1. Availability of agro-meteorological data for crop monitoring in Bangladesh.
2. Present status and future scope for agrometeorological services in Bangladesh.

Md. Shameem Hassan Bhuiyan
Meteorologist (Agrometeorology Division)
&
Focal person, AMIS Project
Bangladesh Meteorological Department

Vision & Mission

1. To provide quantitative assessment of local climatological information to scientific and farming community.

2. To provide technologies with clear application in evolving farming strategies for the benefit of the marginal farmer as well as the progressive commercial farmer through multi-disciplinary research and outreach.

3. To provide regular agrometeorological early warning & advisories to farmers based on the application & location specific medium range weather forecasts for crop and Agromet Advisory Services (AAS) to farmers at local level.

4. To disseminate weather based agromet advisory on line to the farmers in block/village level for efficient farm management.

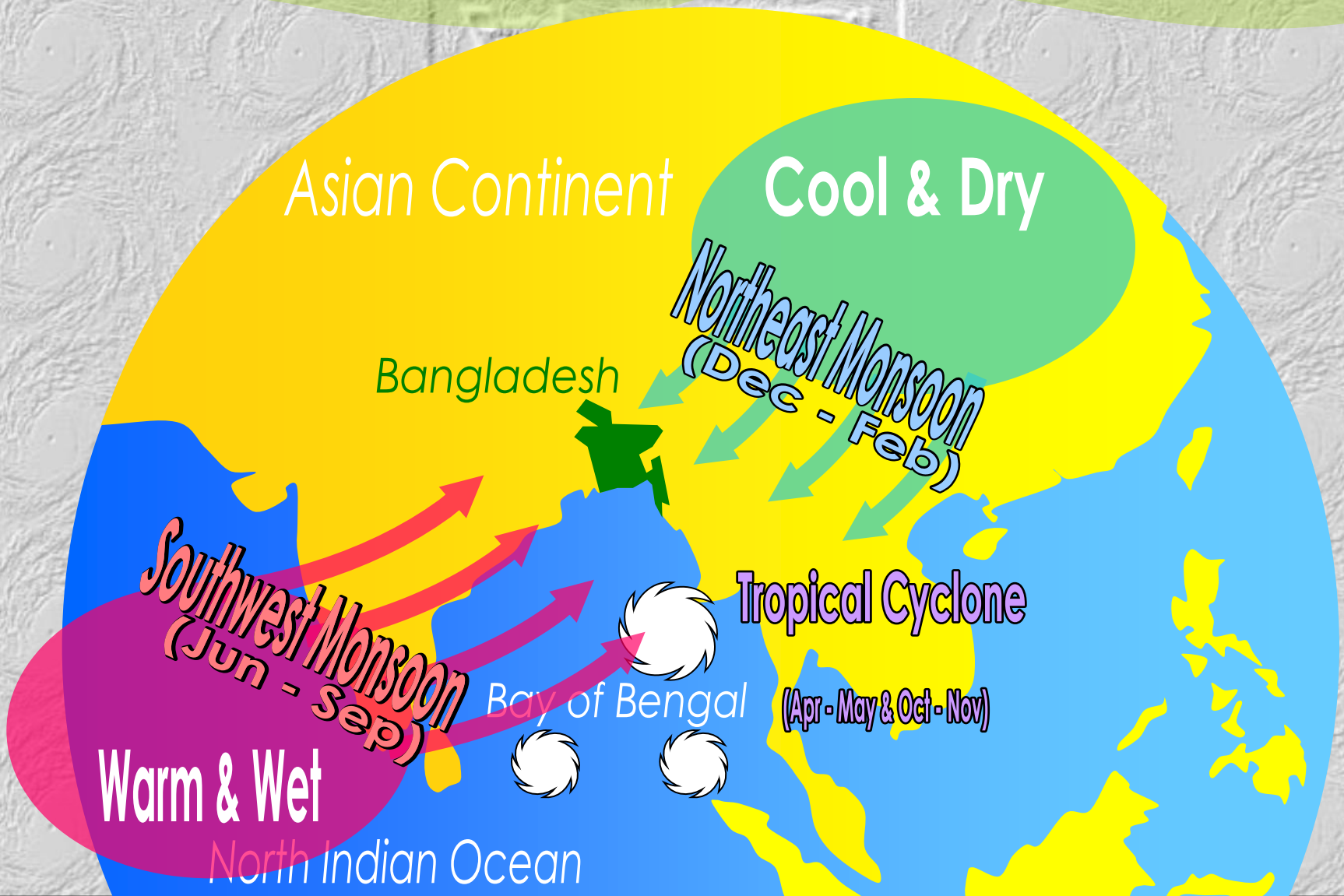
5. To provide weather based adaptation strategies under climate change, climate variability, climate and agriculture risk management.

