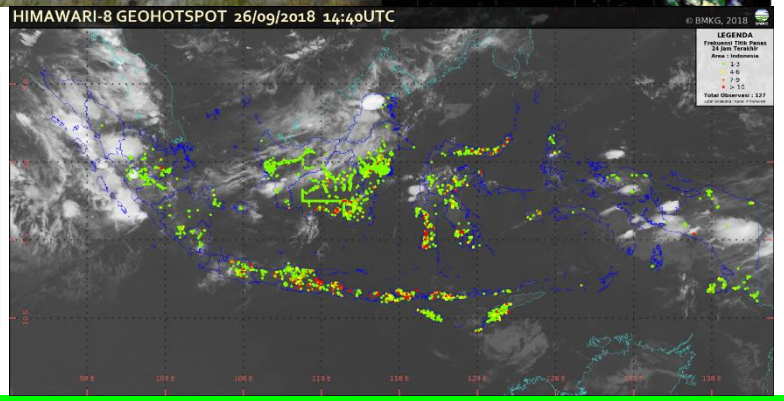


BENEFITS:

a. Supporting Indonesia Zero Hotspot
b. Prevent and anticipate the handling of forest and land fires in Indonesia
c. Prevent and anticipate the handling of Transboundary Haze Pollution

INNOVATION:

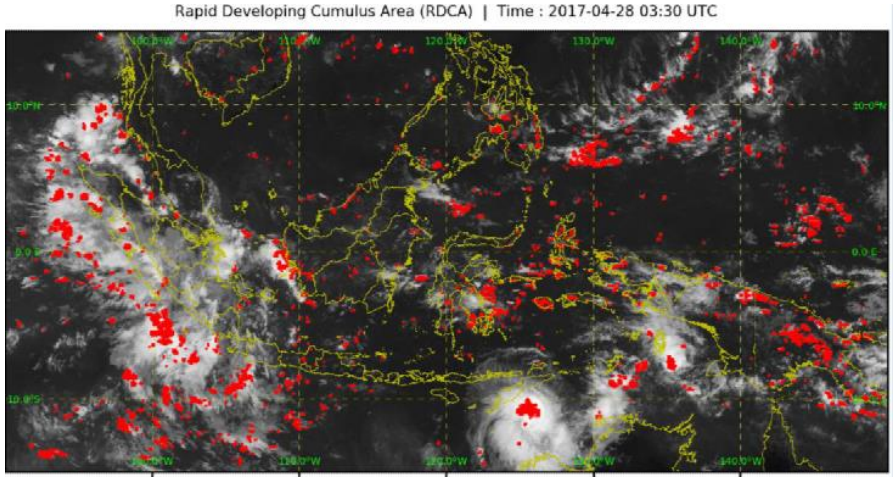
a. Presenting hotspot information data with higher temporal resolution is 10 minutes
b. Provides information on potential location coordinates of forest and land fires
c. Provides near-real time hotspot information

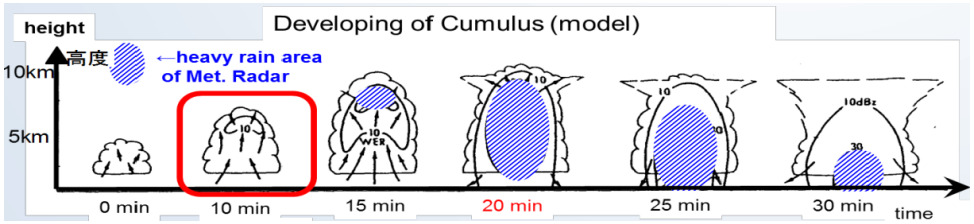


Current satellite data applications
Satellite-based products

IMPLEMENTATION OF RDCA ALGORITHM AT BMKG

- The diurnal cycle of convective cloud generation is quite remarkable along coastlines of major islands in Indonesia maritime continent. Flood events are usually caused by these cloud generation.
- Early warning of Cumulonimbus appearance is important to many sectors (public, transportation, disaster mitigation, etc)
- Capability of Himawari-8 to detect early stage of Cumulonimbus based on 10 minutes observation frequency
- In 2016 BMKG's staffs was invited to JMA for applying RDCA algorithm for Indonesia region and it has been installed at BMKG since 2017

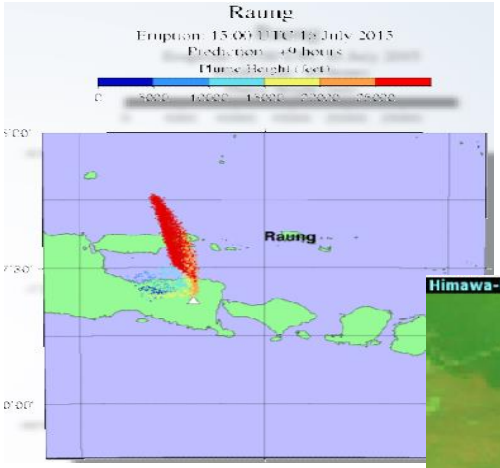




Current satellite data applications
Satellite-based products

VOLCANIC ASH DETECTION BY HIMAWARI-8

- The geography of Indonesia is dominated by volcanoes that are formed due to subduction zones between the Eurasian plate and the Indo-Australian plate.
- Himawari-8 RGB is continously used to monitor volcanic ash dispersion and issued flight safety zone near the volcano area.
- Joint collaboration under SATREPS-JICA framework to develop volcanic ash dispersion model integrated with volcanic hazard mitigation system.



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SATELLITE DATA TO ADDRESS REGIONAL CHALLENGES

CHALLENGES






1. Customized satellite-based products for specific users (oil/gas refinery plant, electric power, mining, aviation) → early detection of lightning, icing, clear-air turbulence.
2. Development of satellite climatology products for supporting climate services.
3. Multi-satellite data processing system for better spatial and temporal resolution derived products.
4. Preparation for GeoKompsat-2A data reception and processing in order to get every 5 minutes observation combined with Himawari-8.
5. The right procedure to validate the accuracy or quality of the derived product / level 2/ level 3 product
6. Archiving the large size data come from new generation weather satellite such as Himawari 8/9, Geokompsat-2A, Feng Yun 4-Series, and some polar orbiting satellite data

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BADAN METEOROLOGI KLIMATOLOGI DAN GEOFISIKA

Thank You

JL. Angkasa I No. 2 Kemayoran
Jakarta Pusat – Indonesia 10720
www.bmkg.go.id