9 th Asia/Oceania Meteorological Satellite User's Conference (AOMSUC)

Country Report by Myanmar

Department of Meteorology and Hydrology

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Jakarta, Indonesia / 11 October 2018

BMKG Headquarter

Outline

I. Abstract (updates on status and plan of satellite data access, processing, application and training)[2]

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

Appendix[3]

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

[2] If you reported your country report at the previous AOMSUC, please copy and paste corresponding items to here and make updates, if any, to them.
[3] If you reported your country report at the previous AOMSUC, please just copy and paste corresponding items here.

Abstract

- Satellite data are being used with the synoptic observations analysis and conventional weather forecast to the weather information for the public awareness. Since 1972 DMH used NOAA and GMS satellites images with facsimile products by WMO assisted. 1990s, DMH can be used AFDOS and Funyun satellite images by China. Currently several operational meteorological satellites are providing global and regional observations. Therefore, DMH is mainly used Himawari-8 since 2010 and get the data update every 10 minutes from it and including SATAID software. So, Japan Himawari-8 satellite is very useful for the daily weather forecasts for the weather information. It is currently in use are Visible, Infrared, EIRc, EIRm, Water Vapour, RGB and Potential Heavy rainfall Areas and SATAID products. However, about 120 observation stations and three radars is still not enough to cover all of Myanmar.
- Weather prediction holds the key for natural disaster prevention and mitigation, transportation safety, industrial prosperity, monitoring of climate change and international cooperation activities.
- Myanmar is exposed to several different kinds of natural hazards. In its recent history the country was faced with disaster events that severely impacted its people and the overall economy of the country. These disaster events include the 2006 cyclone Mala, 2008 cyclone Nargis, 2010 cyclone Giri, 2015 Cyclone Komen, 2017 Cyclone Maarutha, extreme weather events and major flooding in 1991, 1997, 2007 2011 and 2015. These events caused significant impact on the livelihood of the local communities, damage in the infrastructure systems of country, and sometimes a large number of fatalities.
- Therefore, DMH more need to study based on the satellite imagery for the specific weather forecasts and timely dissemination of warning of impending disaster such as cyclones through cyclones warning dissemination systems. DMH need to extent Satellite based on Rainfall Estimation techniques for Climate Change issues and Disaster Risk Reductions.

Satellite data and product requirements, training needs and infrastructure

- We need the application training for Satellites images
- Utilization of satellite application for water forecasting
- Rainfall estimation by using satellite images

Appendix

Background

I. Country overview
   I. Geography
   II. Population
   III. Climate
II. Major historical hydrometeorological disasters
   I. Disaster type and distribution
   II. Life and economic loss
III. Major national economic sectors relying on NMHSs
   I. Agriculture
   II. Transportation
   III. …

Country overview

Boundaries

Total Land Border Length: 6,522 kilometres (4,053 mi)

Total Land Area: 676,578 square kilometres (261,228 sq mi)

Border Countries:

Bangladesh: 271 kilometres (168 mi), India:1,468 kilometres (912 mi), China: 2,129 kilometres (1,323 mi), Laos: 238 kilometres (148 mi), Thailand: 2,416 kilometres (1,501 mi)

Coastline

Total coastline length:1,930 kilometres (1,200 mi)

Total water area: 23,070 square kilometres (8,910 sq mi)

- Myanmar, Agricultural based developing Country.
- Application of weather and Climate factors play an important role for the Rice and other Food production, Irrigation and Water Resource, Transportation and other socio-economic sectors.
- It enjoys the Southwest Monsoon. Most of the areas receive 90% of annual rainfall by Southwest Monsoon season.
- Area: 677,000 square kilometer-ranging 936 kilometers (581 miles) from east to west and 2,051 kilometers from north to south.
- Population 51.4 Million (April 2014)

https://en.wikipedia.org/wiki/Geography_of_Myanmar

Myanmar has a monsoon climate with three main seasons.

The cold and dry season, November to February,

average monthly temperatures - 20°C to 24°C.

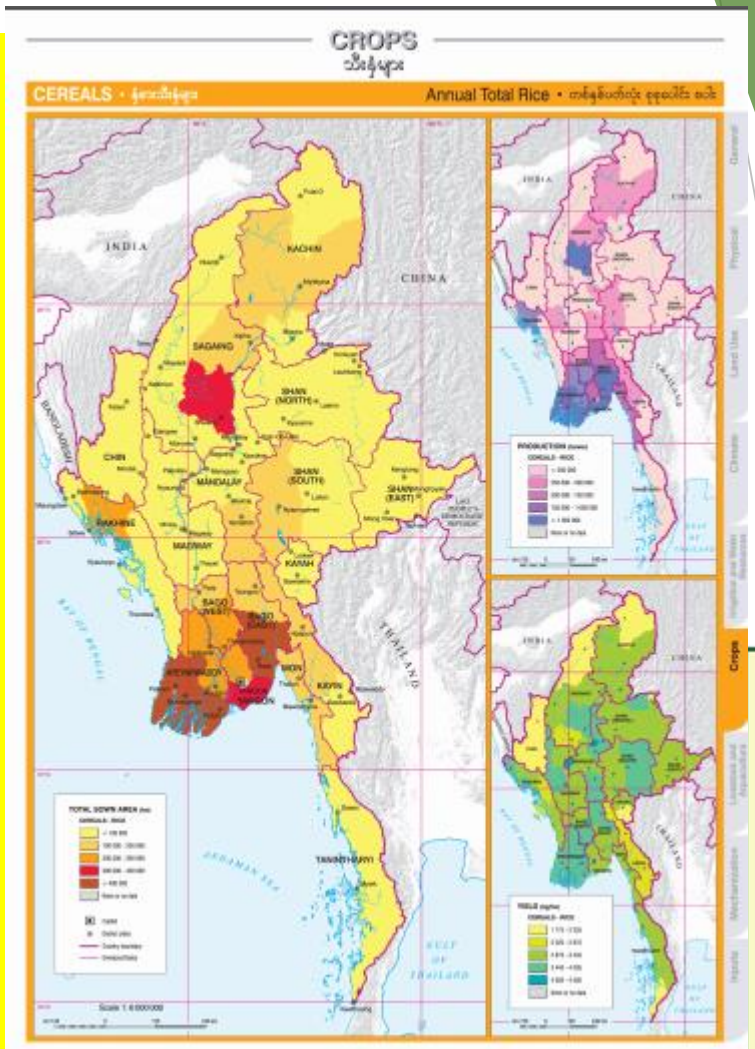
The hot-dry season March to April with average

monthly temperatures - 30°C to 35°C.

The wet season May and October

average temperature - 25°C and 30°C.

Annual rainfall in the delta region is approximately 2,500 millimeters (Yangon 2700 mm), while average annual rainfall in the Dry Zone is less than 1,000 millimeters (Mandalay 840 mm), the coastal regions receiving over 5,000 millimeters of rain annually.



Myanmar Population

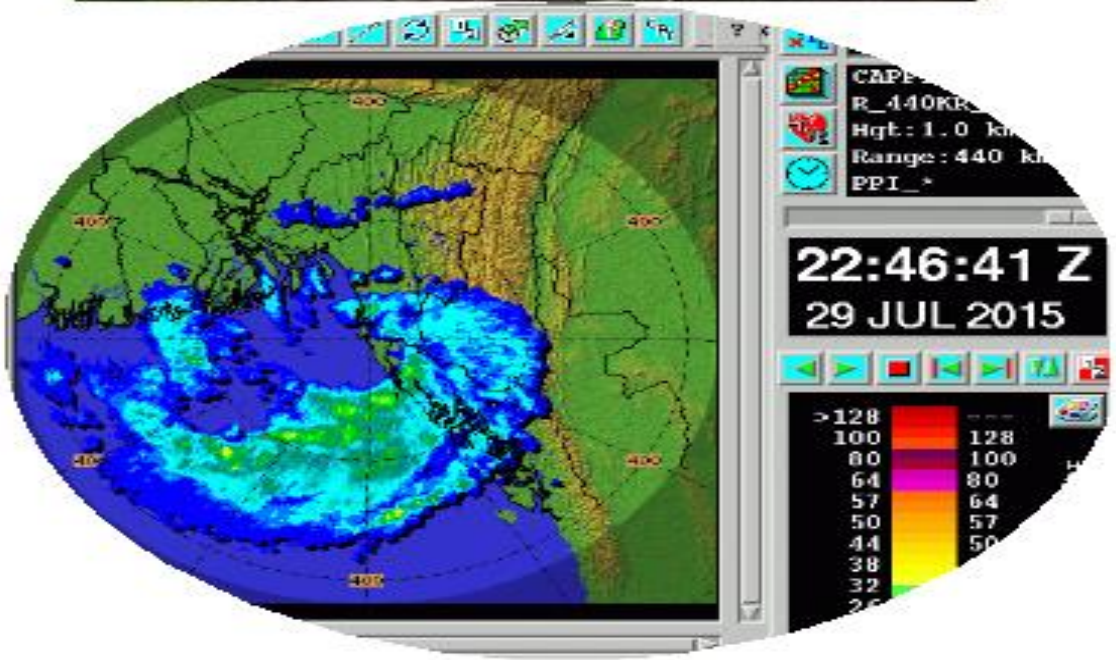
55,325,333	Current population
27,263,202	Current male population (49.3%)
28,062,131	Current female population (50.7%)

Myanmar is an extremely ethnically diverse nation with 135 distinct ethnic groups officially recognised by the Government.

Impacts of severe flood and landslide in Myanmar (2015)

Impacts of severe flood and landslide in Myanmar (2015)

Heavy fall
In Sagaing
Region



Impacts of severe flood and landslide in Myanmar (2016)

Impacts of severe flood in Myanmar (2017)

Impacts of severe flood in Myanmar (2018)

Disasters in Myanmar

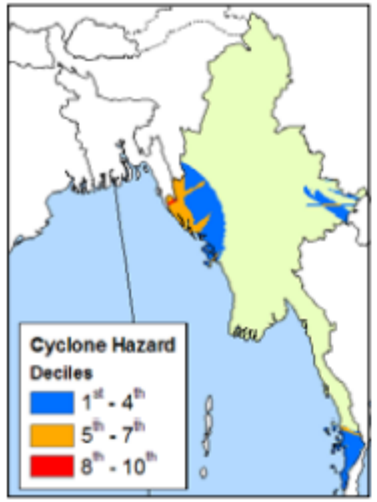
Burma (Myanmar) Natural Disaster Profile

Basic Facts:

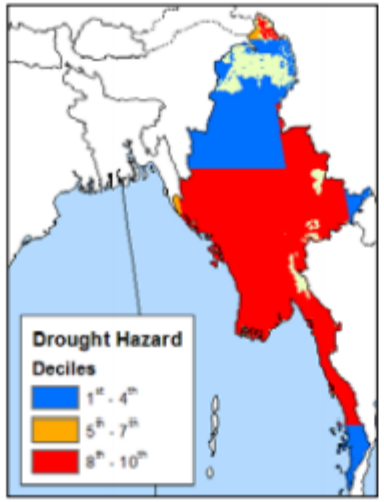
Area: 678,500 km^2
Coastline: 1930 km
Population: 42,720,196

GDP (PPP): $74.53 billion
GDP Per Capita: $1,800
Population Below Poverty Line: 25%

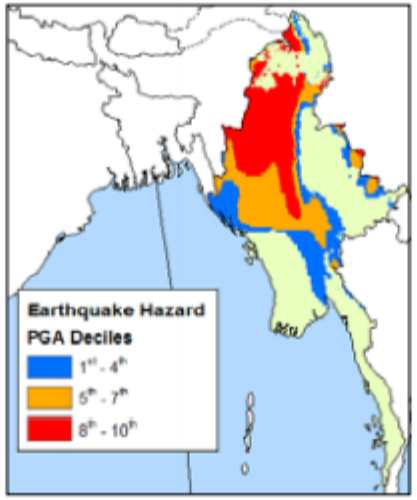
Natural Disaster Risk Hotspots:



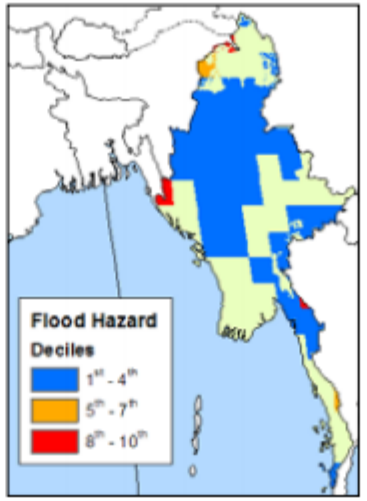
Cyclones



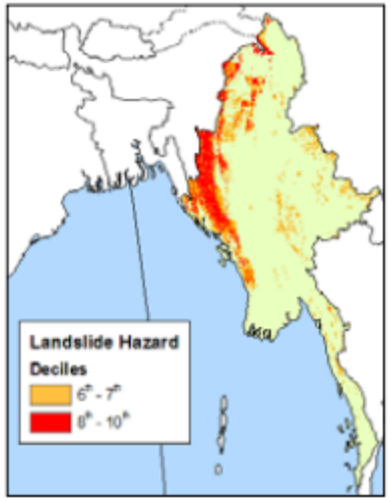
Droughts



Earthquakes



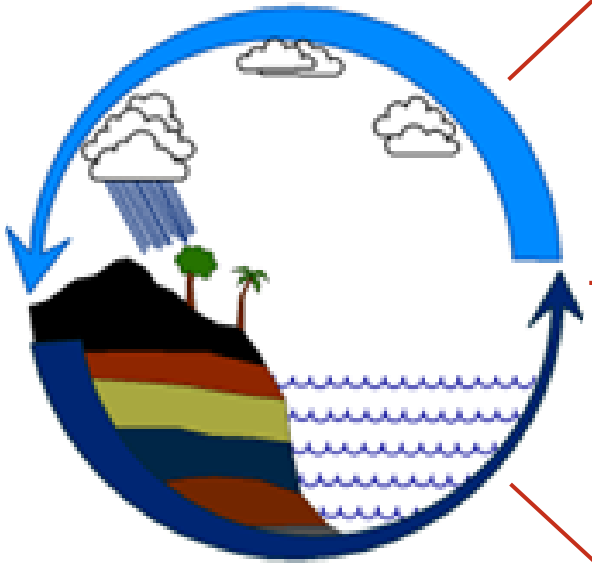
Floods



Landslides

Source: https://www.ldeo.columbia.edu/chrr/research/profiles/pdfs/burma_profile1.pdf

NMHS Activities



Current forecasting System

Warning service

Recent Activities

MYANMAR

DMH
NAY PYI TAW

Objectives of the DMH

(1) To take precautionary measures against and minimize the effects of natural disasters

(2) To promote safety, comfort, efficiency and regularity of air, land (rail & road), sea and inland water transportation.