6. Introduce climate smart precision farming system in Bangladesh.

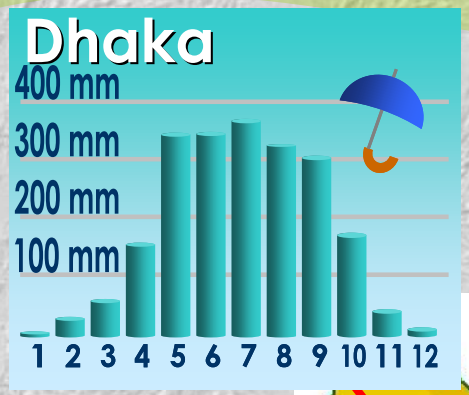
Major Severe Weather and Natural Disasters in Bangladesh

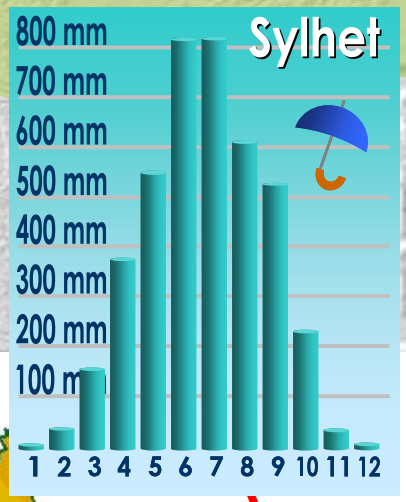
Tropical cyclone, Storm surge, Tidal bores, Floods, Flash flood, Nor'westers, Tornadoes, Droughts, Heat waves, Cold waves, Heavy rain, River erosion, Earth quakes, Land-slides.

Climate of Bangladesh

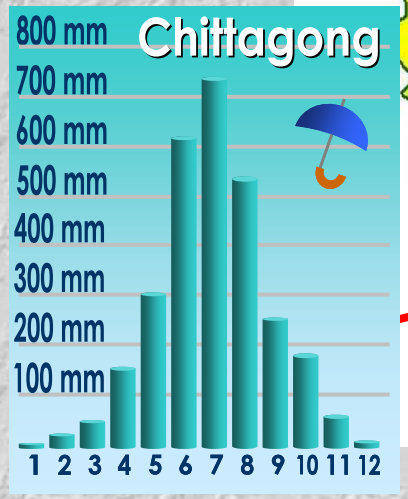


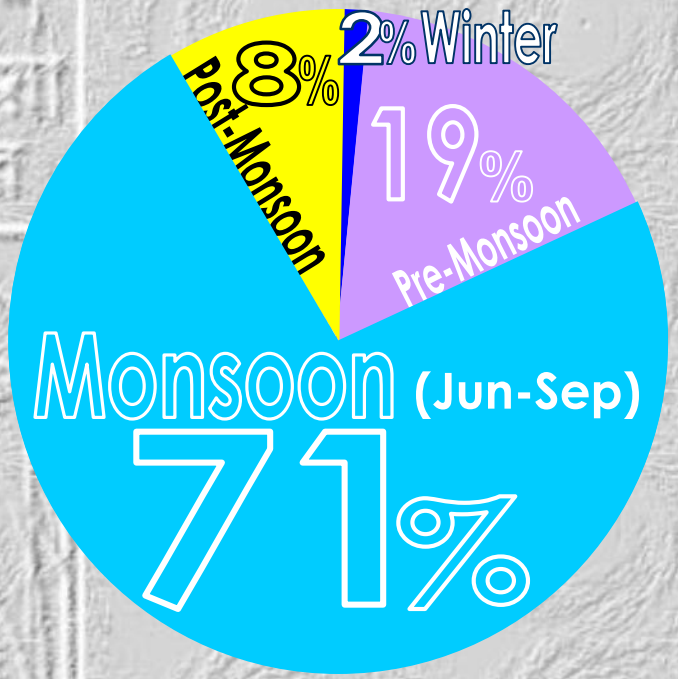
Climate of Bangladesh





How much rain do we recieve?



