



Regional Workshop on Impact-based Forecasts in RA II (Asia)

Seoul, Republic of Korea, November 7 – November 9, 2017

Current Status of Weather Forecasting and Warning System in DMH

Presented by

Hla Tun

Deputy Director

Meteorological Division

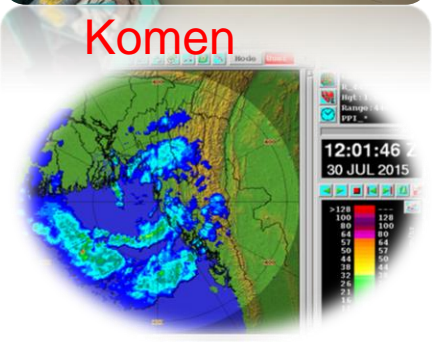
Department of Meteorology and Hydrology

November 8, 2017

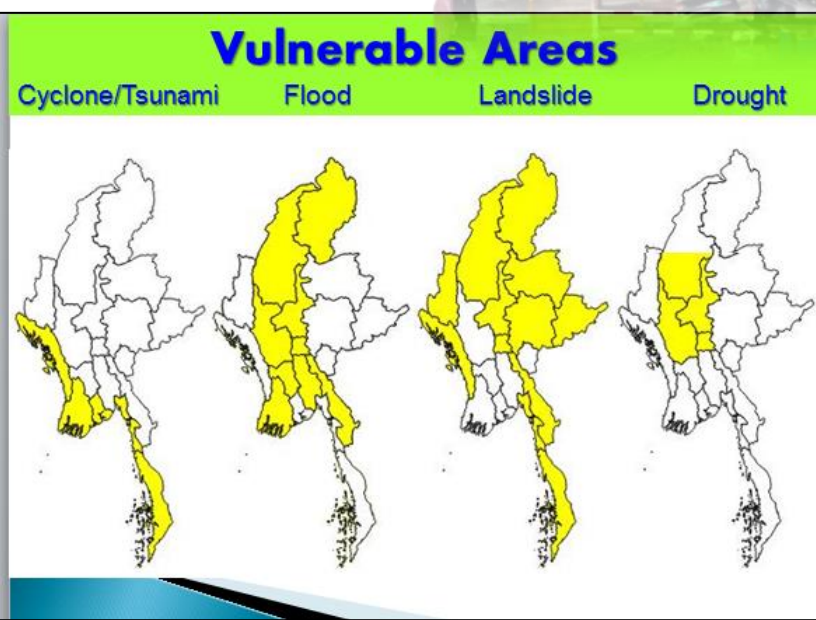
Outlines:

- **Hazard Profile in Myanmar**
- **Existing Facilities for Forecast and Warning Services**
- **Current Meteorological Warning System**
- **Needs and Requirements**

HAZARDS PROFILE IN MYANMAR



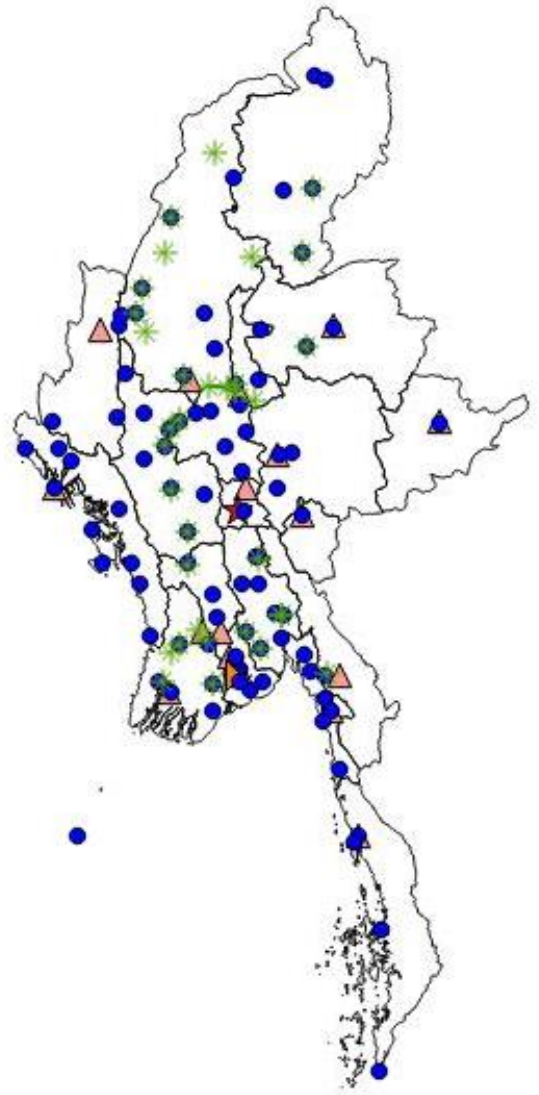
Meteorological Hazards Calendar of Myanmar









Hazards	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Cyclone												
High Temperature												
Low Temperature												
Drought												
Squalls & Thunderstorm												
Flood												
Heavy Rain												
Monsoon Depression												
Hail												