(3) To bring sustainable development of natural resources (hydro electric power, forest produce, water use, wind energy, etc.)

(4) To promote agricultural and food production.

(5) To ensure efficient operation, planning and development of activities in natural defense, industry, health, social welfare and all sectors of national economy.

(6) To undertake international collaboration for all development activities and works of the DMH

Climate of Myanmar

Myanmar is roughly diamond-shaped – with a long southeastern 'tail'
925km (575 miles) from east to west
2,100km (1,300 miles) from north to south
bounded by China, Laos and Thailand in the east,
by Bangladesh and India in the north
by the Indian Ocean in the west and south.

Myanmar has a monsoon climate with three main seasons.
The cold and dry season, November to February,
average monthly temperatures - 20°C to 24°C.
The hot-dry season March to April with average
monthly temperatures - 30°C to 35°C.
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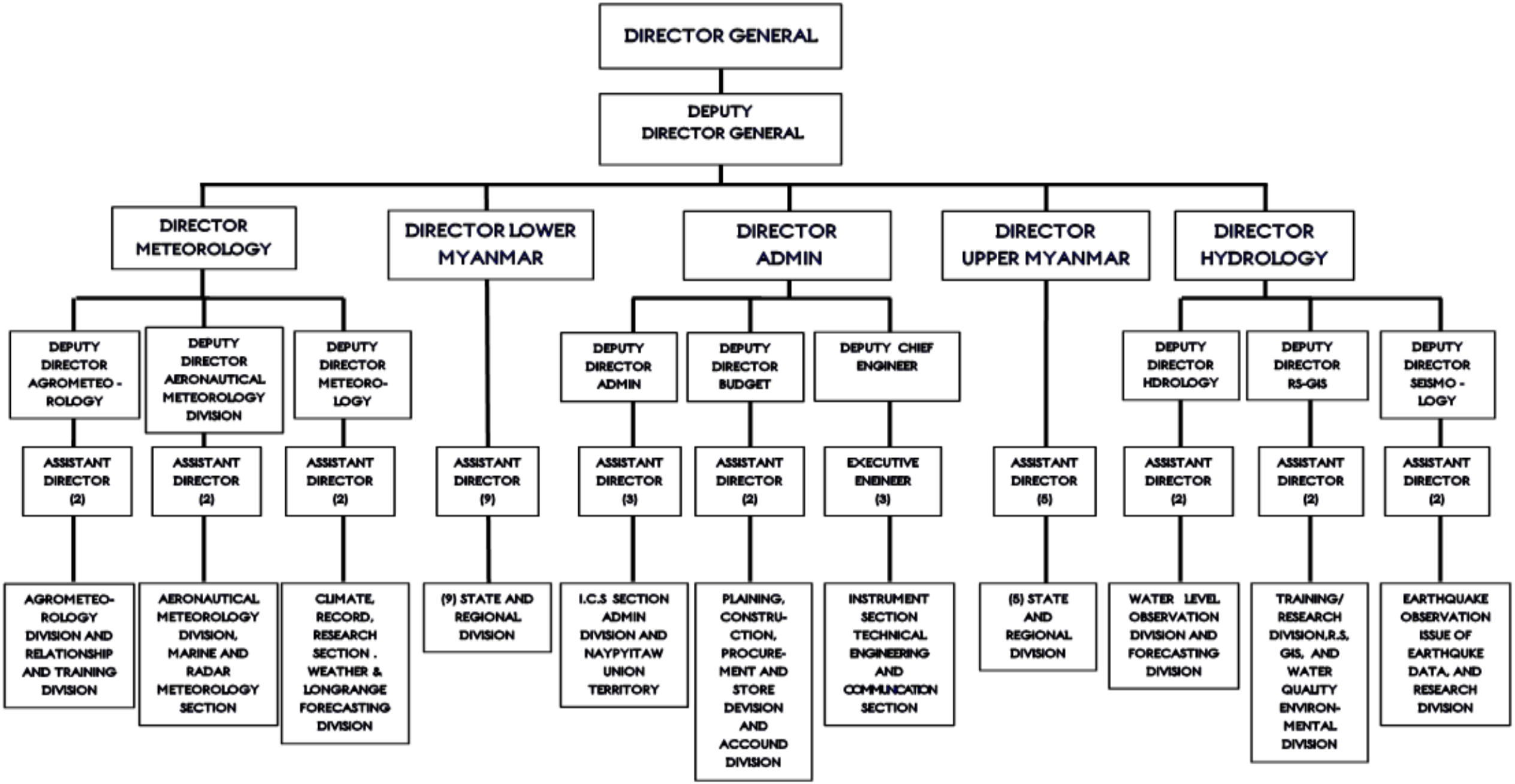
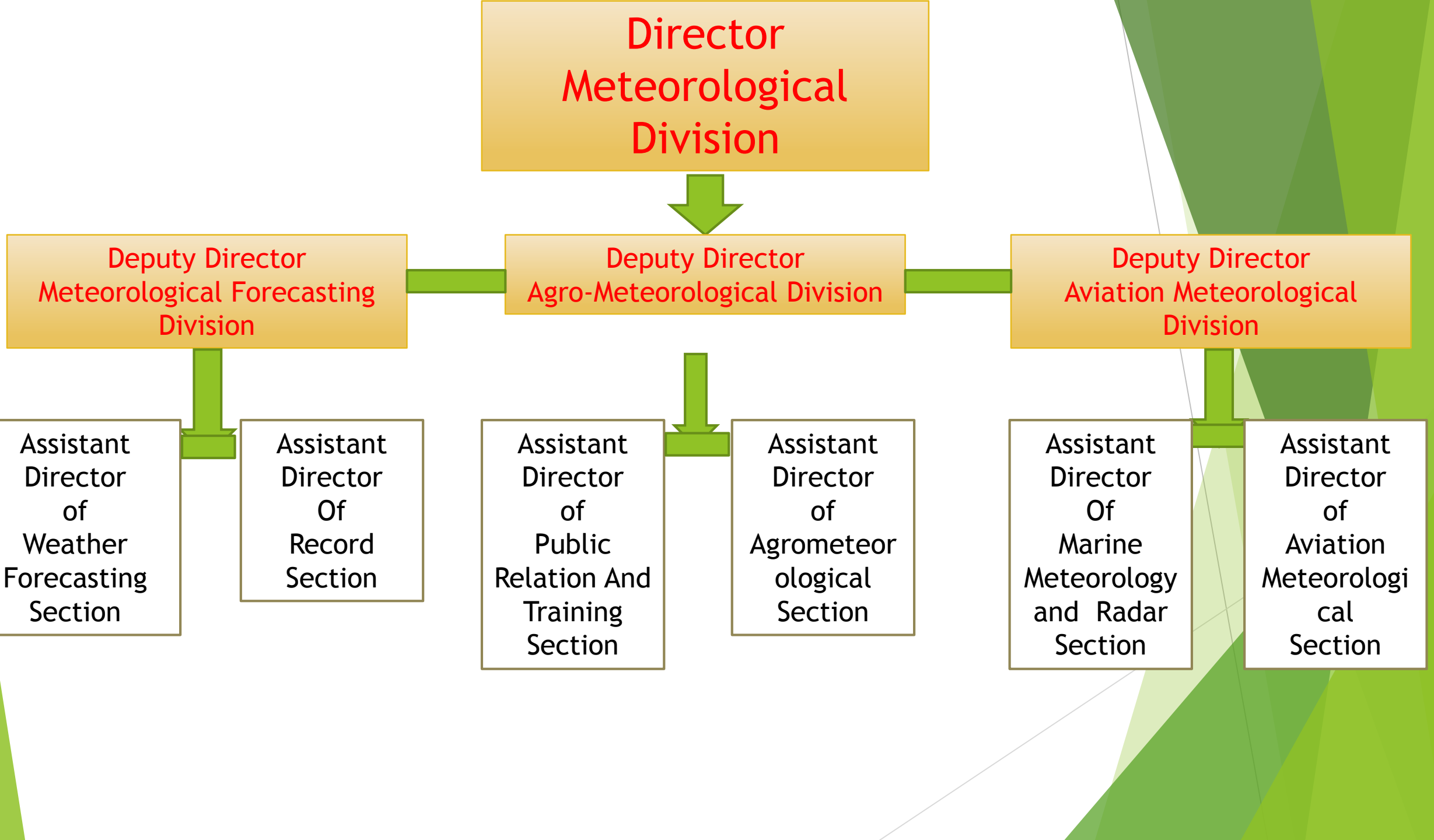
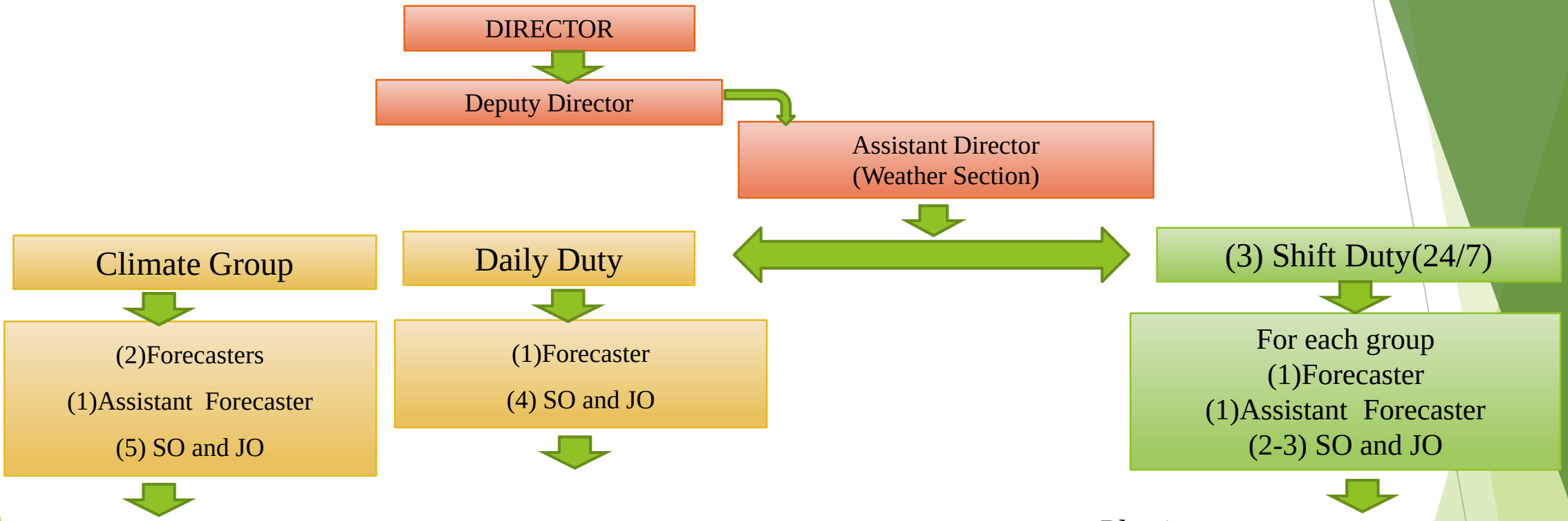
Annual rainfall in the delta region is approximately 2,500 millimeters (Yangon 2700 mm), while average annual rainfall in the Dry Zone is less than 1,000 millimeters (Mandalay 840 mm), the coastal regions receiving over 5,000 millimeters of rain annually.