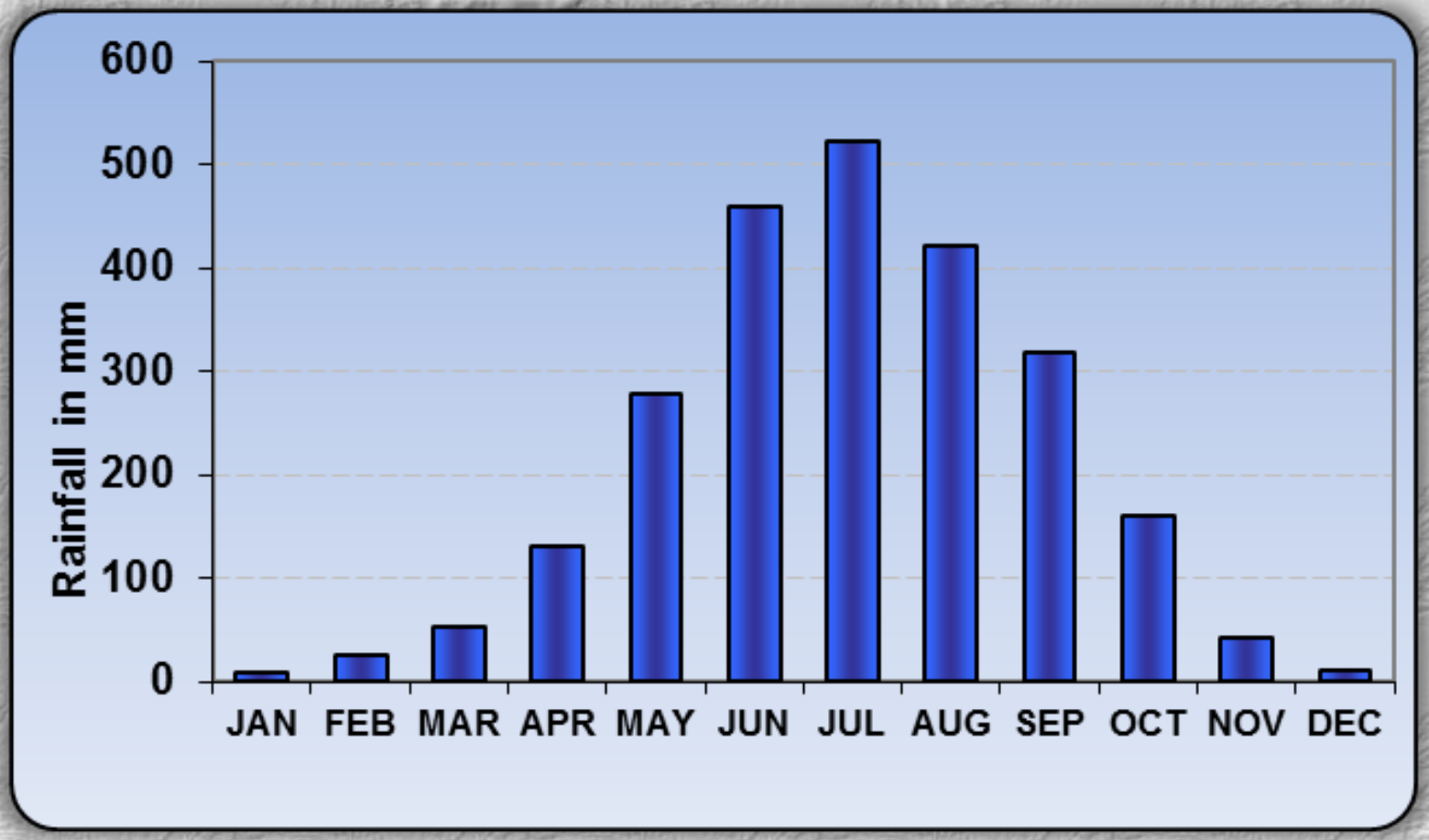


Bangladesh receives 71 % of the total annual rainfall during southwest monsoon (rainy season) which lasts for 4 months.