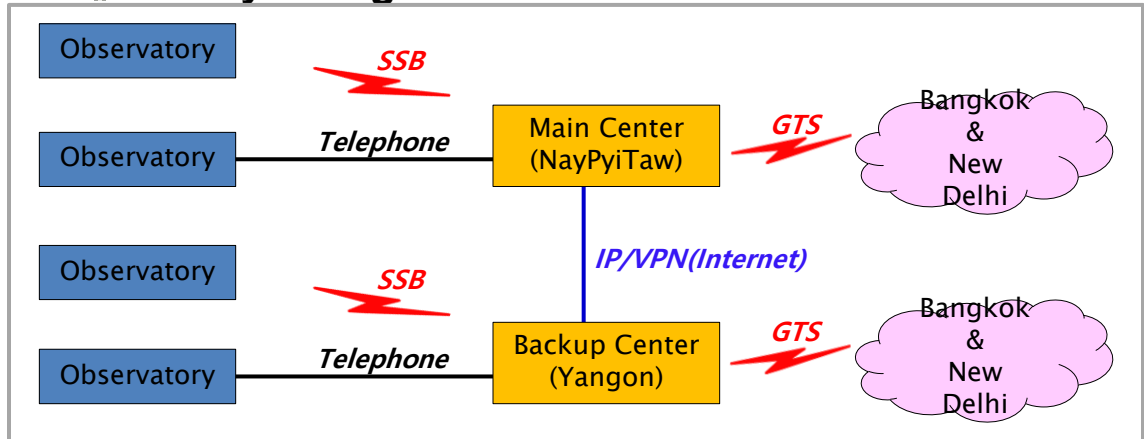
EXISTING FACILITIES FOR METEOROLOGICAL SERVICES IN DMH

Meteorological Observation Network

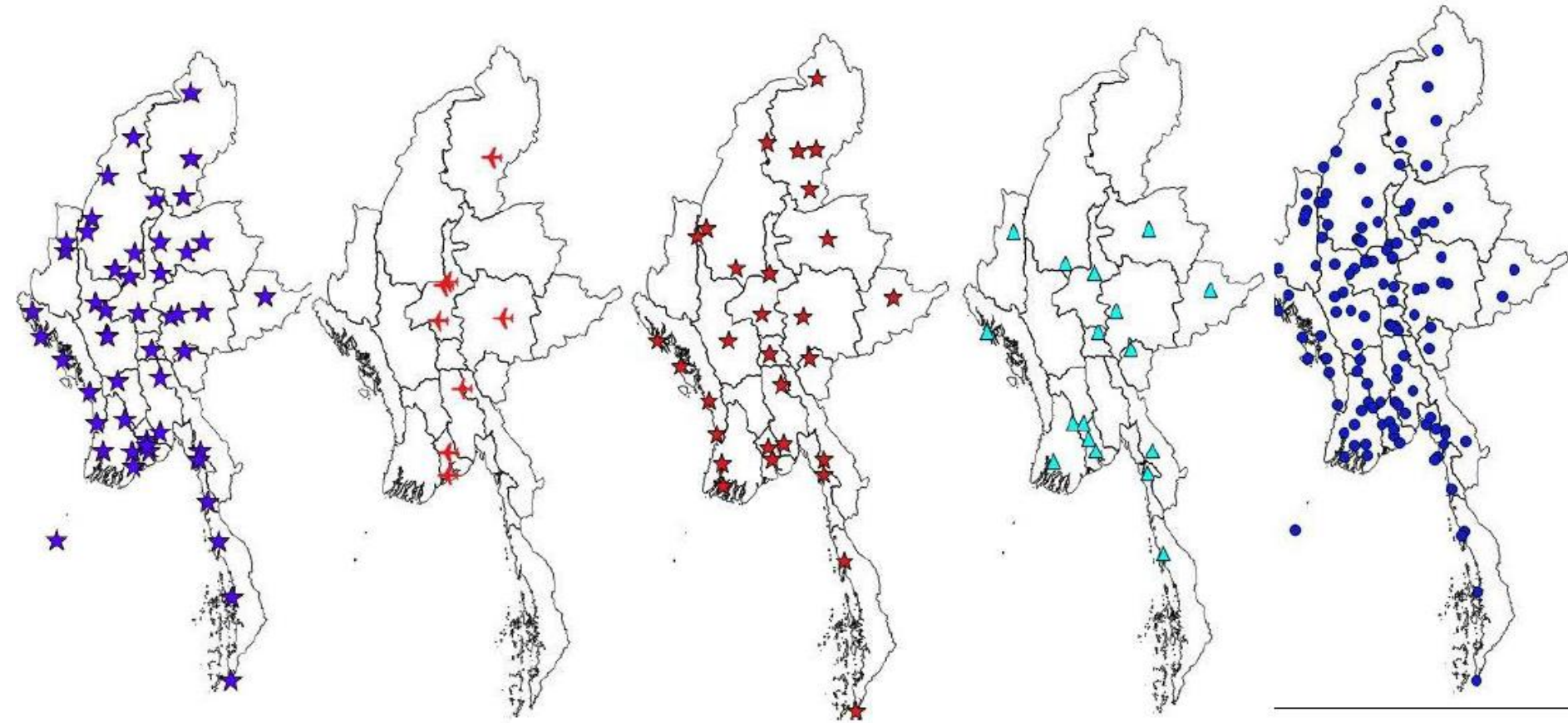


- (50) WMO Register (3)hourly Synoptic Observation Stations
- (1) Upper Air Observation Global Meteorological Observation System

	Reporting Stations	- 50
	Meteorological Stations	- 64
	Agro meteorological Stations	- 17
	Upper Air Station	- 1
	Aviation Weather Station	- 8
	Hydrological Stations	- 27



Observation Network of DMH-Myanmar



51 WMO
GTS Stations

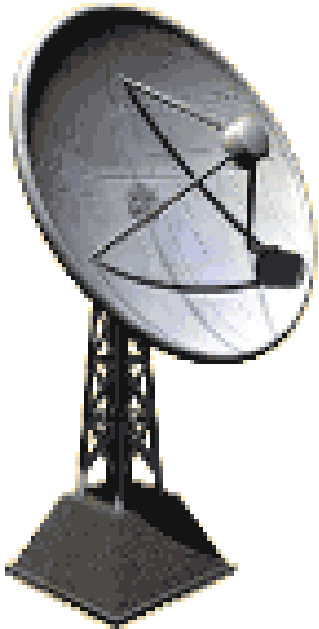
8 Aviation
Stations

30 AWOS
Stations

17 Agro_Met
Stations

121 Reporting
Stations

Installation of MTSAT and SATAID



*MTSAT/HRIT 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) will be received November, 2015)