ORGANIZATION CHART




Director Meteorological Division
Deputy Director Meteorological Forecasting Division
Deputy Director Agro-Meteorological Division
Deputy Director Aviation Meteorological Division
Assistant Director of Weather Forecasting Section
Assistant Director Of Record Section
Assistant Director of Public Relation And Training Section
Assistant Director of Agrometeorological Section
Assistant Director Of Marine Meteorology and Radar Section
Assistant Director of Aviation Meteorological Section

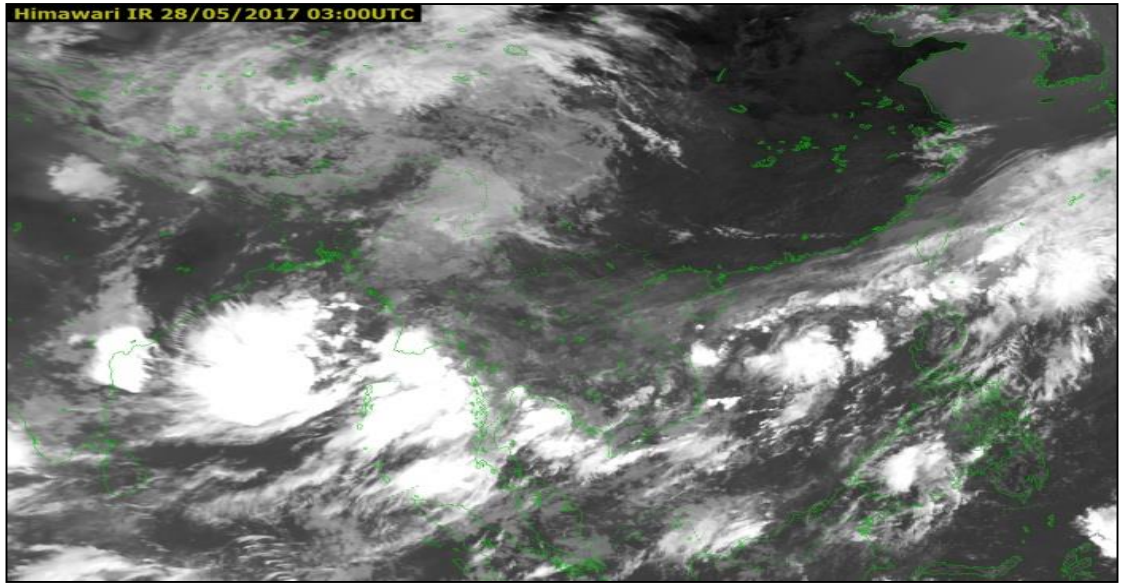
Skill Manpower of Weather and Long Range forecasting Division (Nay Pyi Taw)

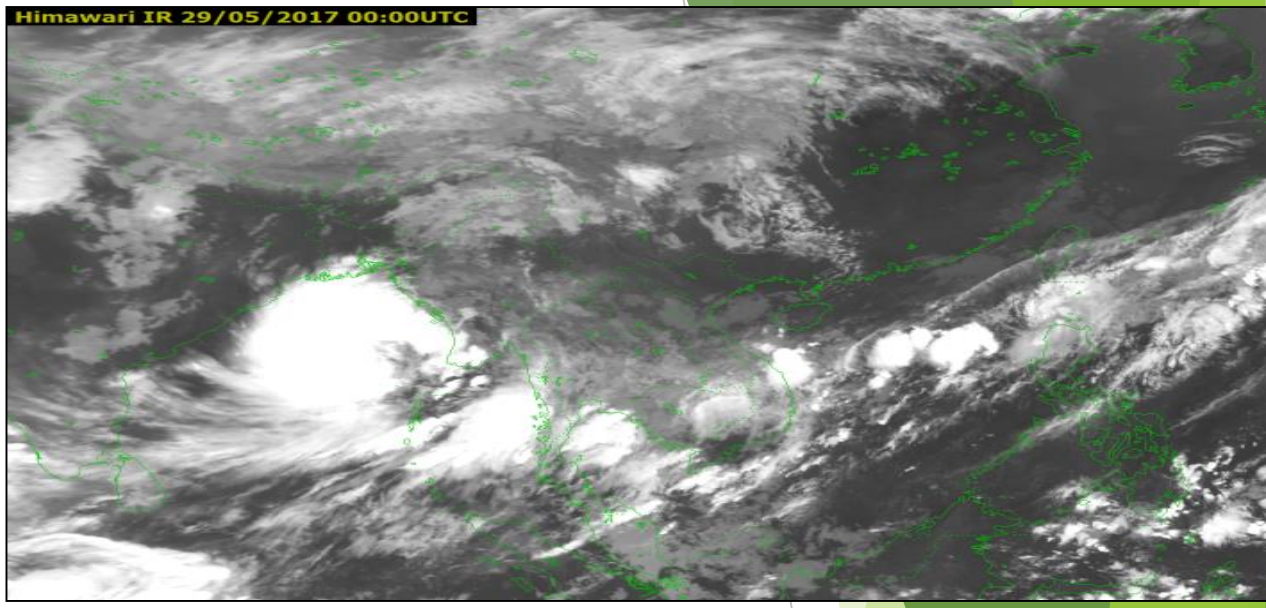


- Climate Modeling
- Seasonal Forecast
- Monthly Forecast
- 10 Days Forecast
- Research

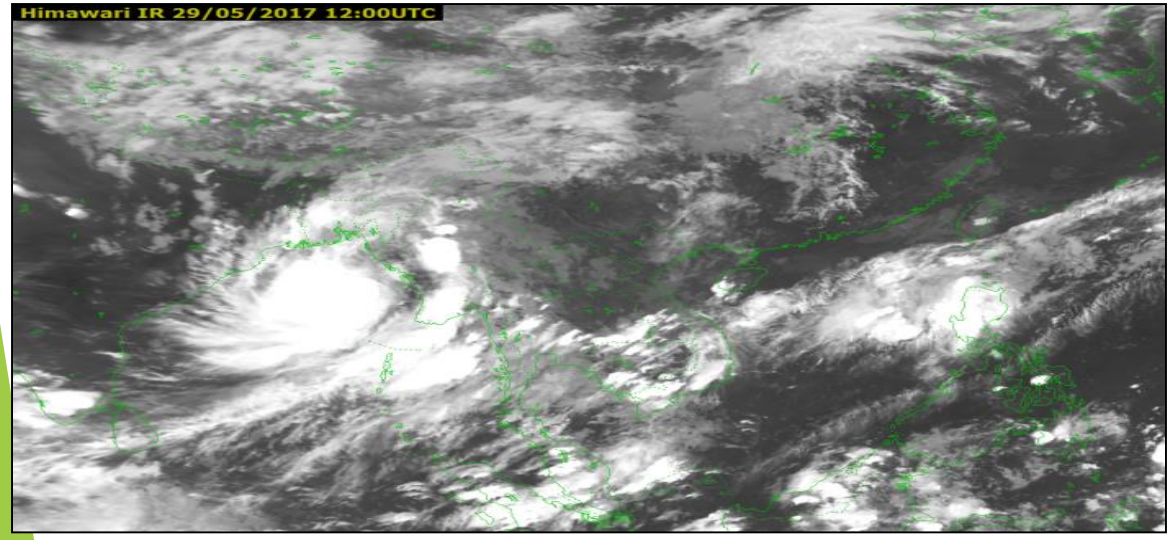
- Management
- Meeting / Workshop Training
- Data collection
- Administration

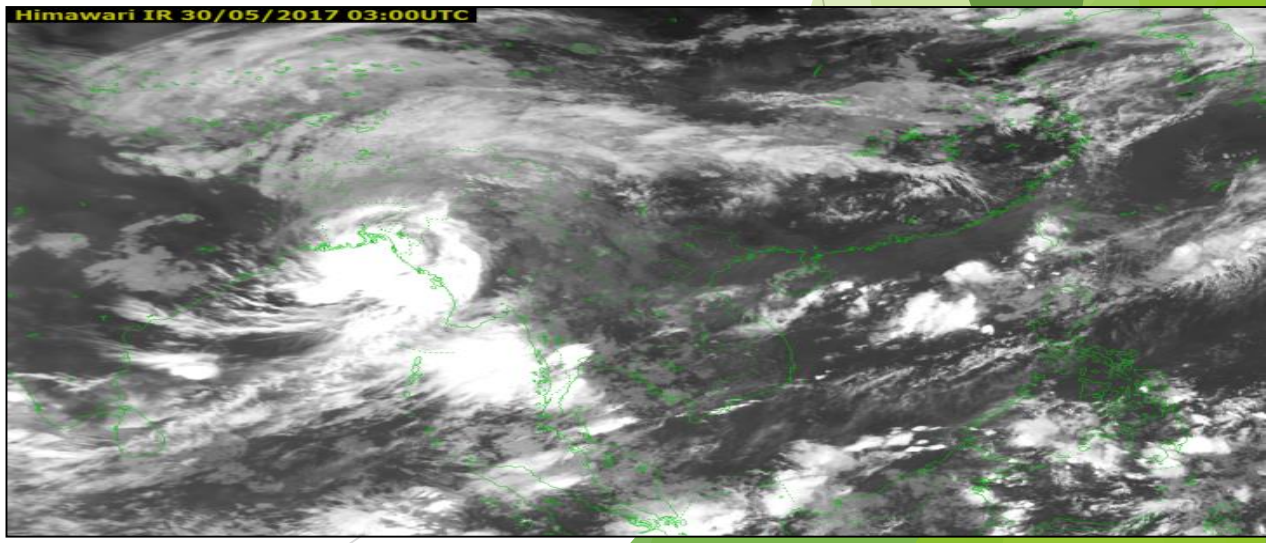
- Plotting
- Analysis of Weather chart
- Weather forecasting
- Sending Fax (dissemination)
- To issue Warning/News

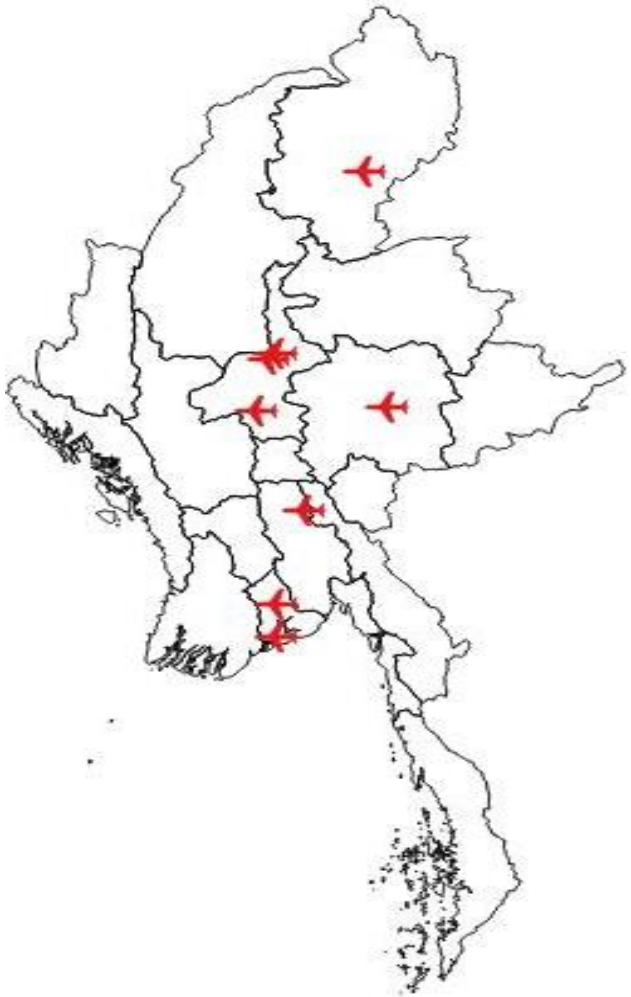




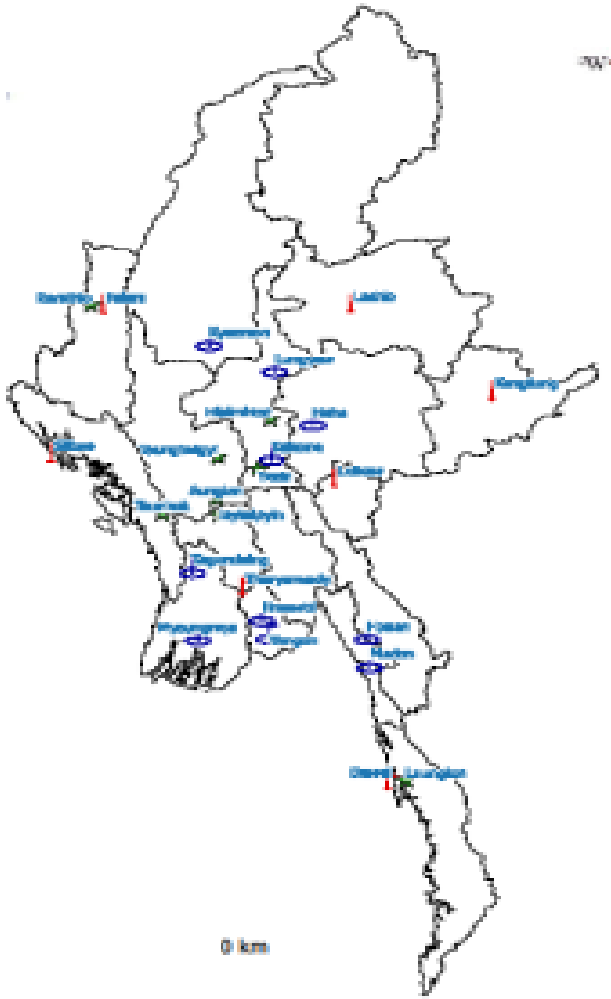
2017 Cyclone “MORA”