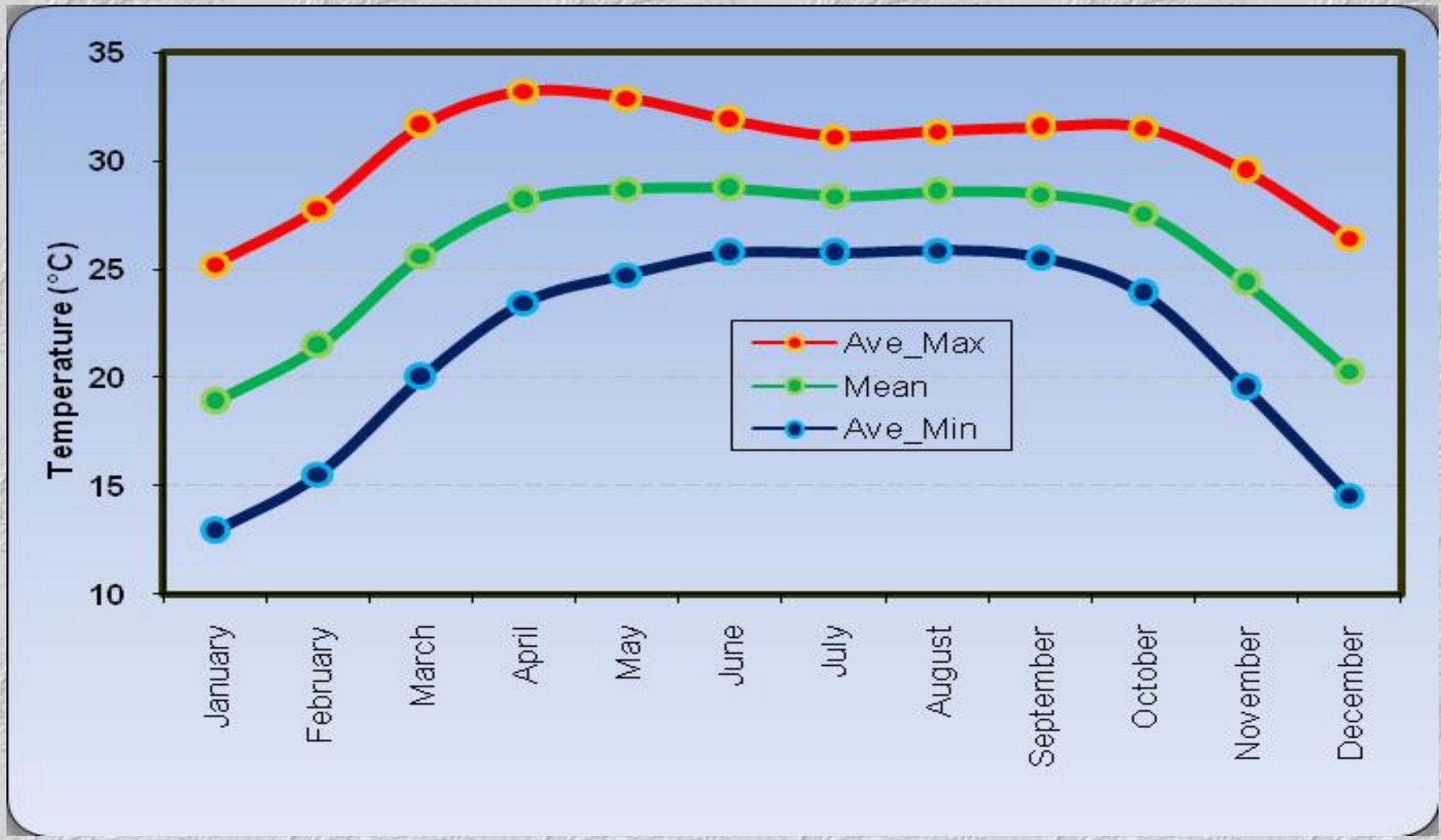
CLIMATE OF BANGLADESH

Seasons	Period	Weather Events	Rainfall
Summer (Pre-monsoon)	March to May	Nor'wester, Thumder, Tornado, Hail, Cyclone, Heat Wave	19%
Rainy Season (Southwest Monsoon)	June - September	Heavy rain, Monsoon Depression, Flood	71%
Autumn (Post-monsoon)	October - November	Cyclone, Tornado	8%
Winter (Northeast Monsoon)	December - February	Abnormal Dryness (Drought), Cold Wave	2%

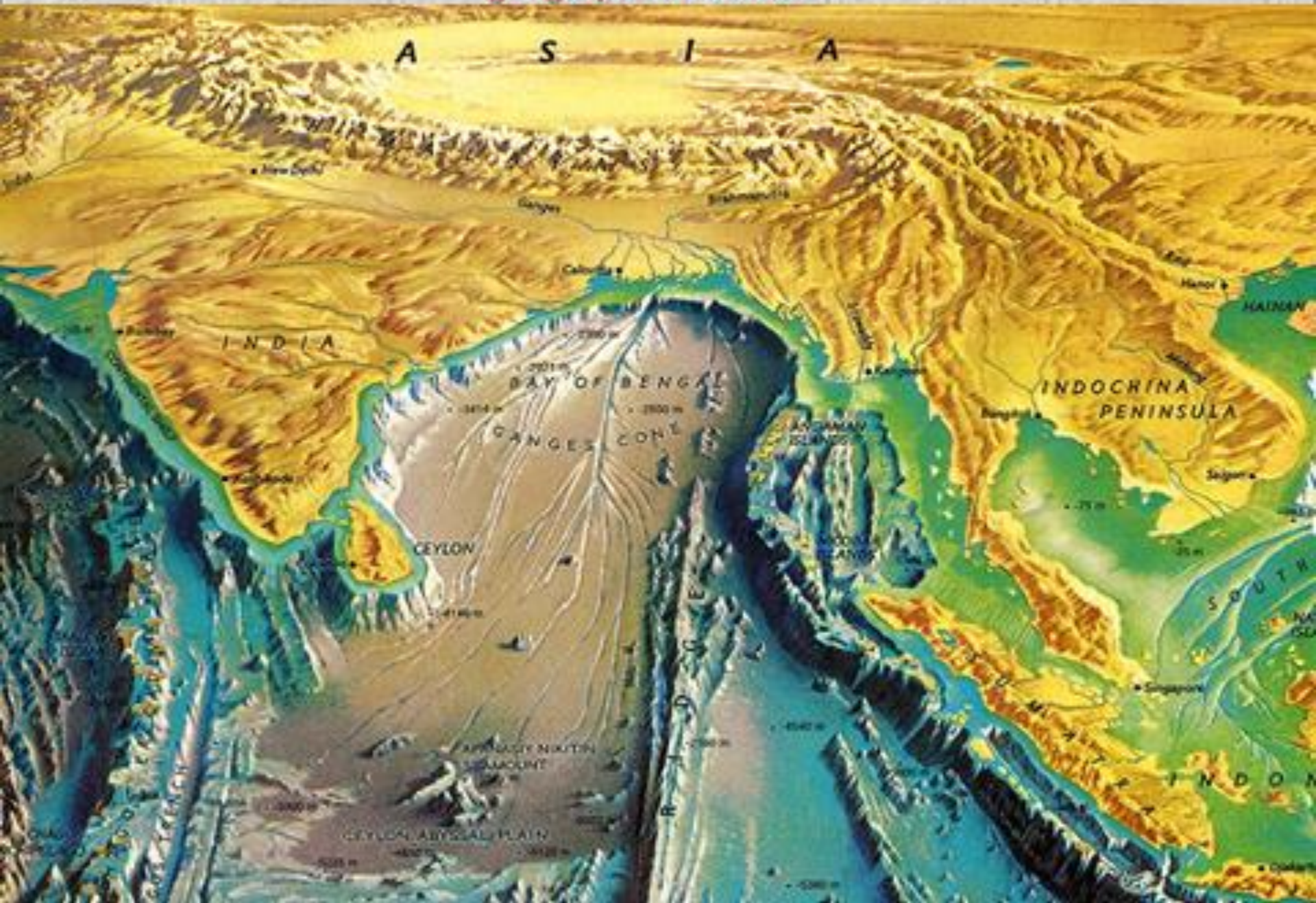
Monthly Distribution of Rainfall over Bangladesh