Grant aid project “Establishment of Disastrous Weather Monitoring System”

Perspective View



Kyauk Phyu



Yangon

Wireless LAN



Yangon
International
Airport



Mandalay

Internet Link

VSAT



Internet Link

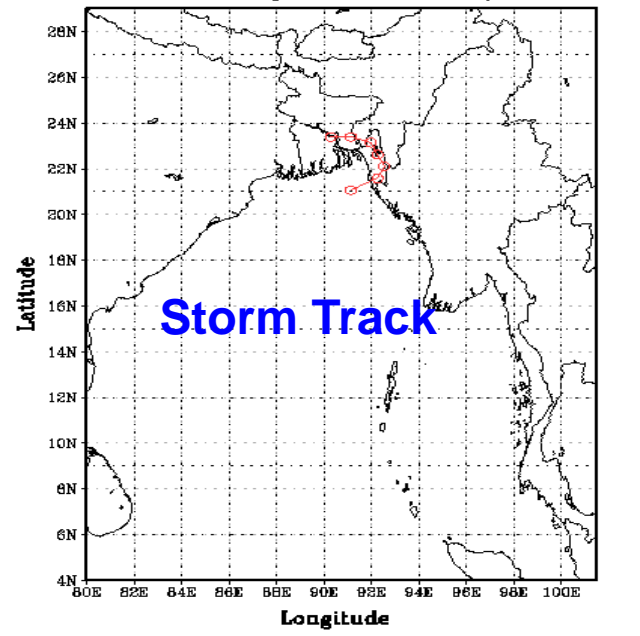


DMH Multi-Hazard Early
Warning Center, Nay Pyi Taw

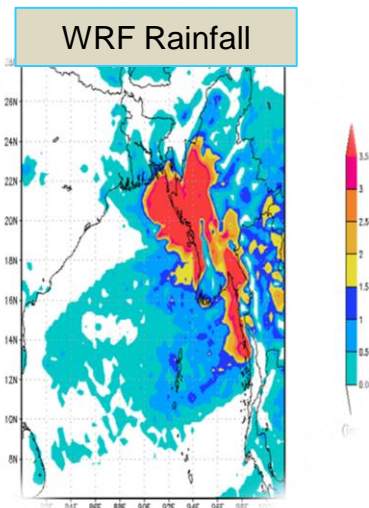


Japan Radio Co., Ltd.