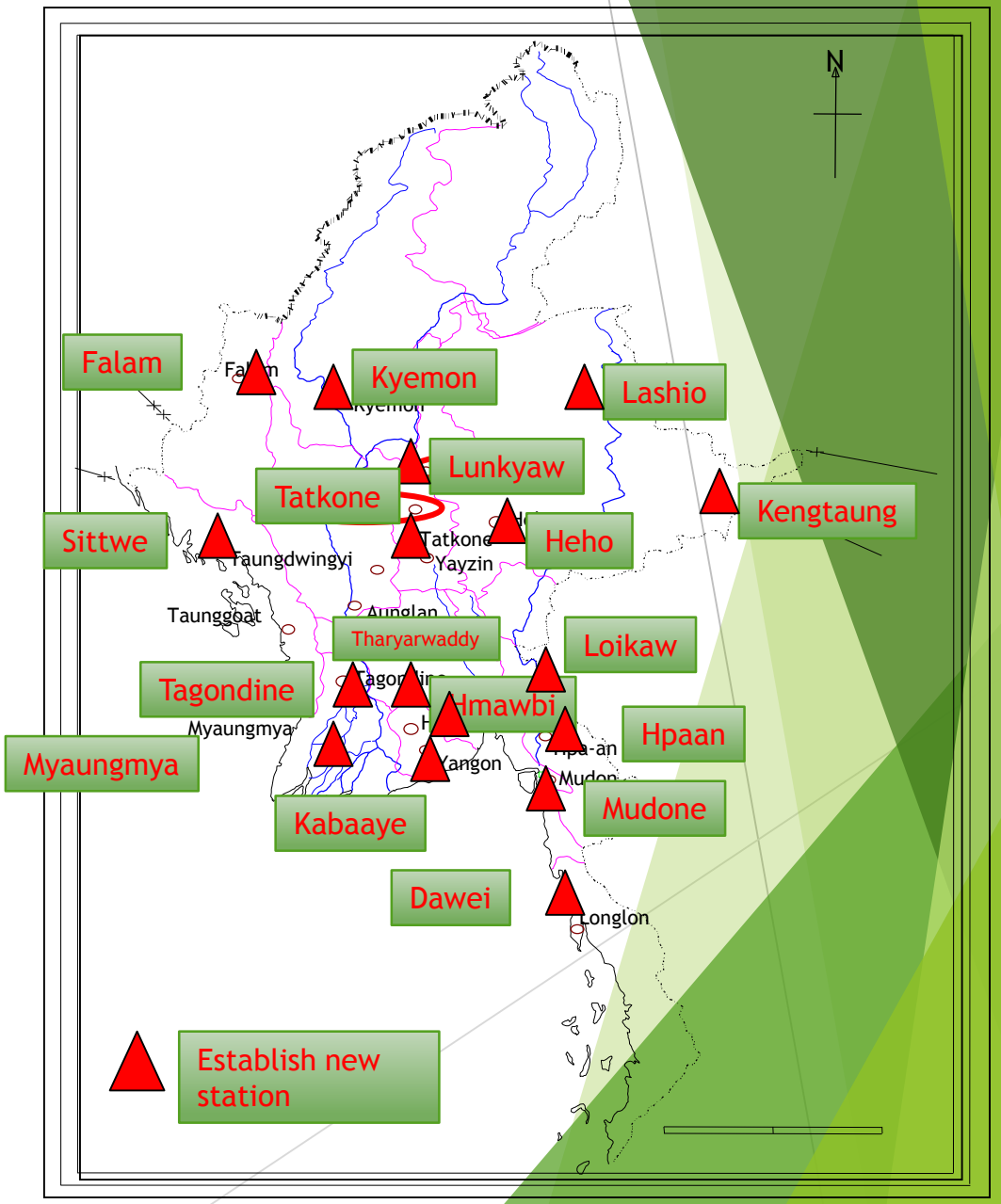
8 Aviation Stations



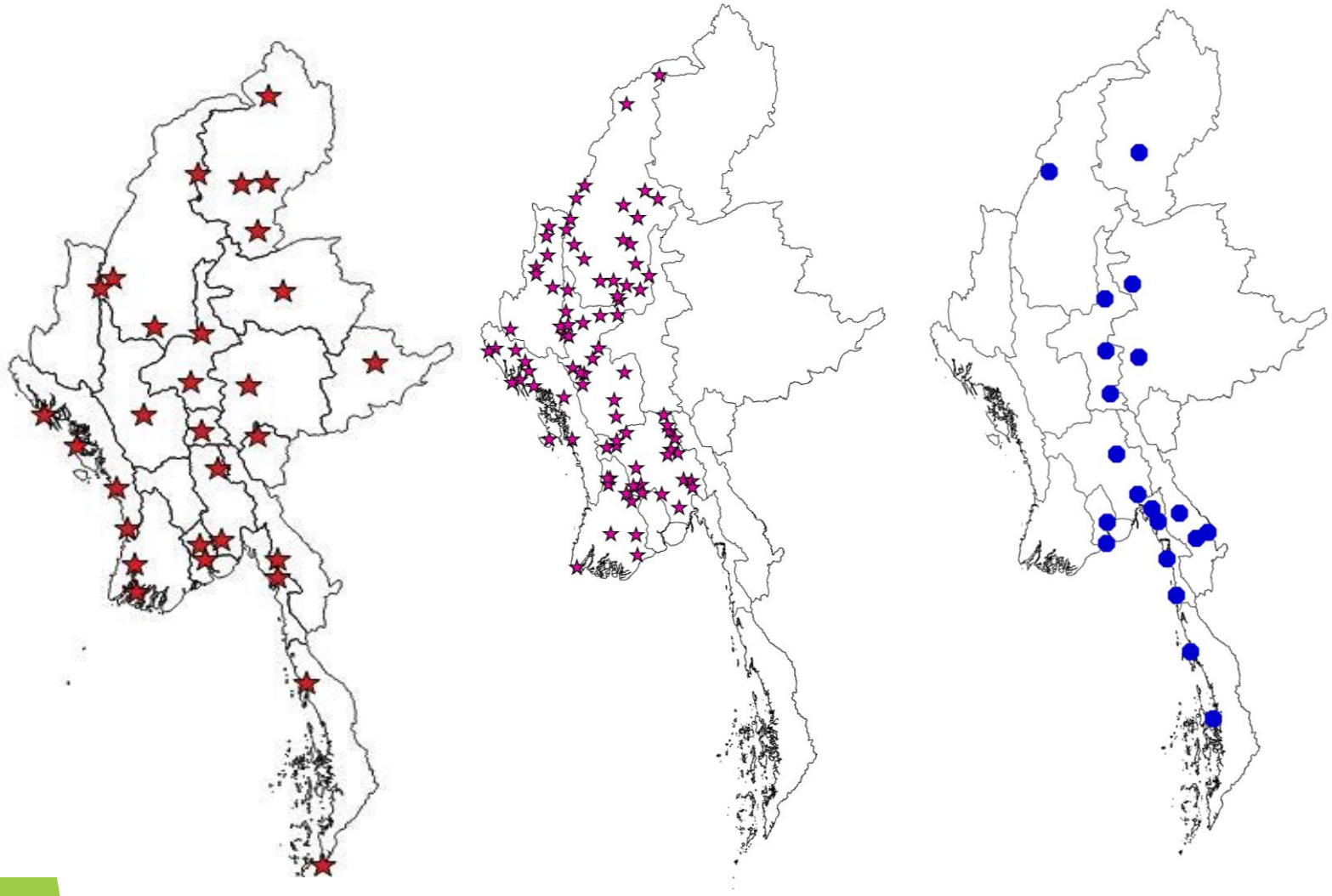
17 Agro-Met Stations

121 Manual Reporting Stations

AWS


N
Falam
Kyemon
Lashio
Lunkyaw
Tatkone
Kengtaung
Sittwe
Heho
Faungdwingyi
Yayzin
Taunggoat
Tharyarwaddy
Loikaw
Tagondine
Hmawbi
Hpaan
Myaungmya
Kabaaye
Mudone
Dawei
Longlon
Establish new station

Meteorological Automatic Observation Network

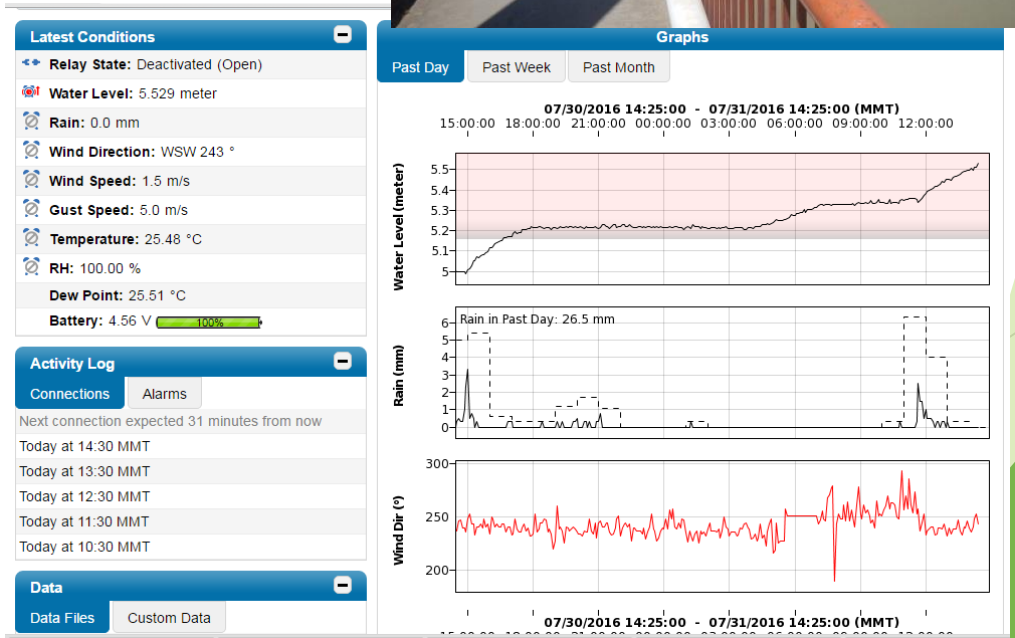


JICA 51 Stations

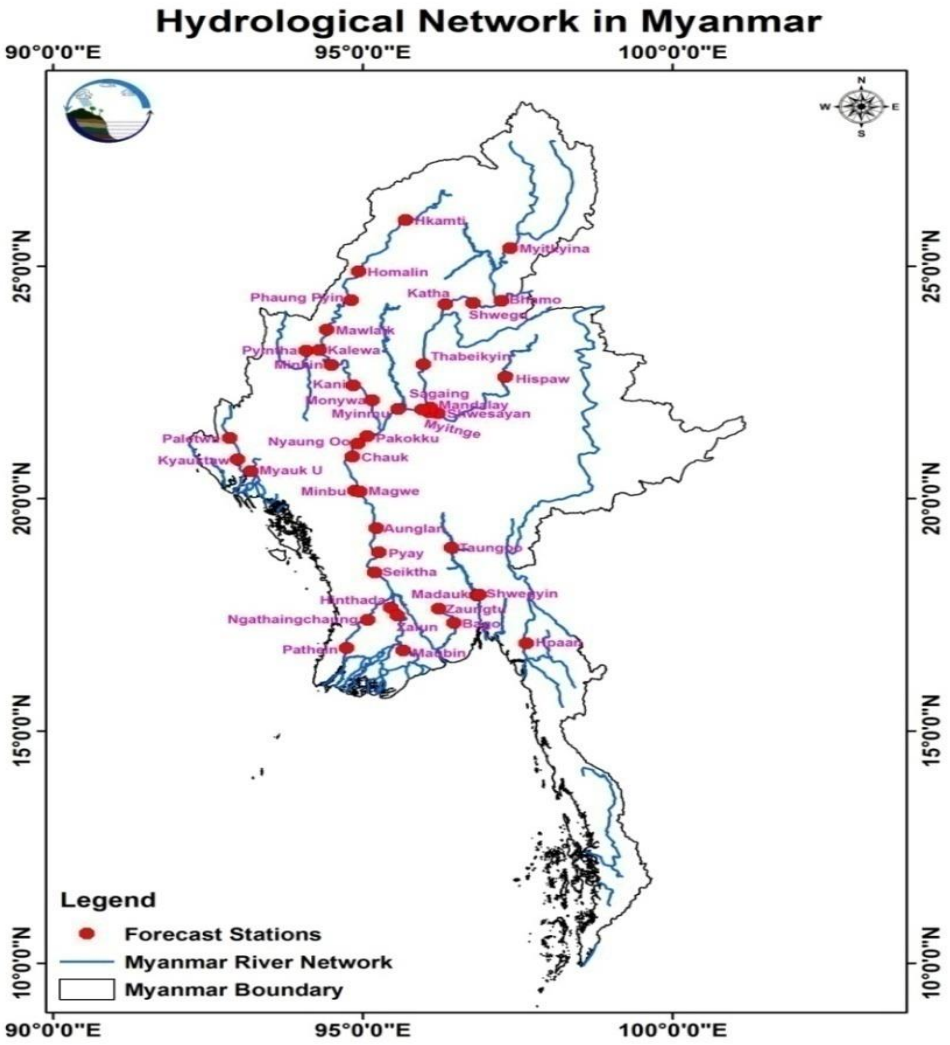
ITCZ 88 Stations

20 Stations

DMH's Water Level Observation System



Hydrological data observation and flood monitoring network system in Myanmar



Hydrological observation Stations in Myanmar

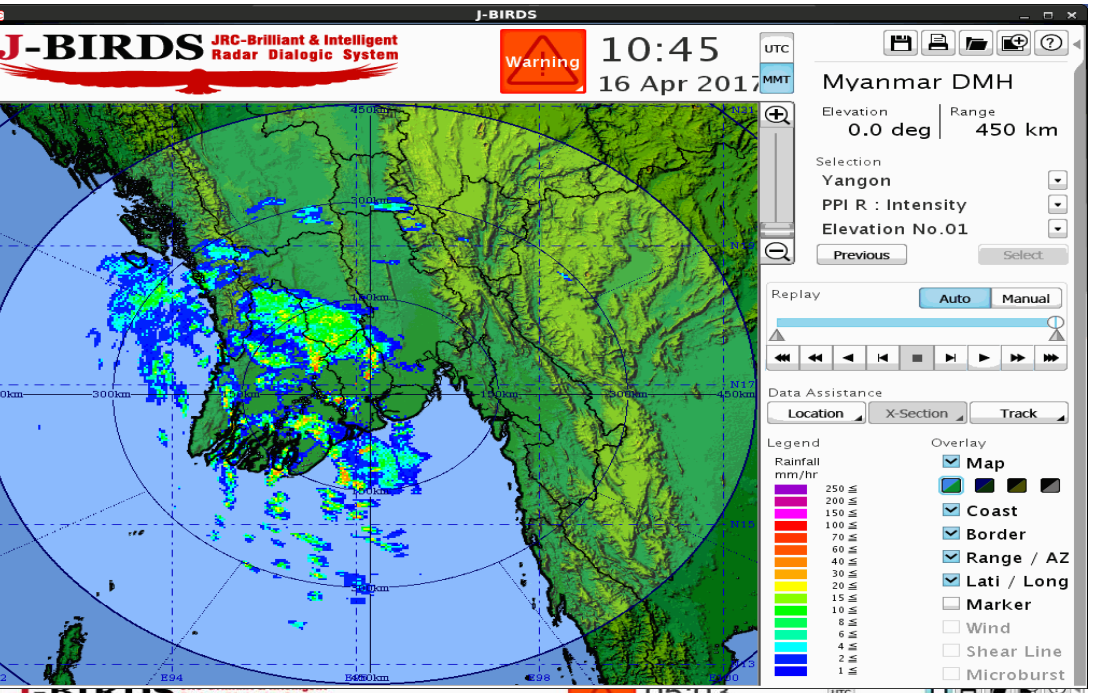
Department of Meteorology and Hydrology [DMH] plays an active role in disaster risk reduction of Myanmar, particularly in Early Warning Dissemination.