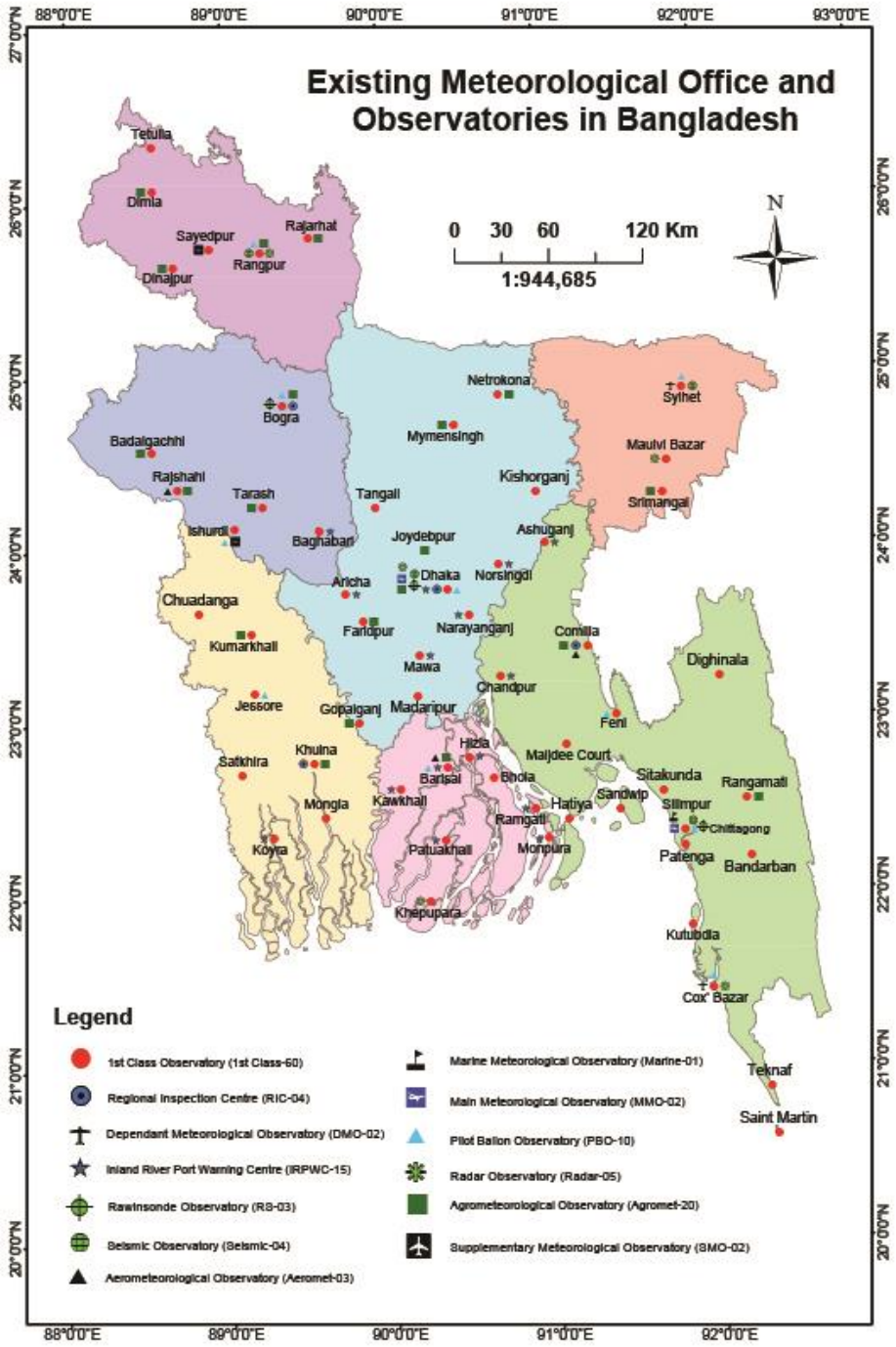


Monthly Maximum, Mean & Minimum Temperature over Bangladesh



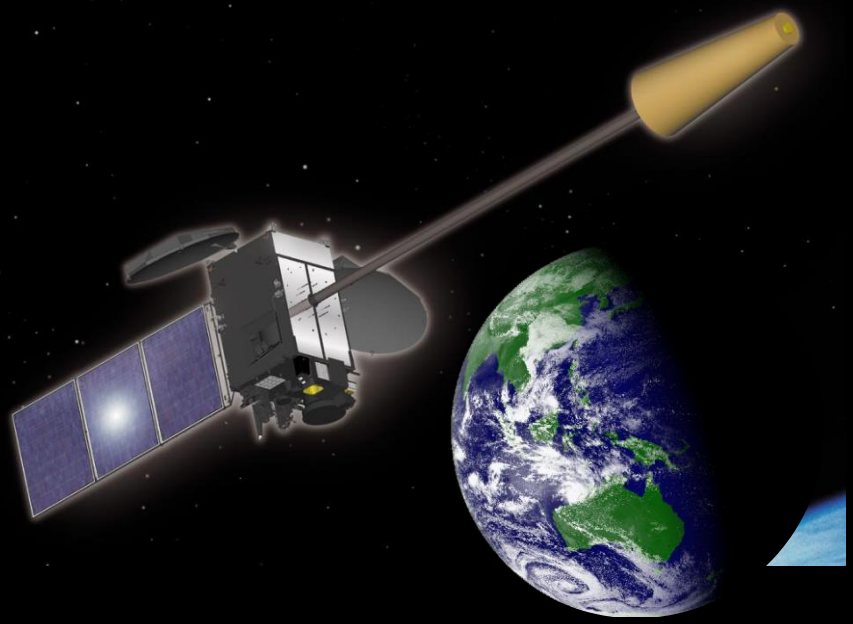
Bangladesh is highly vulnerable for natural disaster due to its critical geographical location