Track of Depression in July 2015

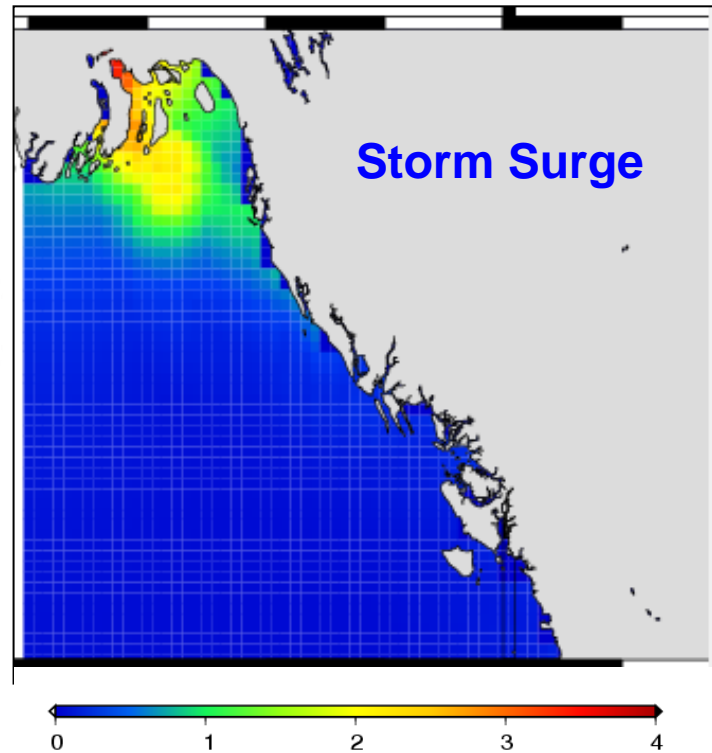


WRF Rainfall

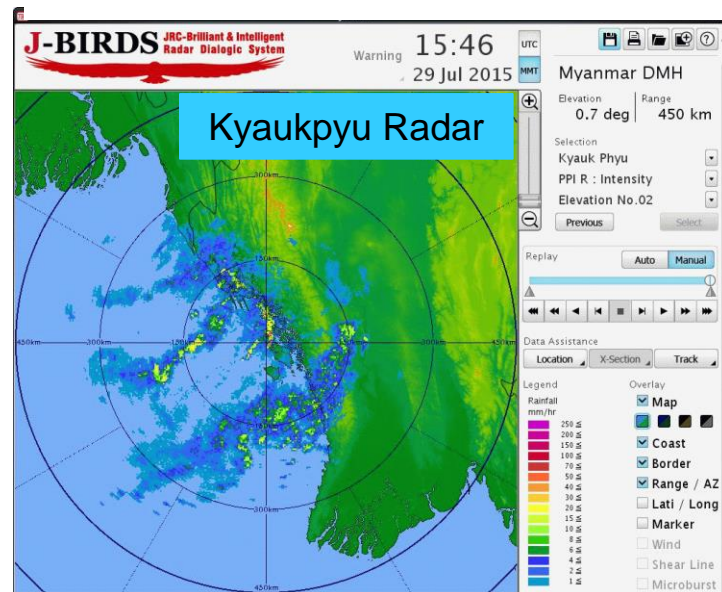
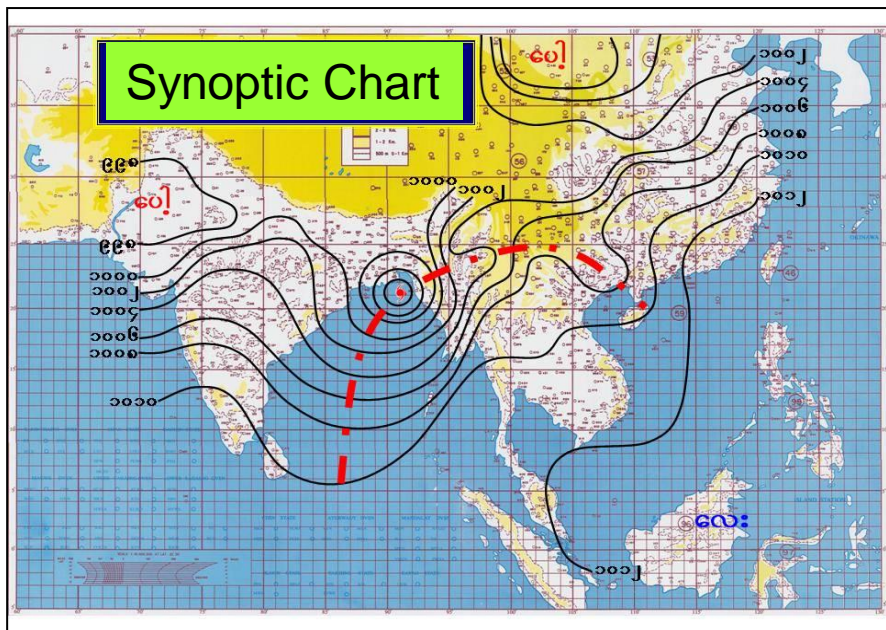


Cyclonic Storm
"KOMEN"

Storm Surge



Synoptic Chart



Data assimilation

- Input data : GFS model output (GRIB data)
- ECMWF (Net CDF)

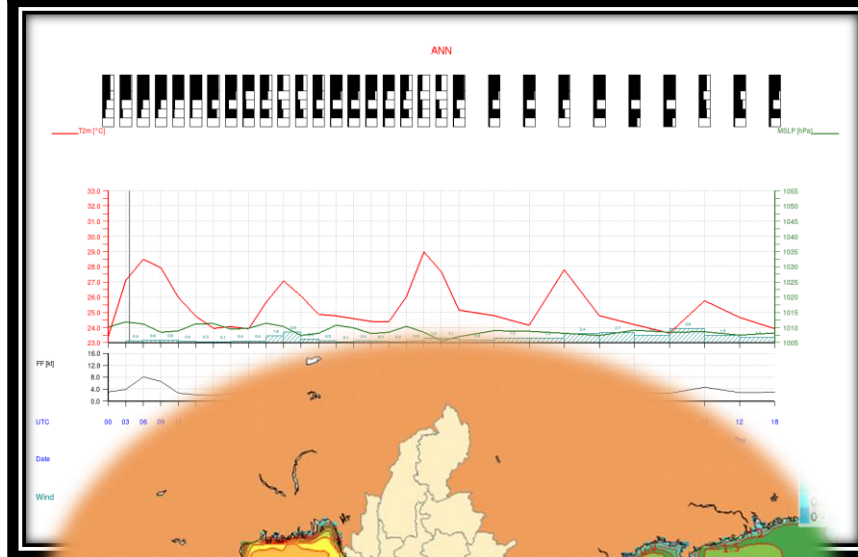
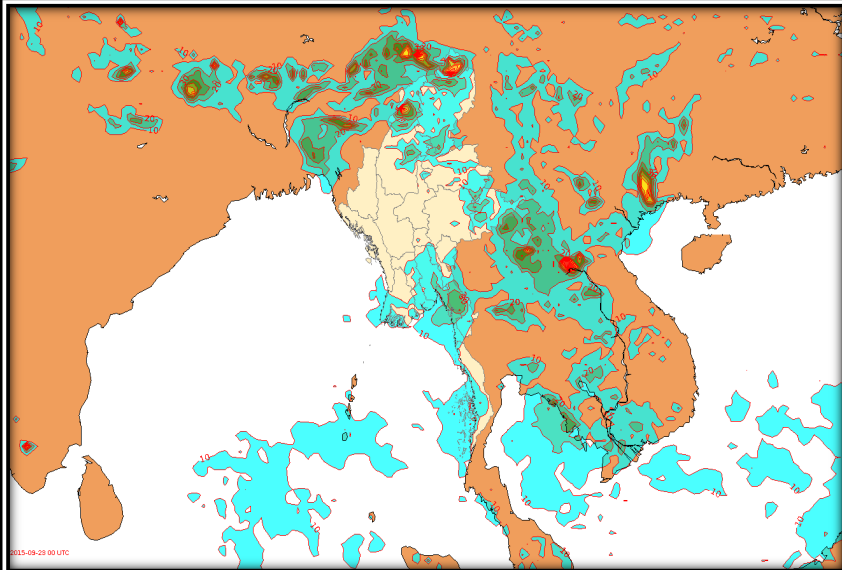
Numerical model

WRF regional model,
DIANA tools(Norway, Met. NO.)