DMH has (72) Hydrological observation stations.

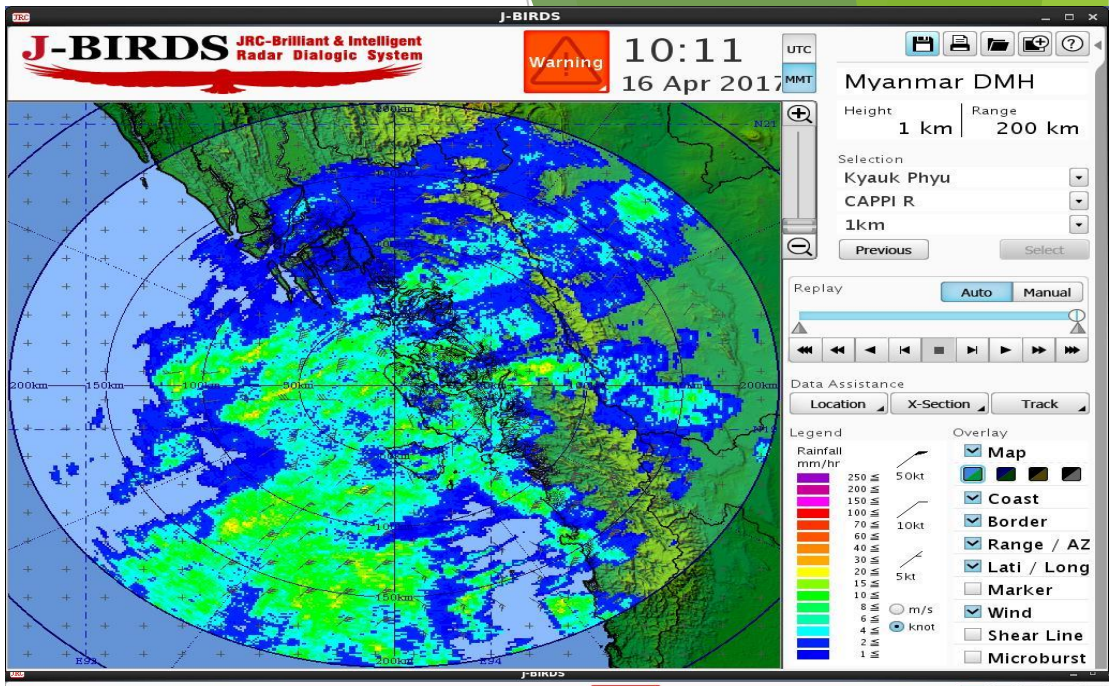
DMH issue Daily, (10) days, monthly and seasonal water level forecasts for major (12) rivers and also issues the flood warning and flood bulletin for these (42) stations during monsoon period.

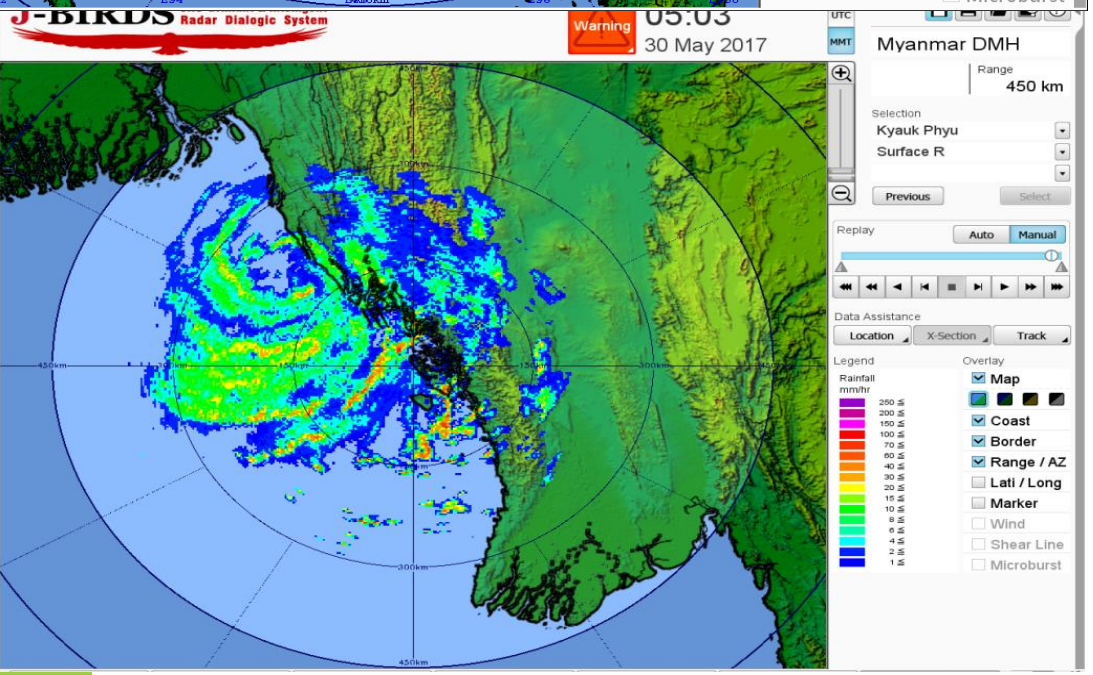
And also the minimum alert water level issue for (7) stations in central Myanmar area on Ayeyarwady and Chindwin rivers in low flow period.

Radar Products

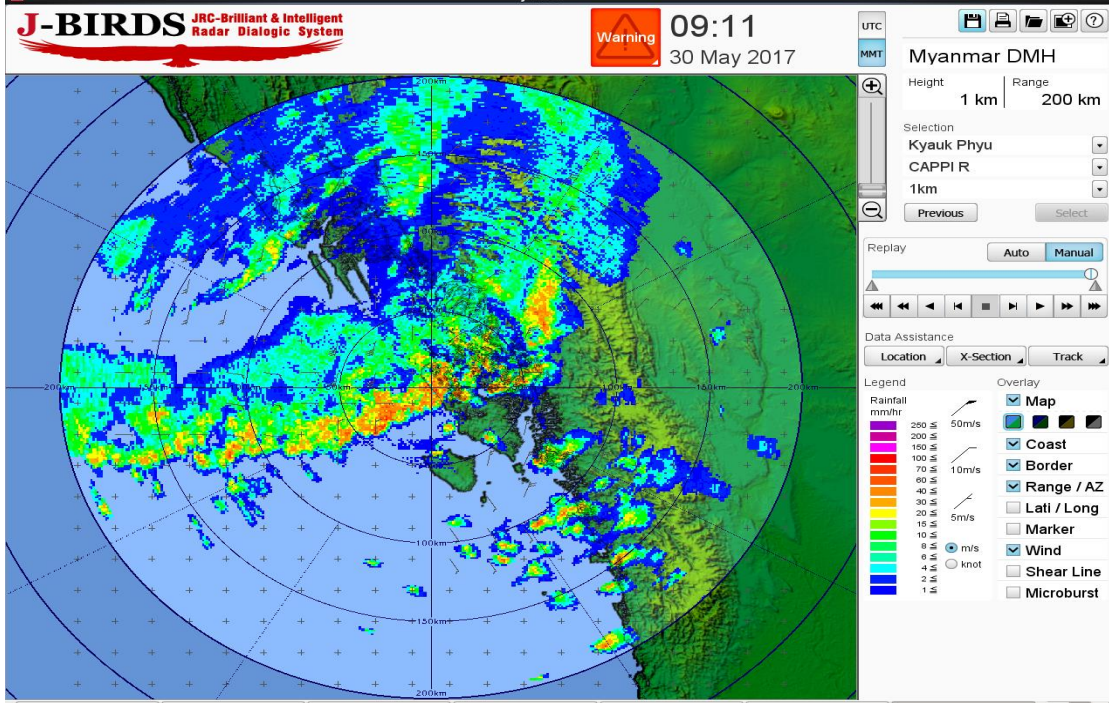


Cyclonic Storm "MAARUTHA" 14-17 Apr17





Radar Images (Kyauk phyu) Cyclonic Storm "MORA" 25-30 May 2017

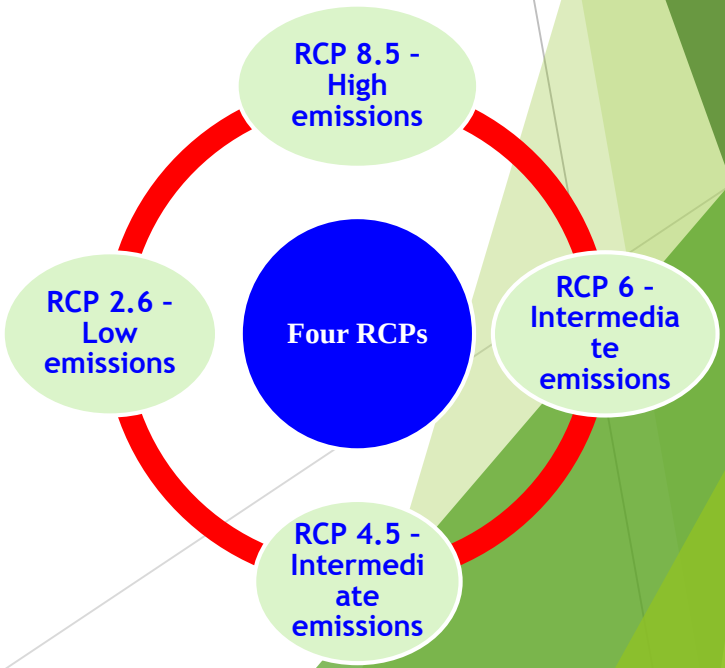


Climate Change Projection Activity in DMH

CMIP5 models included in GDDP dataset

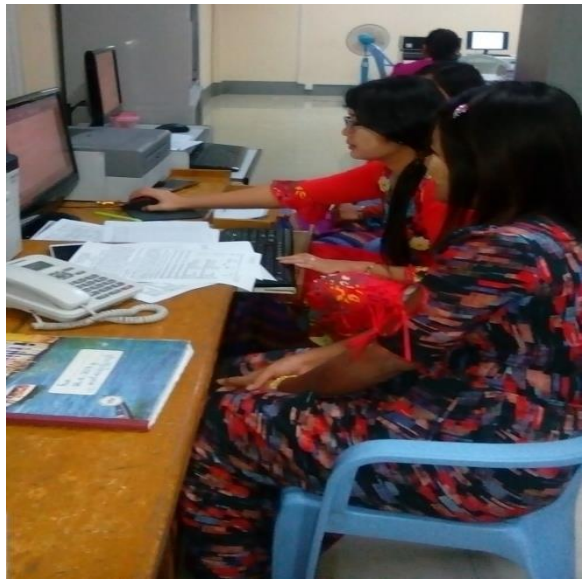
NASA Earth Exchange Global Daily Downscaled Projections (NEX-GDDP)

ACCESS1-0	CSIRO-MK3-6-0	MIROC-ESM
BCC-CSM1-1	GFDL-CM3	MIROC-ESM-CHEM
BNU-ESM	GFDL-ESM2G	MIROC5
CanESM2	GFDL-ESM2M	MPI-ESM-LR
CCSM4	INMCM4	MPI-ESM-MR
CESM1-BGC	IPSL-CM5A-LR	MRI-CGCM3
CNRM-CM5	IPSL-CM5A-MR	NorESM1-M



WEATHER DISCUSSION

Operation
Daily Weather FC

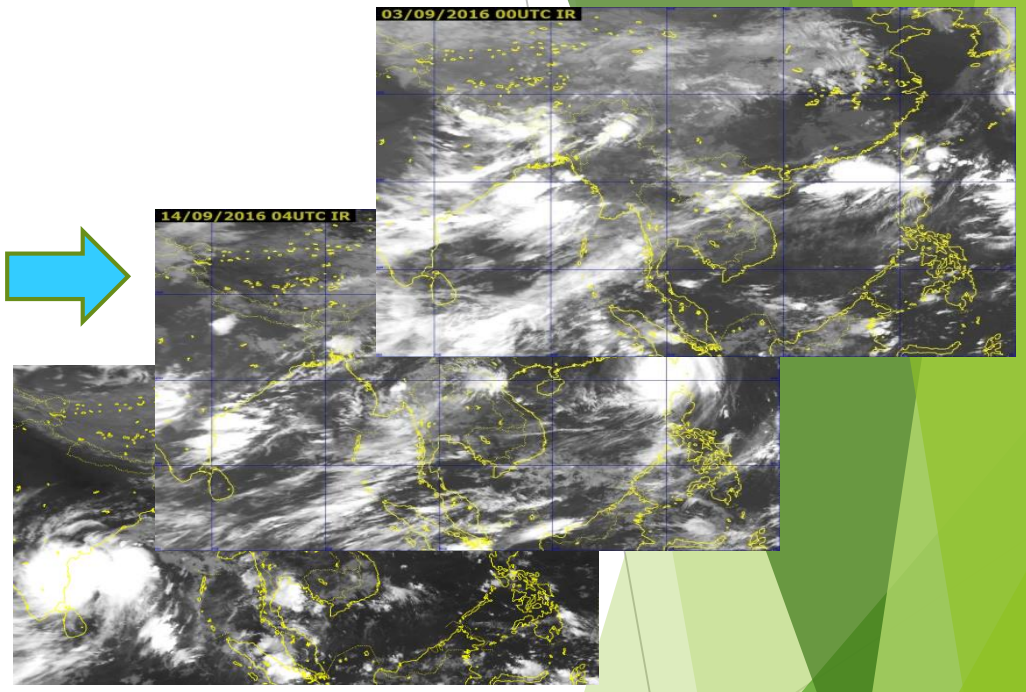


Access, Processing and Application of Satellite Data and Products

I. List of satellites/instruments currently used operationally for NWP, nowcasting and other applications
II. Current capabilities of access, processing and archiving of satellite data and products
III. Current satellite data applications
    I. Key application areas
    II. Satellite-based products