Automatic Weather Obs. System : 40
Synoptic observatories : 60
Pilot Observatories : 10
Rawinsonde Observatories : 03
Agromet observatories : 20
RADAR Stations : 05
Seismic Observatories : 04
Marine met Obs. : 01
MMO : 02
DMO : 02
SMO : 02
Aeromet : 03
RIC : 04
Inland River port warning Center : 15

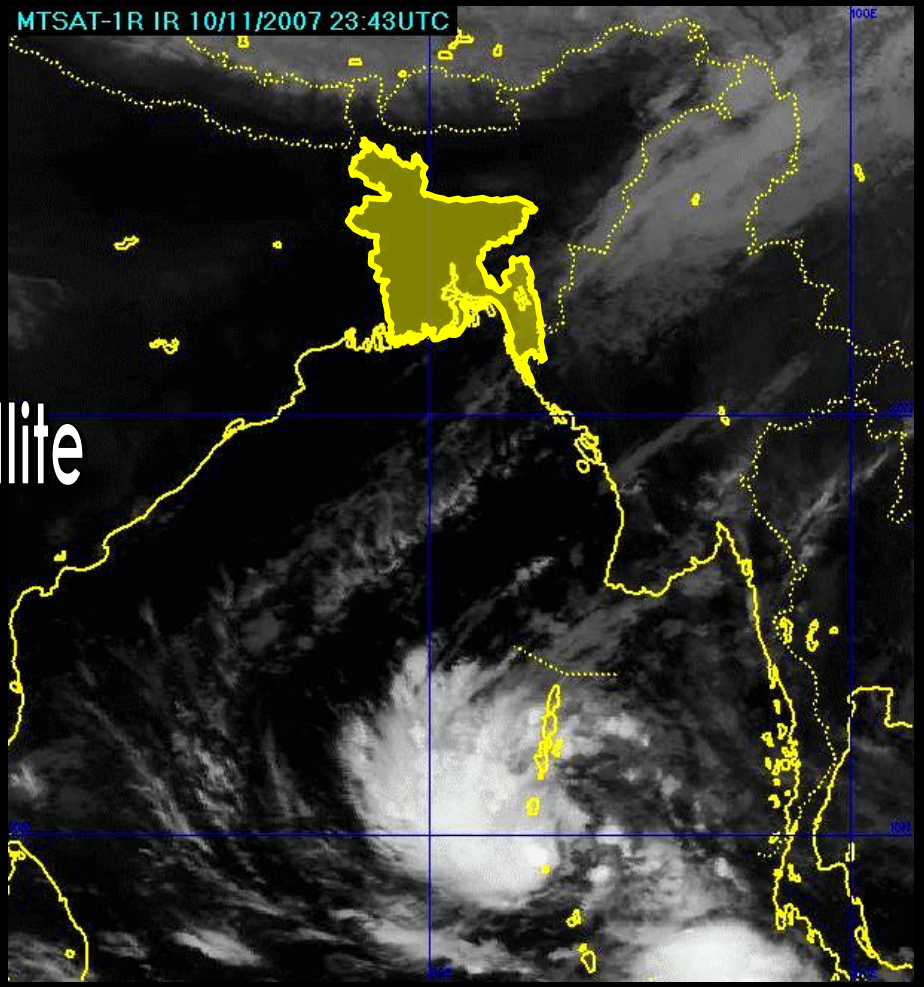
Total 300 AWS will be installed all over the country with in next two years.