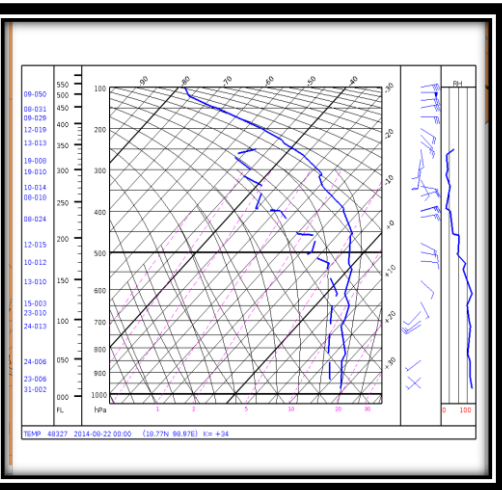
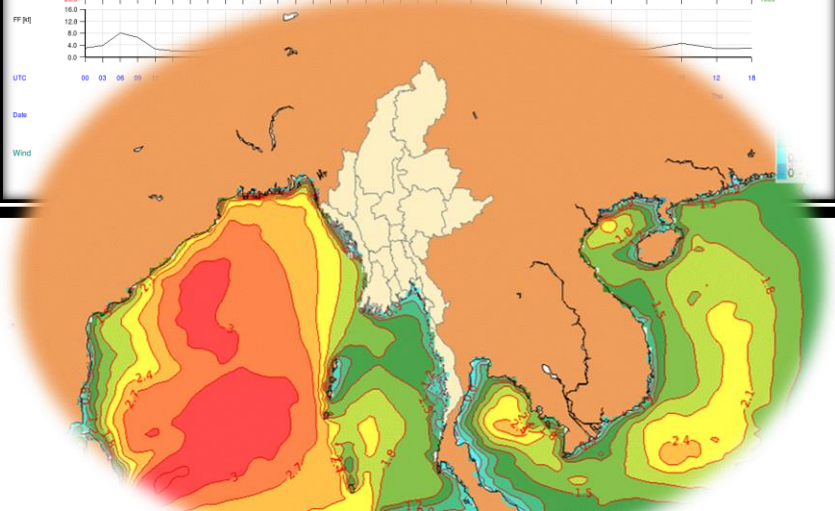
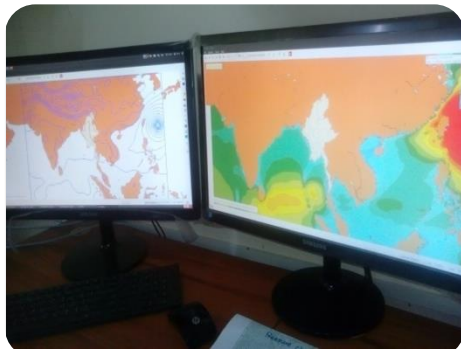
Purchase high-performance PC

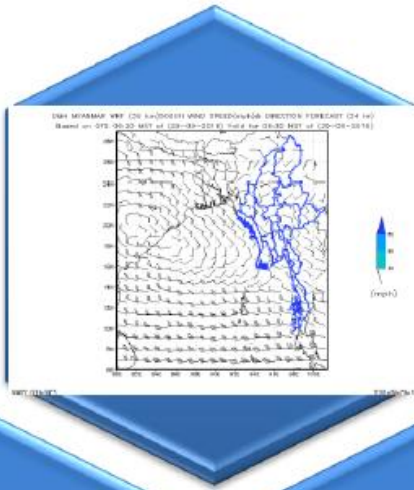
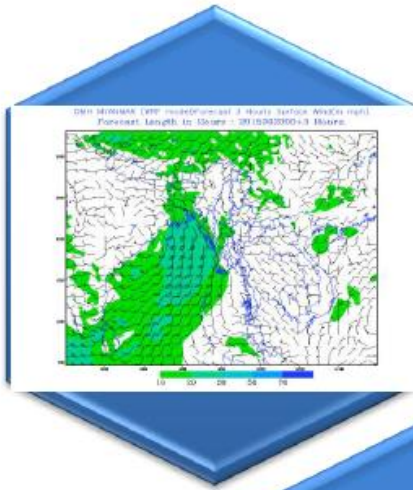
Production data

- Forecast elements
- Max/Min. Temp.
Humidity
- Sea level pressure
- Surface / Upper wind(speed, dir.)
- Precipitation & Meteorogram
- +
Other parameters

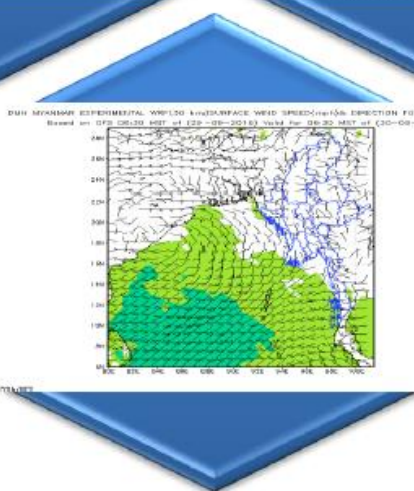
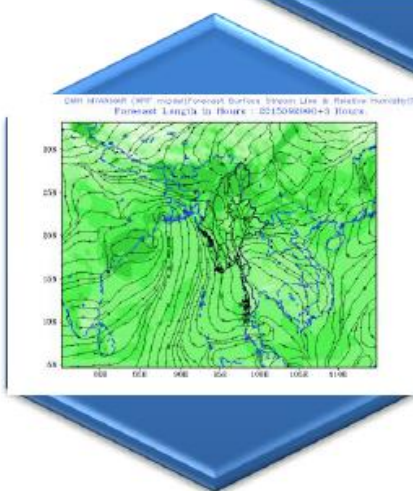
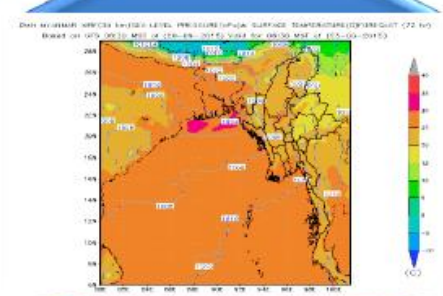
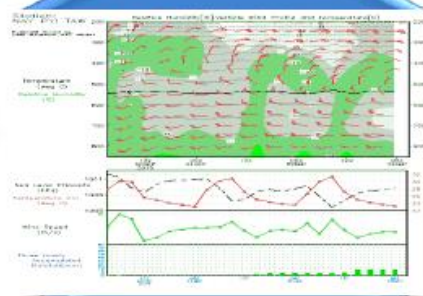