Satellite

Installation of Himawari cast and SATAID (JICA)

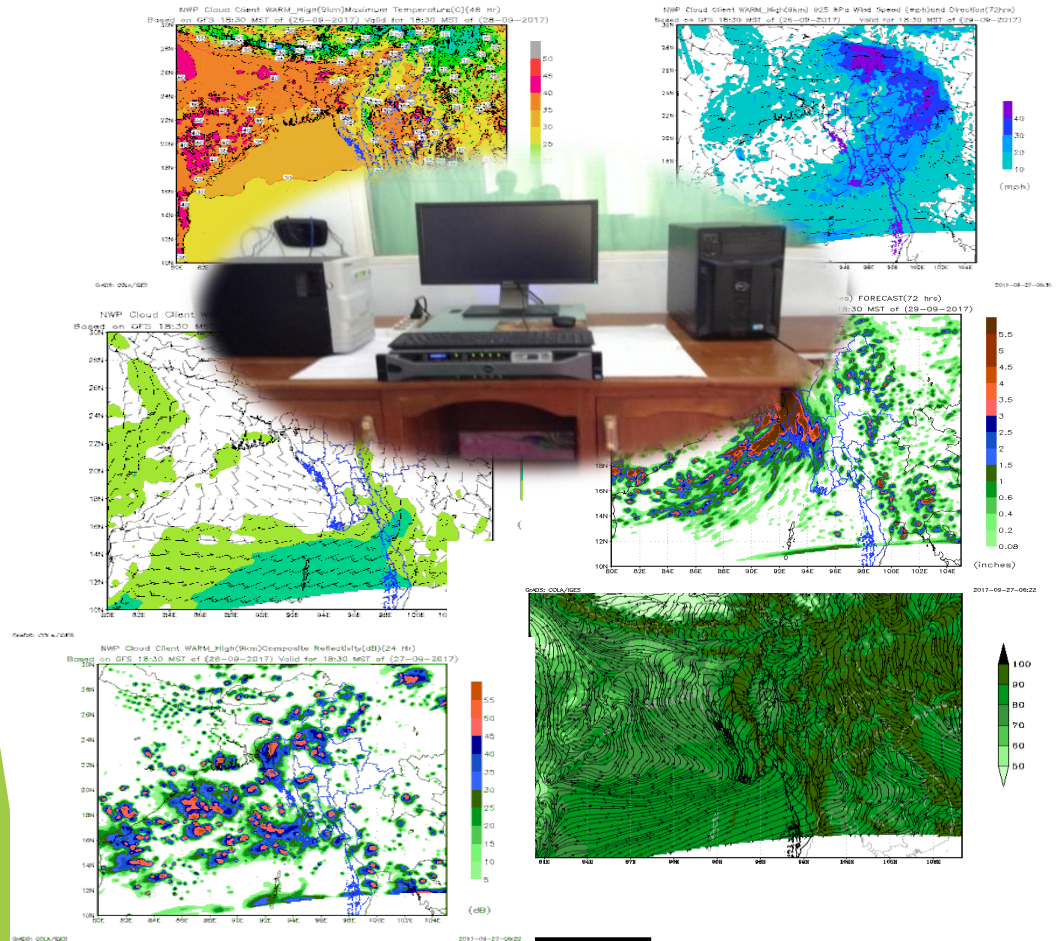


Himawari cast Direct Receiving Antenna

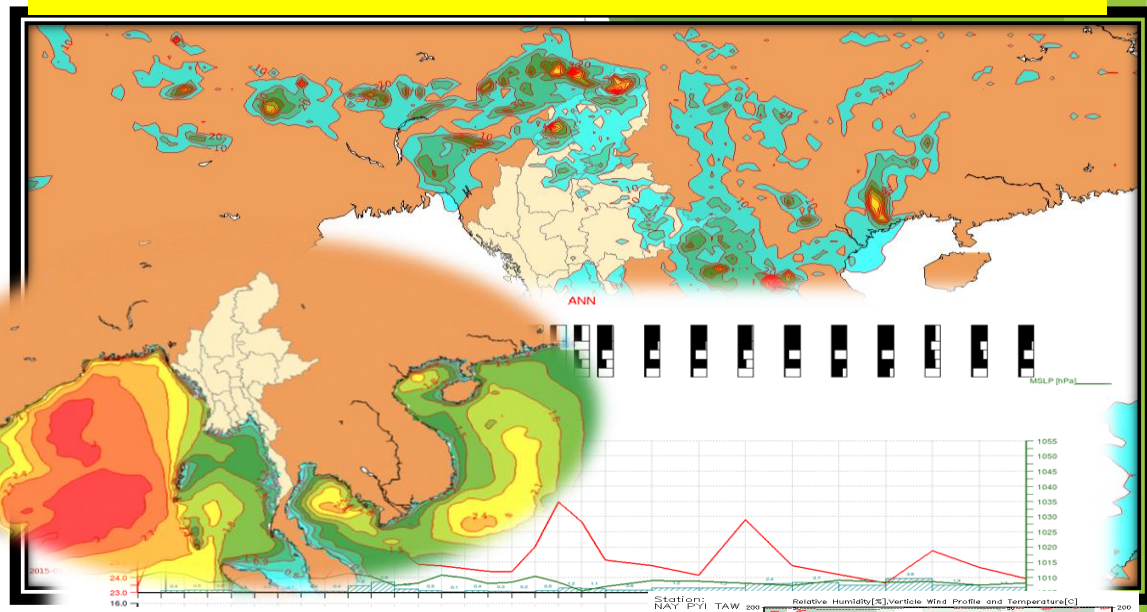
MTSAT/HRIT Data Processing System in DMH, Nay Pyi Taw

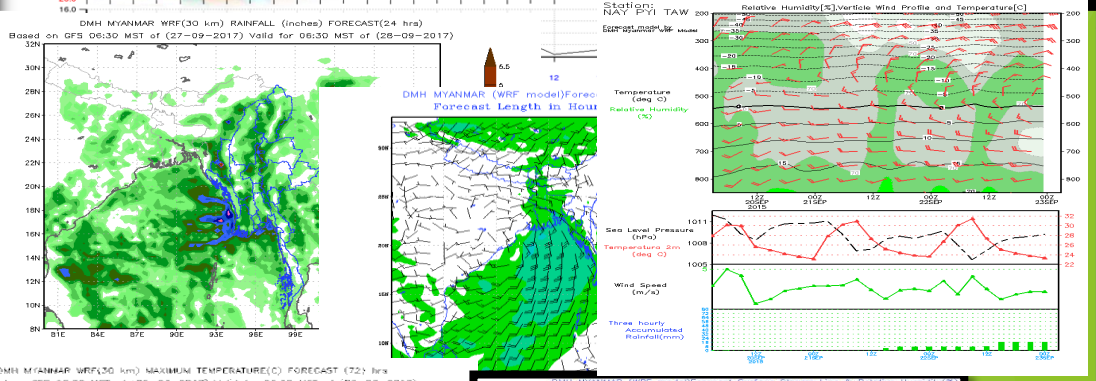
Installation of MTSAT and SATAID are started from 2010 December, donated by JICA . Preparing Himawari 8 (MTSAT) received November, 2015)

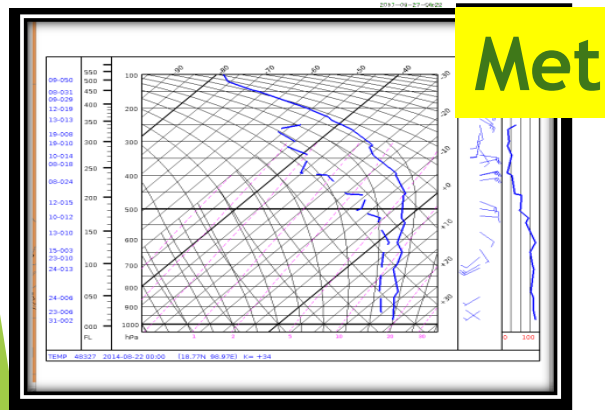
WARMS (9km Resolution)



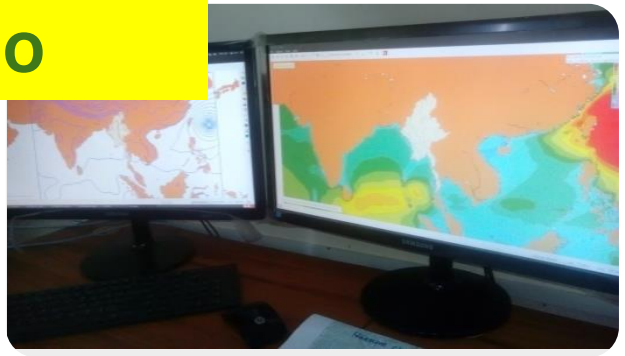
Numerical Weather Prediction : WRF and DIANA

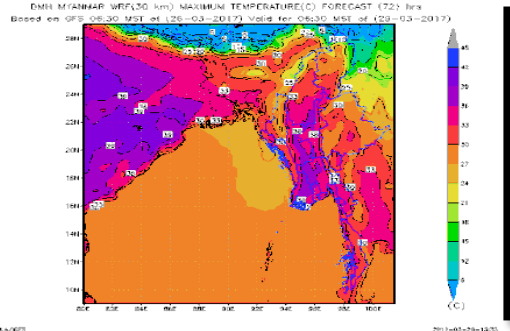


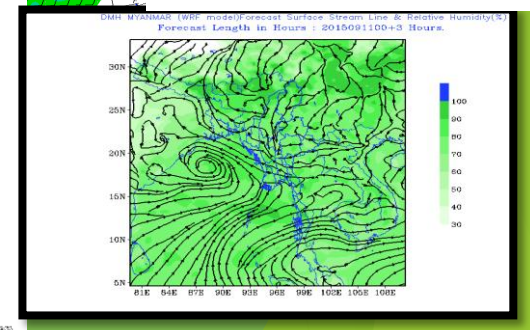


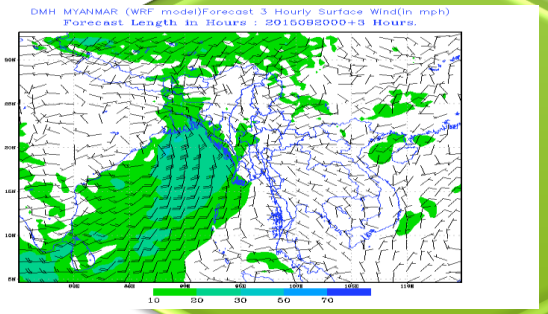


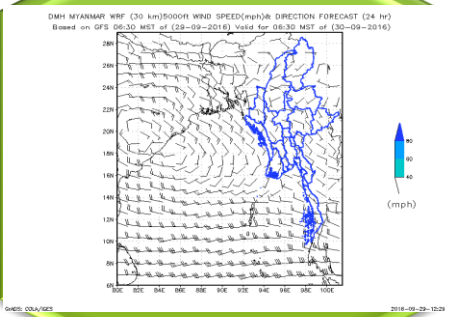
Met.no



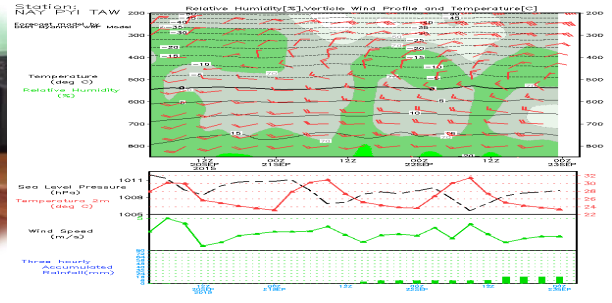


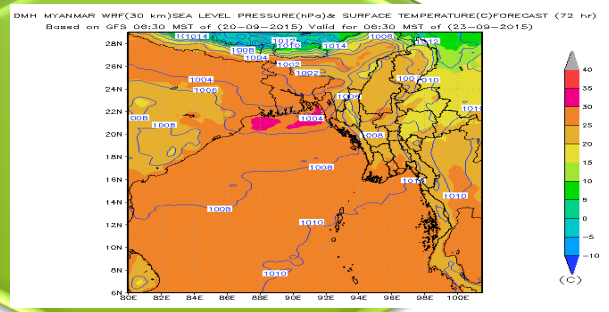




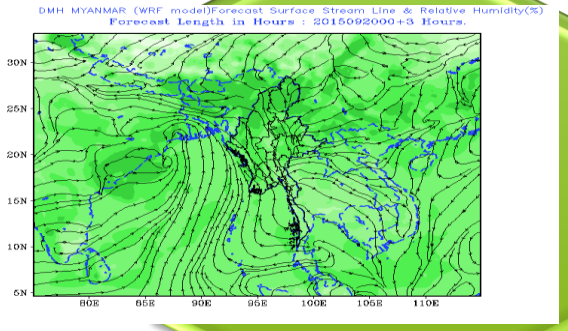


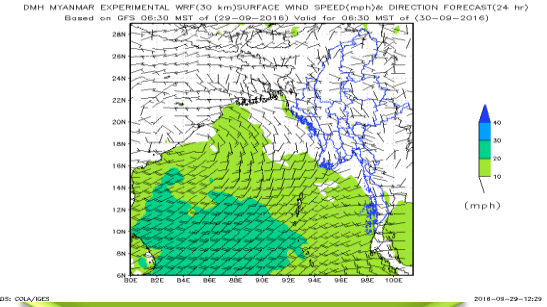
WRF Output





30 km and 9 km





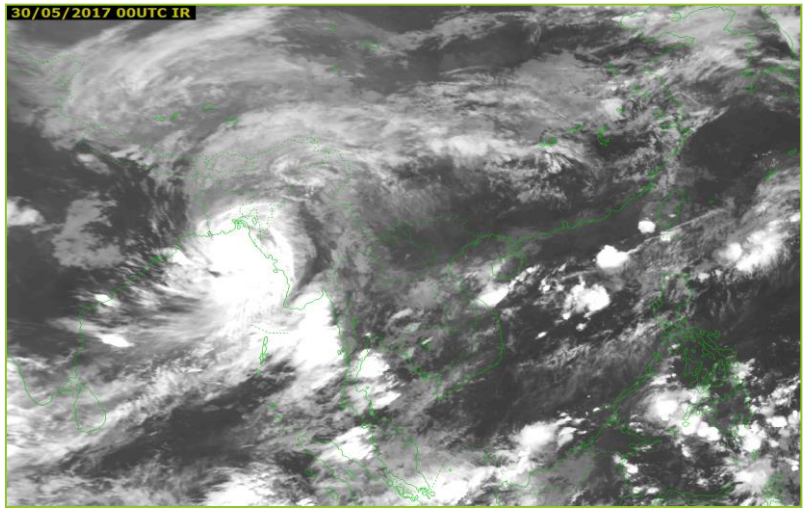
Satellite Data to address Regional Challenges

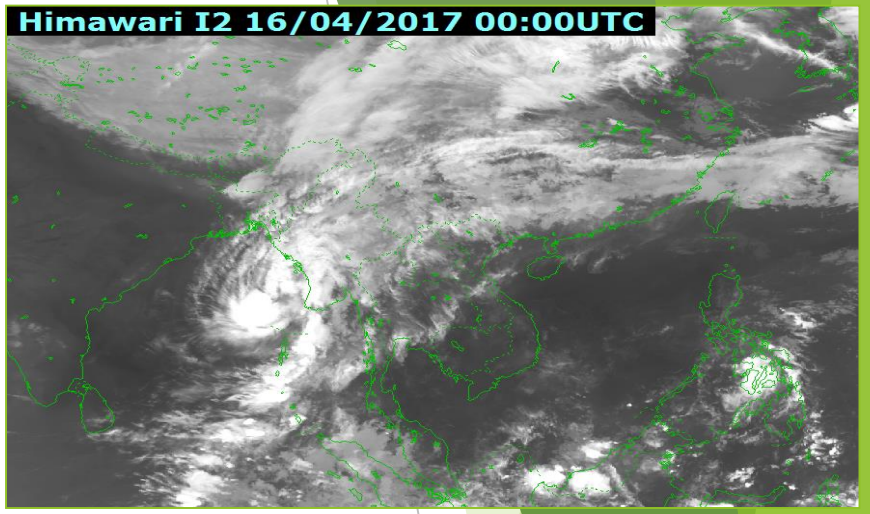
Please provide several showcases (examples) on the satellite data used in your NMHS, including from the new-generation of geostationary satellites, to address the national and regional challenges.

Cyclonic Storm “MORA”

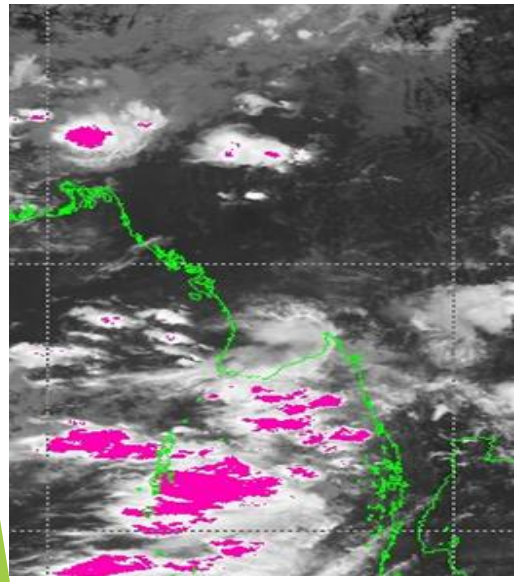
Satellite Images

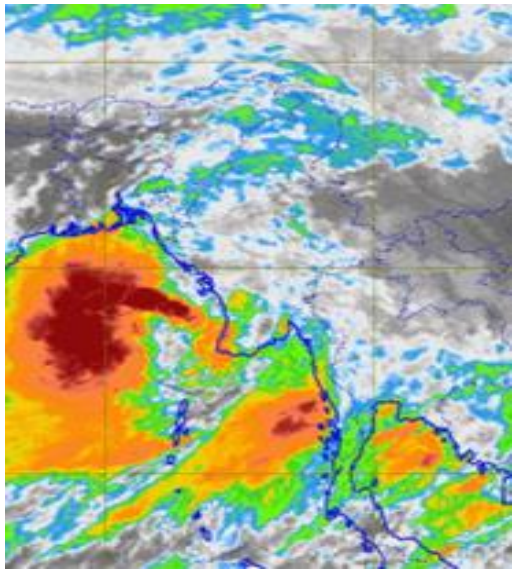
Cyclonic Storm “MAARUTHA”

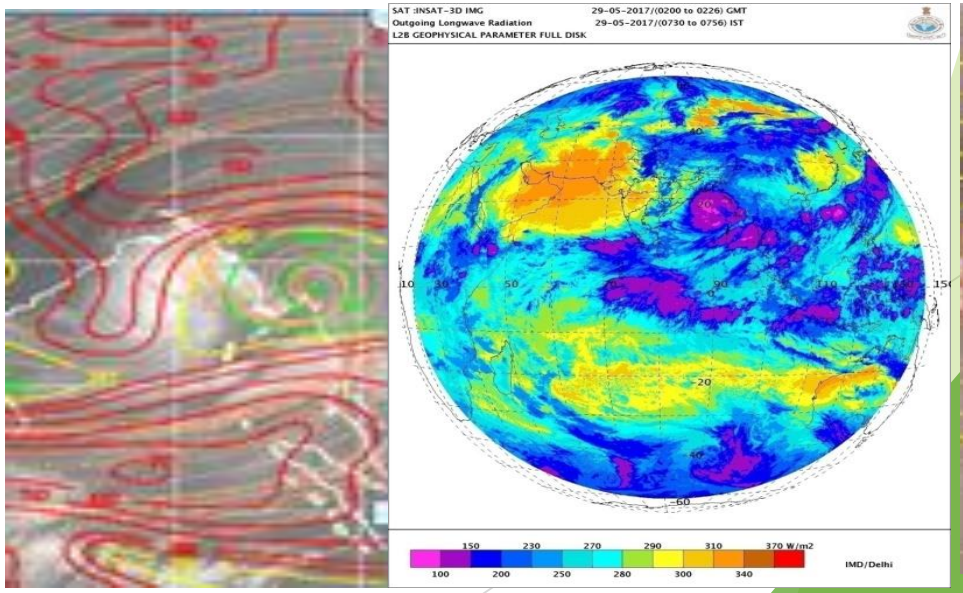


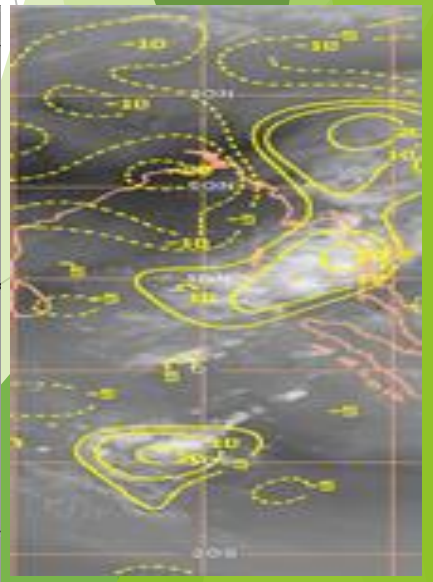


- *Upgrade- Every 10 minutes observations (Himawari-8 , 14th December, 2015)*



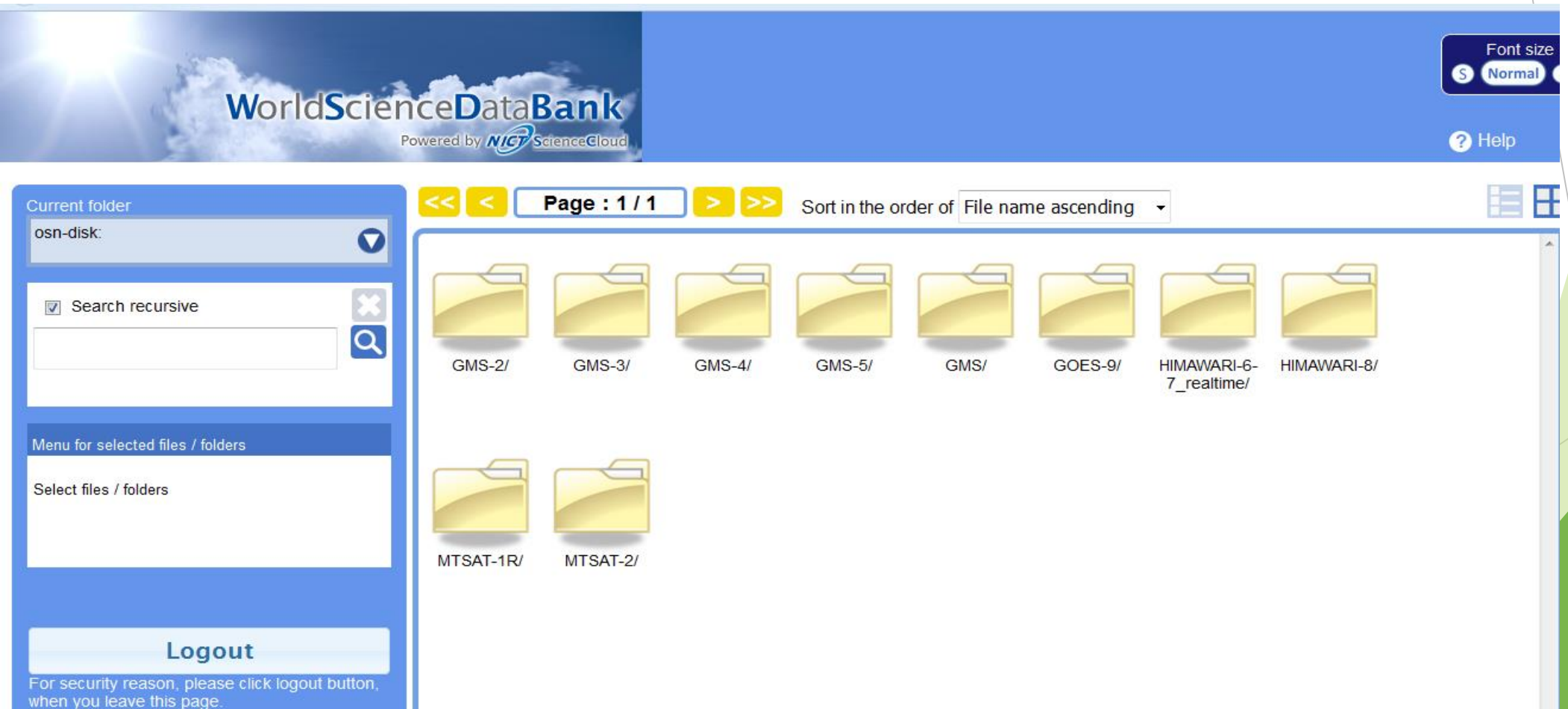






Downloading for the Historical Satellite Data

➢ All data of the JMA's satellites (GMS 1-5, MTSAT 1R-2, Himawari 8) are available at the website operated **by NICT** (National Institute of Information and Communications Technology).
https://segweb.nict.go.jp/wsdb_osndisk/shareDirDownload/03ZzRnKS?lang=en



RAMMB

Regional and Mesoscale Meteorology Branch

Organization Chart | NOAA | NESDIS | Cooperative Research Program

Search RAMMB

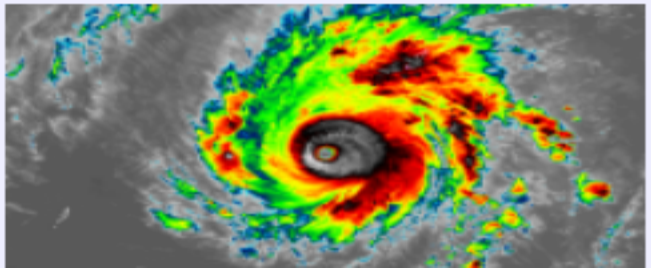
Google Search

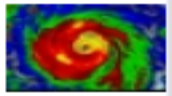
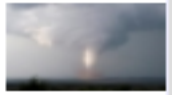
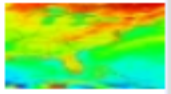
- **Experimental Products**
  - Google Earth
  - RAMSDIS Online
  - Proving Ground
  - TC Real-Time
  - TC Genesis
  - Downslope Winds
- **Training/Outreach**
  - VISIT
  - SHyMet
  - International
  - Case Studies

The Regional and Mesoscale Meteorology Branch (RAMMB) of NOAA/NESDIS conducts research on the use of satellite data to improve analysis, forecasts and warnings for regional and mesoscale meteorological events. RAMMB is co-located with the Cooperative Institute for Research in the Atmosphere (CIRA) at Colorado State University in Fort Collins, CO.