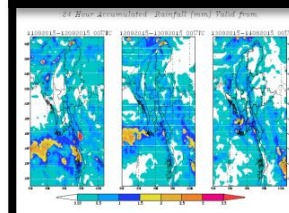
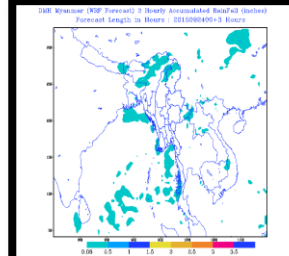
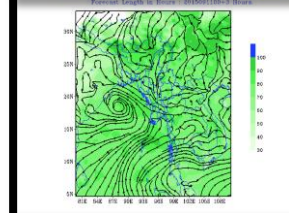
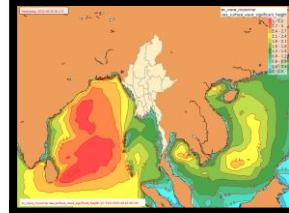
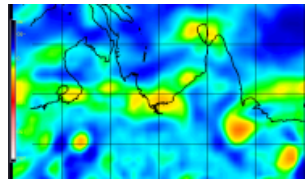
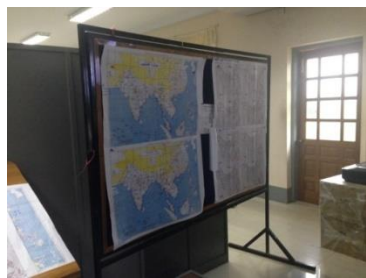
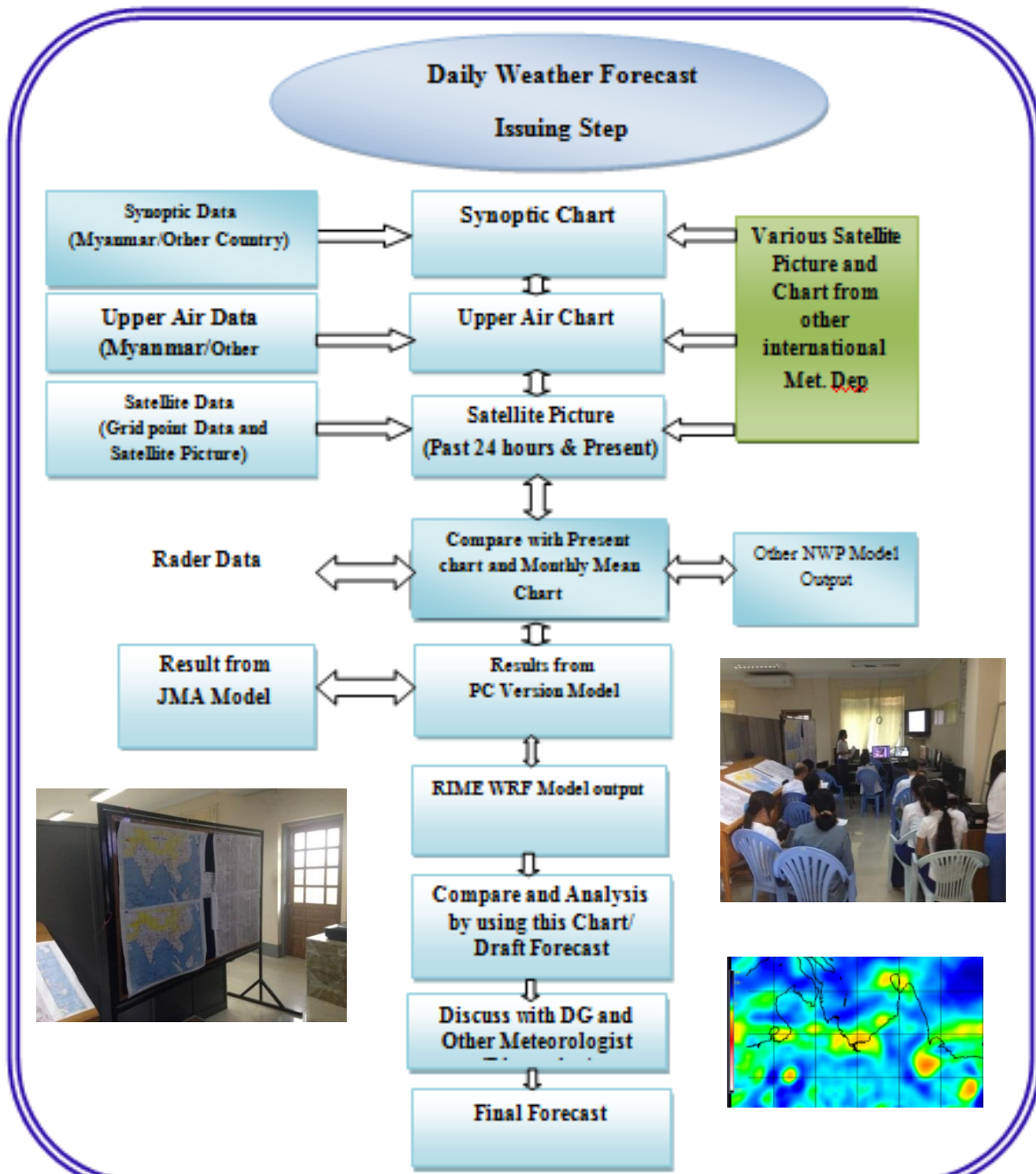
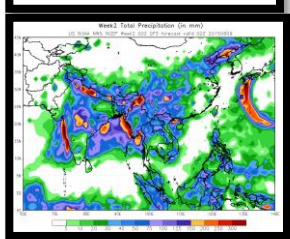
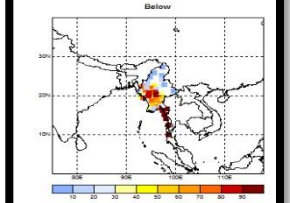
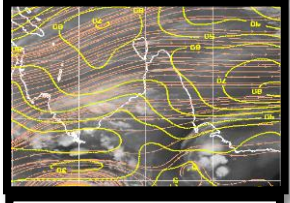
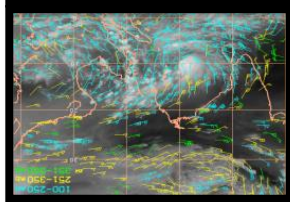
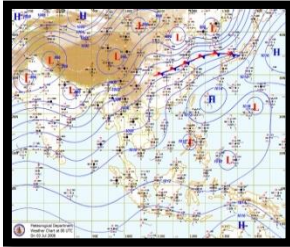
Met.no





WRF Output





Type of **Warning** and **Forecast**

- **Cyclone Warning**
- **Storm Surge Warning**
- **Untimely Rainfall Warning**
- **Heavy Rain Warning**
- **Port Warning**
- **Squall Warning**
- **Strong Wind Warning**
- **Scanty Rainfall Warning**
- **Decrease of Night temperature**
- **Increase of Day Temperature**
- **Significant Weather condition**

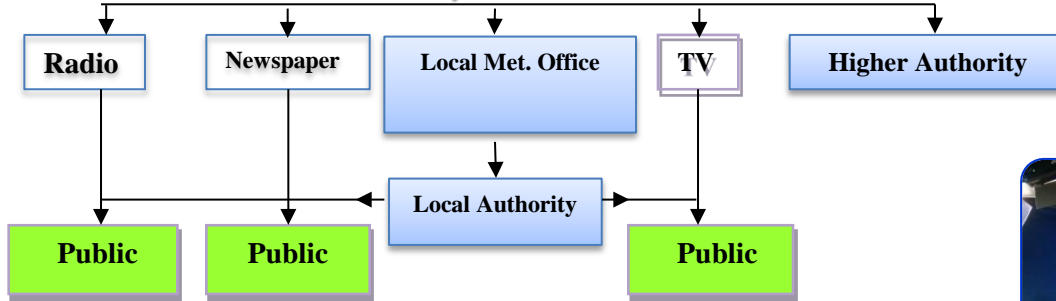
- **Daily Weather Forecast**
- **Dekad Weather Forecast**
- **Monthly Weather Forecast**
- **General Weather Outlook for (SW & NE) Monsoon season**
- **Early/Peak/Late Monsoon season Forecast**
- **Special Weather Forecast**
- **New Records (Rainfall/Temperature)**
- **Bay/Andaman Sea Bulletin**
- **Cyclone News**
- **Condition of Southwest Monsoon (Onset and withdrawal)**

Climate Information Timeline For Users

Type of Forecast	Time of Issuance	Forecast Validity
Daily Weather Forecast	7:00Am/12:00noom/2:00pm/ 4:00pm/7:00pm	24 hours
Sea Route Forecast	10:30 Am/1:30Pm	24 hours
Special weather forecast	As per request and weather conditions	Depend on duration
Cyclone/surge	24–36 Hr before	–
Untimely Rainfall	Weather disturbance....	–
Strong Wind Warning	March (15)(31)/April(1)	Pre Monsoon Period
significant day & night temperature	If necessary	–
Heavy Rainfall/ Scarcity Rainfall Warning	If necessary	–
New Records (Rainfall/Max/Min)	when new record occur..	–
(10)Day Weather Forecast	Every Month of 8/18/28	(10)Days
Monthly Weather Forecast	Every Month of 28	(1) Month
General Weather Outlook for (SW/NE)Monsoon Season	April 28/October 28	Monsoon Season
Seasonal Weather Forecast	April 28, June 28, August 28	Early, Peak, Late Monsoon

Forecast /Warning Dissemination System

Forecast /Warning Dissemination System



COLOUR CODING FOR THE STORM

Doesn't depend on storm 's intensity (ie, whatever it is TD, TC or CS), it means only for **RISK** of the storm.

- **Stage 1:** Whatever the storm is TC or CS , which is not expected to move towards Myanmar coast by the present.
- **Stage 2:** Whatever the storm is TC or CS, which is leading to Myanmar coast by the present.
- **Stage 3:** Whatever the storm is TS or CS, which may cross to Myanmar coast within next (12)hrs.
- **Stage 4:** Whatever the storm is TS or CS, which is crossing to Myanmar coast by the present.
- **Stage 5:** Whatever the storm is TS or CS, which has crossed to Myanmar coast & free from storm risk.

Storm Warning

Movement and Storm wind area

At the time of early morning of 2nd May

SCS "Nargis" take a direction to ENEward with the speed of 30 mph, Ngayokkaung township, Shwethaungyan township in Patheingyi District are expected to be under Storm wind area in early morning of 2nd May.

Landfall point (Where, When)

At the time of evening of 2nd May

It is expect to be landfalled on some coast among YYYY district and ZZZZ district in the evening of 2nd May.

Storm wind area (How)

States, Regions shown below will be under Storm wind with over 50mph.
Ayeayawady division, Yangon division, West Bago division, South Rakhine state

States, Regions shown below will be under Strong wind with over 30mph.
Mon state, East Bago division, South Mandalay division, South Magway division, North Rakhine state.