Current Highlights

Himawari Real Time Imagery



- **Research Projects**
  - Tropical Cyclones 
  - Severe Weather 
  - Winter Weather 
  - Hazard Detection 
  - Satellite Climatologies 
  - GOES-R Research & Proving Ground 

RAMMB
Regional and Mesoscale Meteorology Branch

NOAA Satellites and Information
National Environmental Satellite, Data, and Information Service

CIRA
Cooperative Institute for Research in the Atmosphere

Cooperative Research Program (CoRP) | Center for Satellite Applications and Research (STAR)

Currently Active Tropical Cyclones

- Current Active Cyclones
- Archive
  - 2016 Season
  - 2015 Season
  - 2014 Season
  - 2013 Season
  - 2012 Season
  - 2011 Season
  - 2010 Season
  - 2009 Season
  - 2008 Season
  - 2007 Season
  - 2006 Season
- Additional Information

Last Updated 0 Minutes Ago

Atlantic

No Currently Active Cyclones

Eastern Pacific

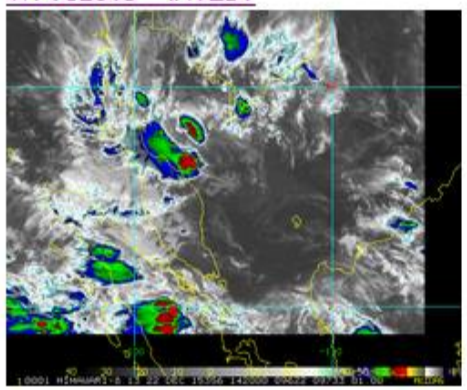
No Currently Active Cyclones

Central Pacific

No Currently Active Cyclones

Western Pacific

WP982015 - INVEST

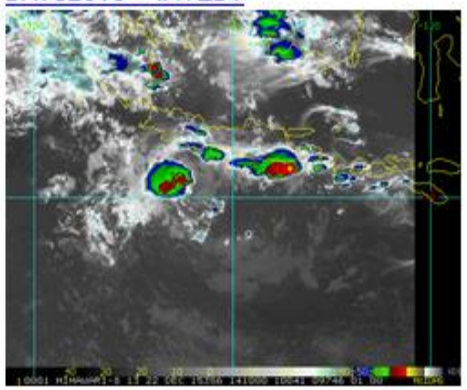


North Indian Ocean

No Currently Active Cyclones

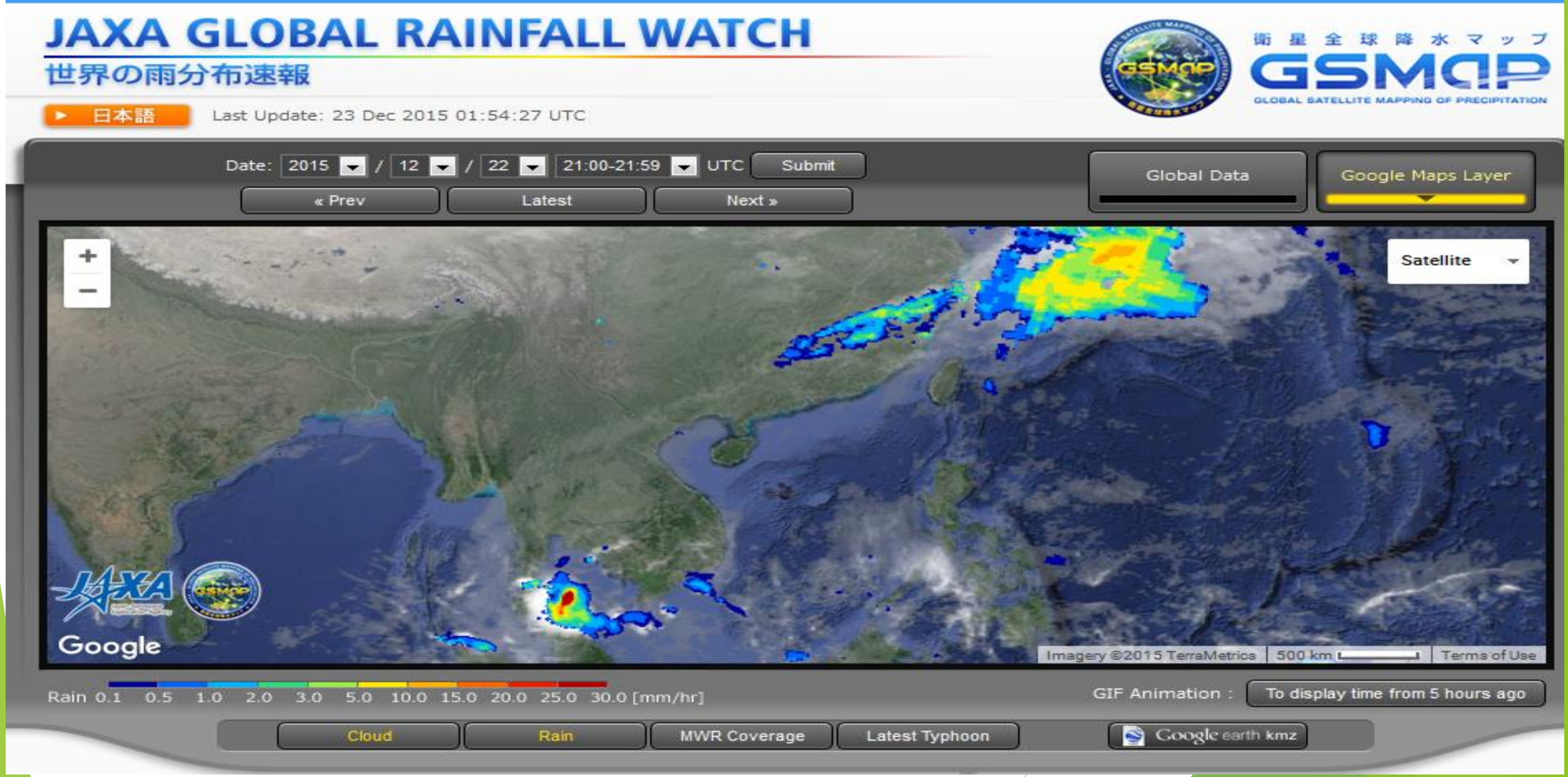
Southern Hemisphere

SH982016 - INVEST

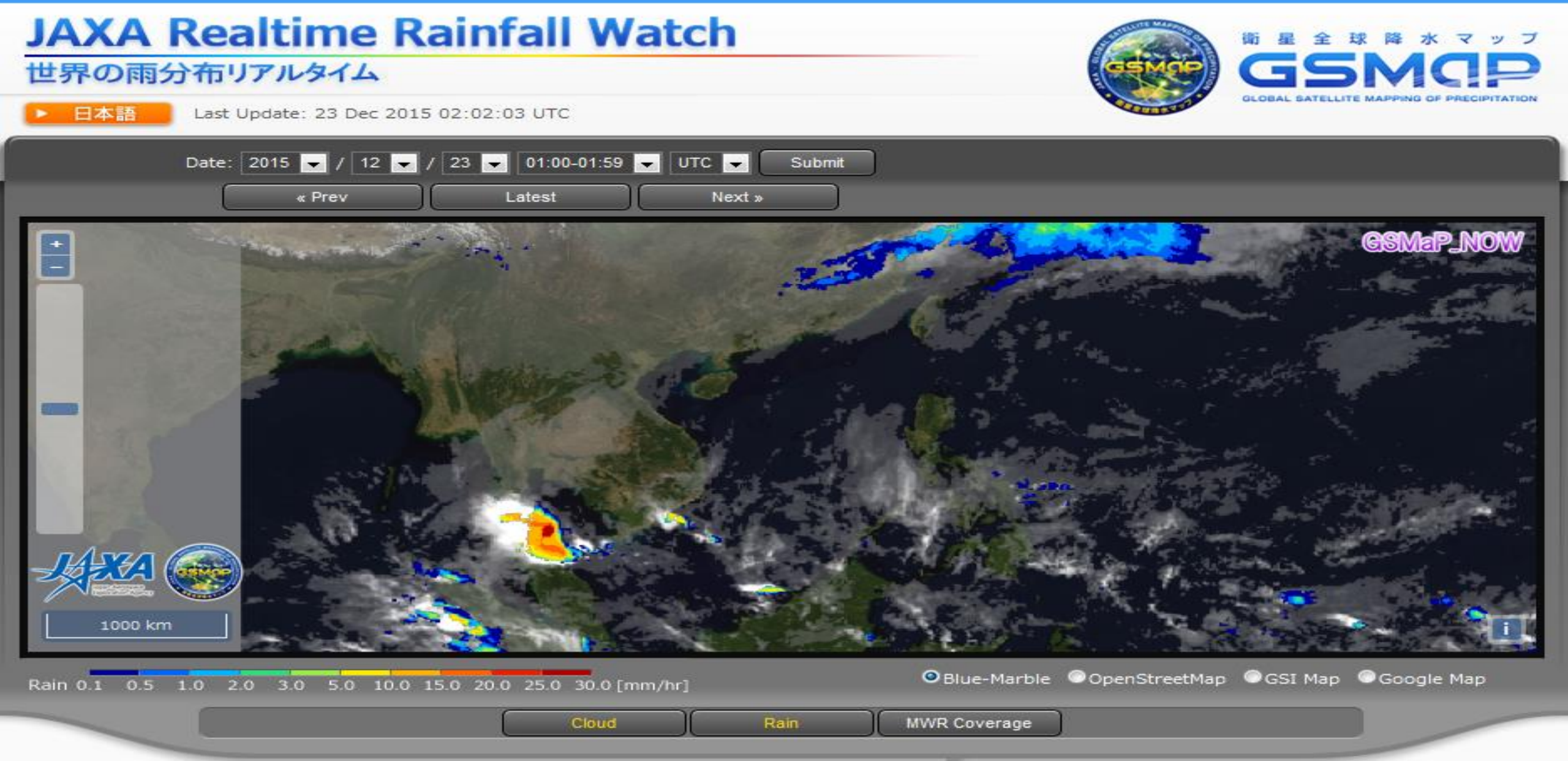


SH992016 - INVEST

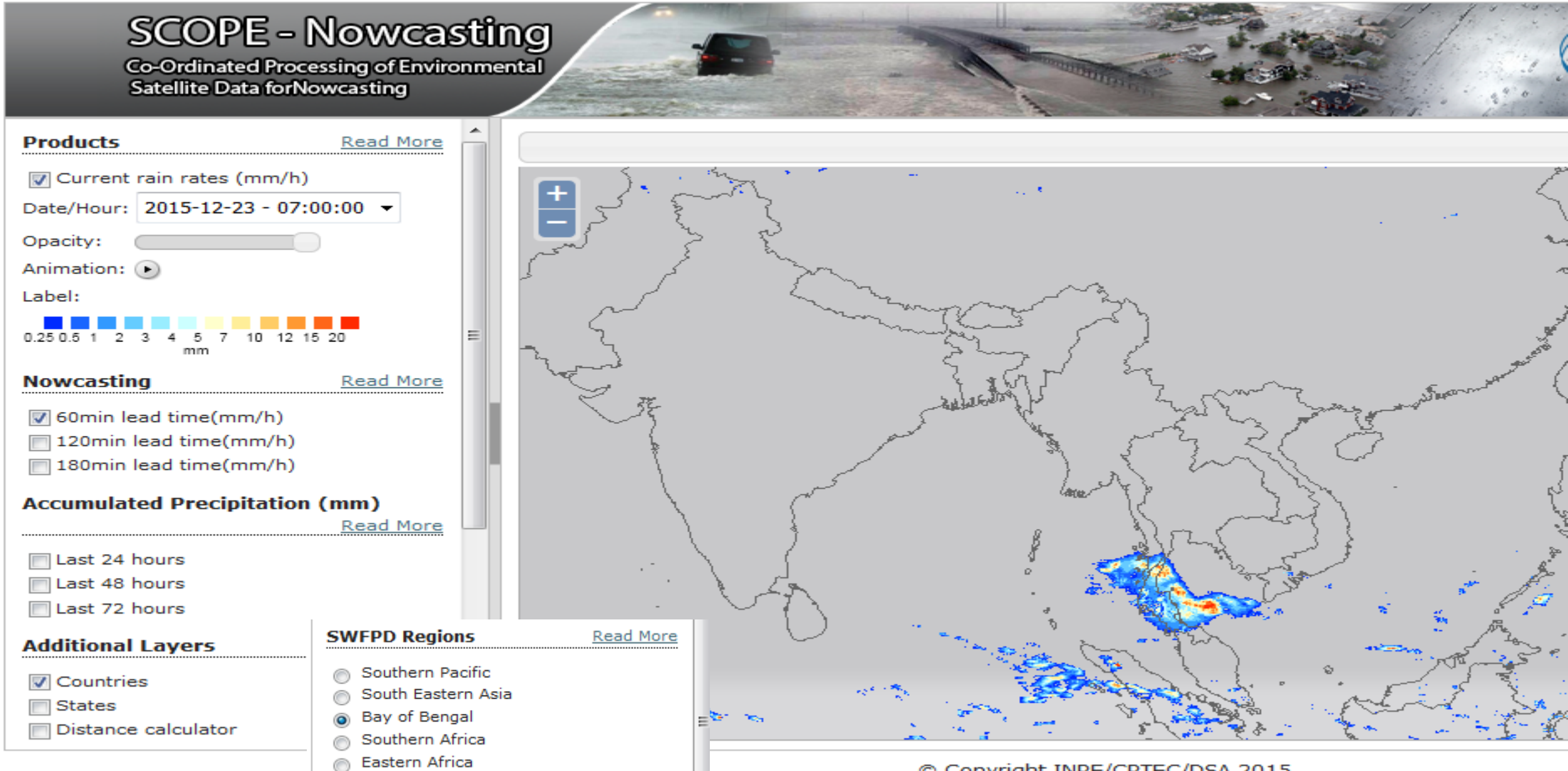
http://sharaku.eorc.jaxa.jp/GSMaP/



http://sharaku.eorc.jaxa.jp/GSMaP_NOW/index.htm



http://sigma.cptec.inpe.br/scope/



DMH's plans/expectations for utilization of new-generation geostationary meteorological satellite data

- To upgrade our forecast accuracy by using high spatial resolution and multi-spectral bands.

- To do the research such as Tropical cyclones, Heavy rain, etc by using new generation satellite data and imagery.

- To upgrade our Capacity building for Satellite Meteorology (short and long term training).

- To use Tools (for eg. Advance Dvorak Technique (ADT)) for the Tropical Cyclone Forecasting.

Thank You for your Kind Attention!