Squally weather for Affect Coast

Especially, frequent squalls with rough seas will be experienced in Deltaic, off and along Rakhine coast, Sea surface wind speed in squalls may reach 100-120mph.

Storm Surge

The probable maximum storm surge is about 12-14 feet at the towns below in the evening of 2nd May.
HainggyiKyun, Laputta and MawlamyineKyun.

And about 10-12 feet in the evening of 2nd May;
Ngayokkaung, Shwethaungyan and Ngwesaungtownship.

General caution

General caution

Due to SCS "Nargis", widespread rain or thundershowers with locally heavy falls, storm wind and flash flood are likely in Laputta, Myaungmya, Wake ma, Kyaunggon and Nyaungdon townships in Patheingyi District at Ayeayawady Regions, Yangon, Hmawbi, Twante, Taikkyi and Ngasutaung Townships in Yangon Region

Advisory

It is advised to take caution against the impact of very severe cyclonic storm such as heavy rain, storm wind, storm surge, landslides and flash flood.

Heavy Rainfall Warning

Heavy falls warning No. 4, 2015

Heavy rainfall warning

(Issued (14:30) hrs MST on 24- 7-2015)

According to the observations and analysis of meteorological conditions at (14:00) hrs MST today, under the influence of strong monsoon in the Bay of Bengal, rain or thundershowers will be fairly widespread to widespread in the following Regions and States with regionally and isolated heavy falls during the next (3) days commencing afternoon today.

During (24) hours, Rain are likely to be above three inches- (77)mm in Upper Sagaing and Bago Regions, Shan, Chin, Rakhine, Kayin and Mon States.

During (24) hours, Rain are likely to be above one and half inches- (38)mm in Lower Sagaing, Mandalay and Magway Regions.

Advisory for the people that living near high land areas, small rivers and streams to avoid landslide and suddenly rise the river level.

Cause and Effect

When, How

Where,

Advisory

Warnings/Advisories and corresponding emergency responses	DMH issues warnings for disasters/phenomena associated with TCs, such as heavy rain, strong winds and storm surge.
Potential Disaster Risks	Landslide, flash flood advise
Target (warning areas)	Expected path of cyclone landfall and inland areas.
Meteorological variables/indices used for warnings/advisories	Pressure, wind, rainfall, cloud direction from hourly weather observations from coastal stations
Criteria/Thresholds	24 hours rainfall - (3) inches (77 mm) and above -(1.5) inches(38 mm) and above
Contents of Warning/Advisory Message	Intensity, location, movement, estimated max wind, wind, rainfall, wave, advisory for fisherman and vessels.

Recent Activities

- ✓ DMH actively cooperate with the regional partners– WMO, Norwegian Government, TMD, JMA, JICA, KOICA, KMA, CMA. UNESCAP, IMD, ADPC, and RIMES to develop the skilled man power in weather forecasting.
- ✓ JMA, JICA, KOICA, KMA, RIMES, TMD and ADPC provide technical assistance and instruments to improve weather forecast, climate and climate change, disaster risk reduction and communication.
- ✓ Meteorological Virtual System–Camera, digital audio line, computer etc. for TV Studio donated by China Gov. (October, 2015).

Recent Activities

- ✓ Strengthening Capacity Development Program with Norwegian Meteorological Institute and technical assistance from ADPC.
- ✓ Establishment of Master Plan for the Advancement of National Meteorological System in Myanmar with KMIPA
- ✓ Establishment of End to End Early Warning System for Natural Disaster (Connection between MRTV & DMH HQ with cable link)
- ✓ The installation of Meteorological (3)Radar System and (30)AWOS with Japan Gov.
- ✓ UNESCAP– RIMES Project on reducing risks of tsunami, Drought, Capacity Building for NWP

Need and Requirements ...

Institutional and regulatory strengthening

- To set up the policies and guidelines on specialized technicians and professionals for each sectors of Meteorology (Satellite, Weather Forecast, Climate, NWP, Instruments, Aviation weather, marine weather, communication)
- To set up Meteorological Services Law
- To establish the instrument Calibration Lab
- Institutional strengthening including the development of a robust legal and regulatory framework

Observation equipment/facilities ...

- To install (1) modernized weather radars at Northern Myanmar areas
- To install (3) hydrogen Generators for Upper air observation facilities (Yangon, Mandalay, Myitkyina)
- For Developing of a Lightning based severe weather Early Warning National wide full service weather and forecasting system
- High gust anemometer for coastal station
- To set up Objective weather analysis system (Surface, Upper air, aviation, etc.)
- To set up modernized weather instruments for aviation, agro-met, especially for Marine Meteorological Division,
- To measure atmospheric UV index, ocean current, sea surface temperature

- To set up Marine Observation Stations along the coastal areas
- To upgrade Marine Meteorological Instruments Extension and Installation with Technical Transfer
- To install about (5) tide-gauges stations of continental shelf data, more accurate observation will receive.
- **To extend Automatic Weather Station (AWS)**
- **To upgrade TV broadcasting System**

Forecasting ...

- ✓ To implement data assimilation for Weather Research and Forecasting Models (Satellite, Radar, Automatic Weather Operation System, High Speed Computer) (eg. WRFDA).
- ✓ To build up Agricultural and climate Advisory Services (ACAS) for Myanmar
- ✓ To promote of Numerical weather Prediction System.
- ✓ To do development of Oceanography and Marine Meteorological Forecasting
- ✓ To establish Meteo-alarm system for Early Warning (software, data/information)

- To implement the now-casting system (Numerical Weather Prediction, Satellite application and Radar Technology
- Creation of a Service Delivery Platform for weather services
- Modernization of operations centers, data management and communications/IT systems, engineering and calibration facilities
- Technical upgrading of the meteorological observation network
- Utilization of weather radar to weather forecast



Thank
You

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