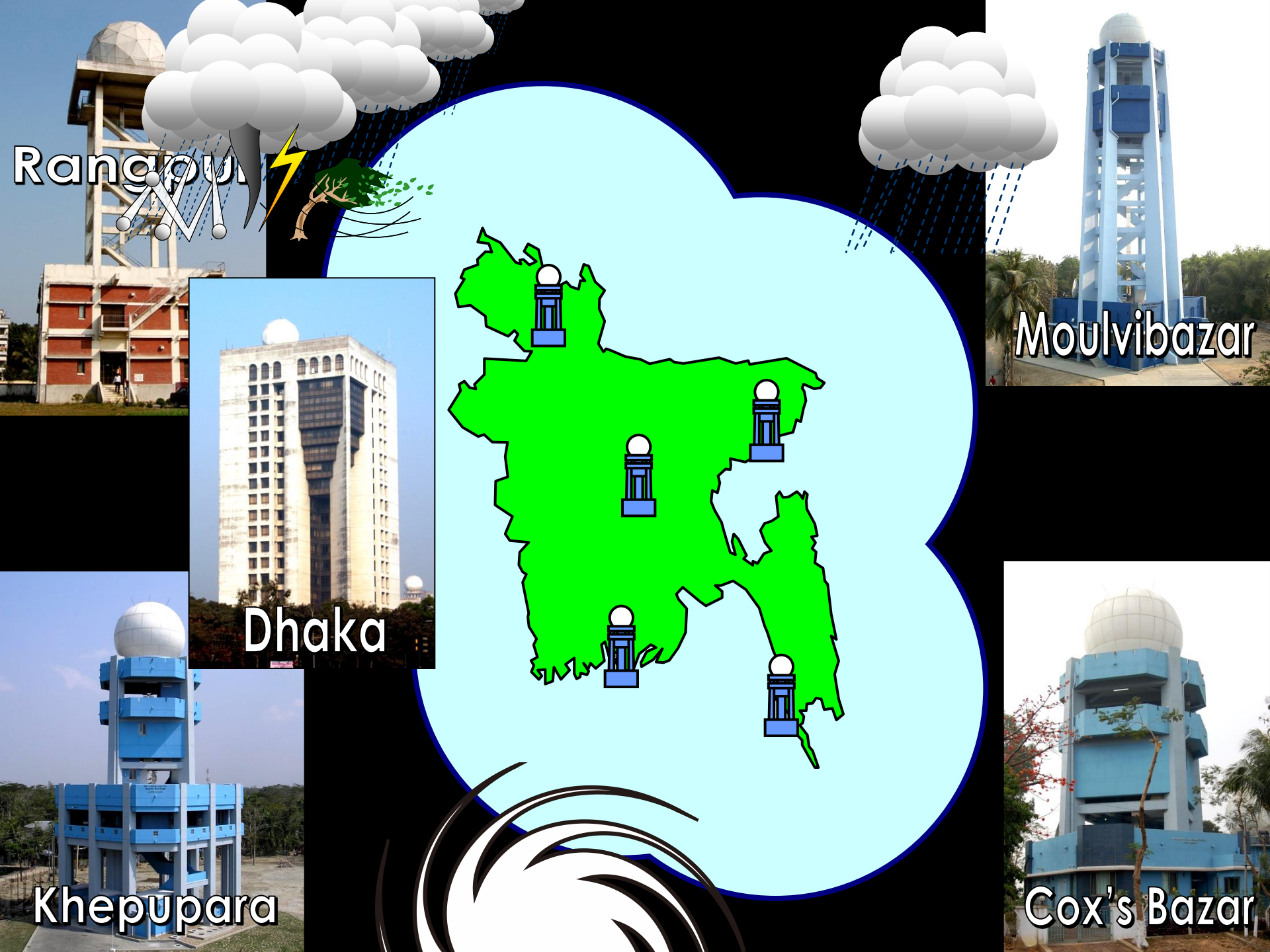


Japan's Meteorological Satellite

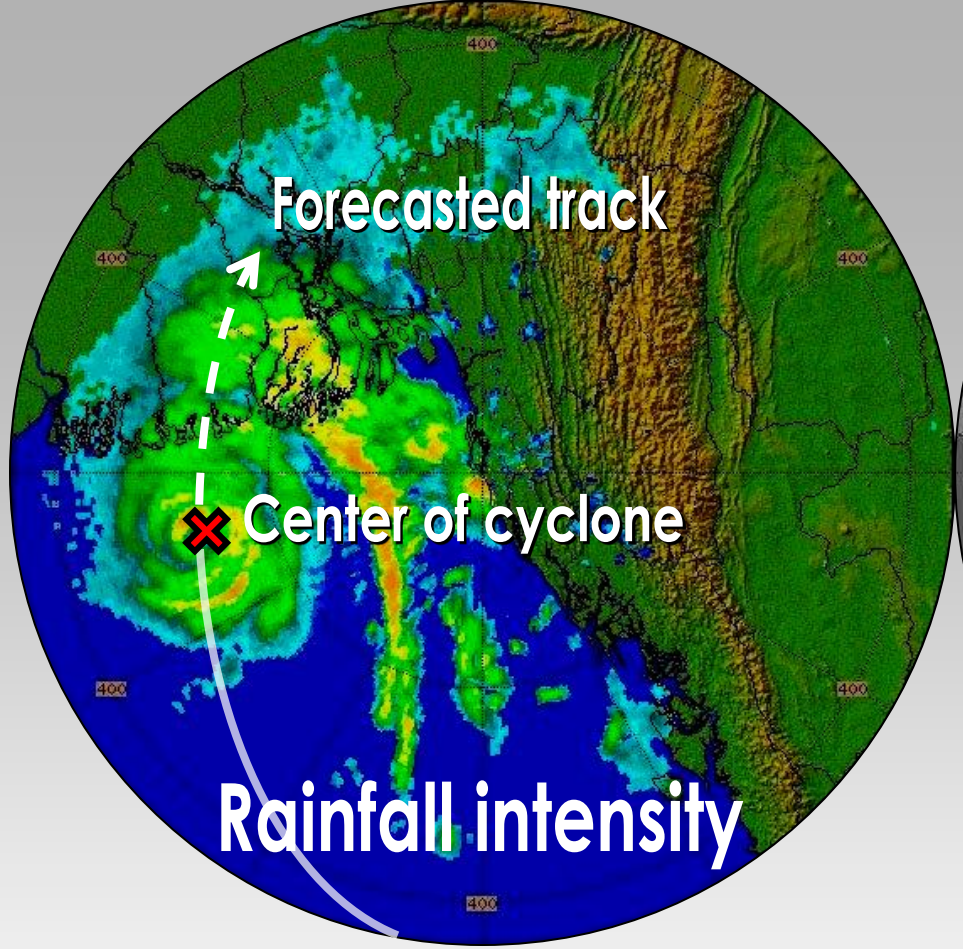
MTSAT

Himawari-8
Launched on 7 October 2014

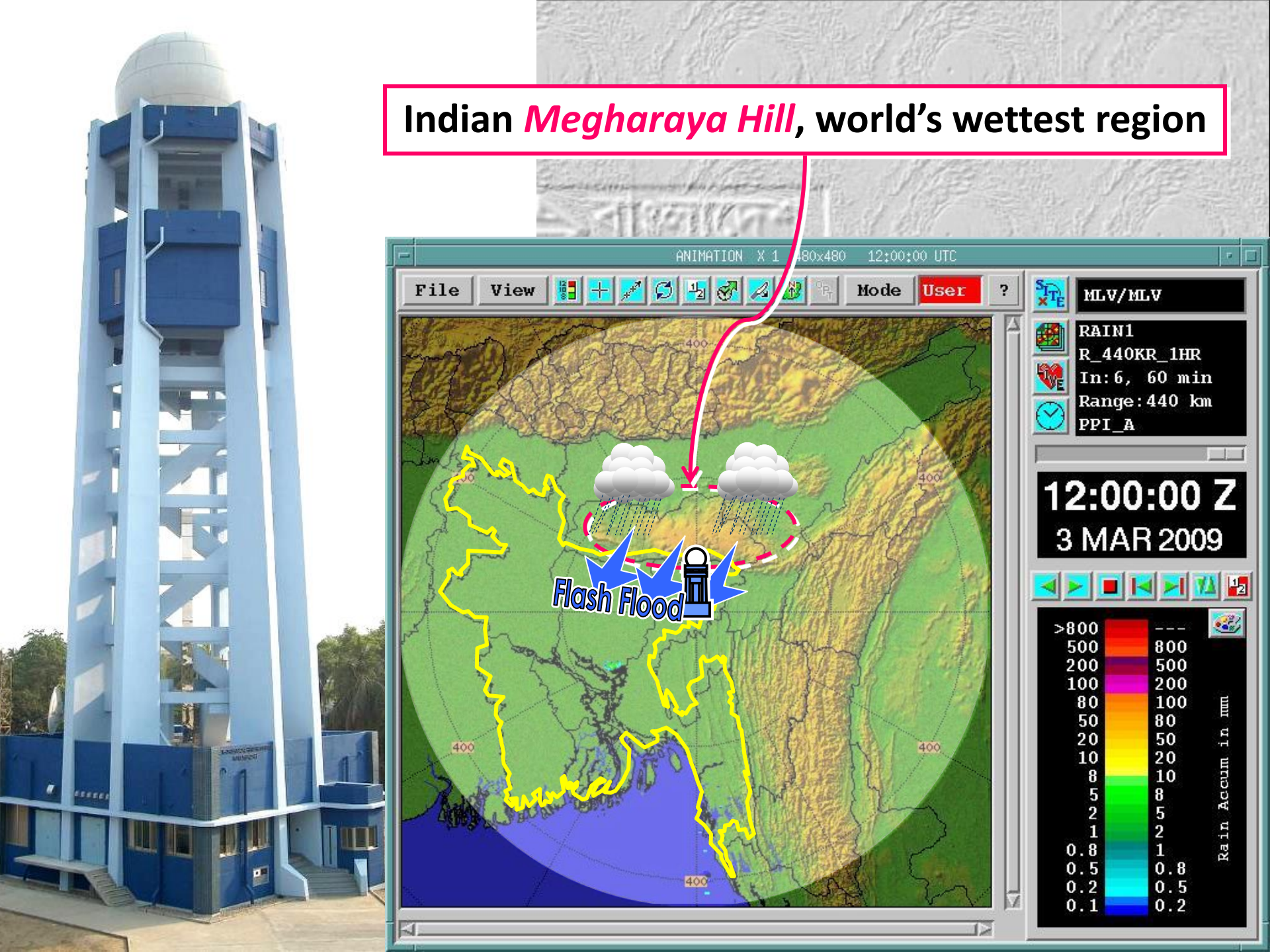



Rangpur
Dhaka
Moulvibazar
Khepupara
Cox's Bazar

Meteorological Radar



Doppler Radar


Indian Megharaya Hill, world's wettest region
ANIMATION X 1 480x480 12:00:00 UTC
File
View
Mode
User
?
MLV/MLV
RAIN1
R_440KR_1HR
In: 6, 60 min
Range: 440 km
PPI_A
12:00:00 Z
3 MAR 2009
Flash Flood
>800
500
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800
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1
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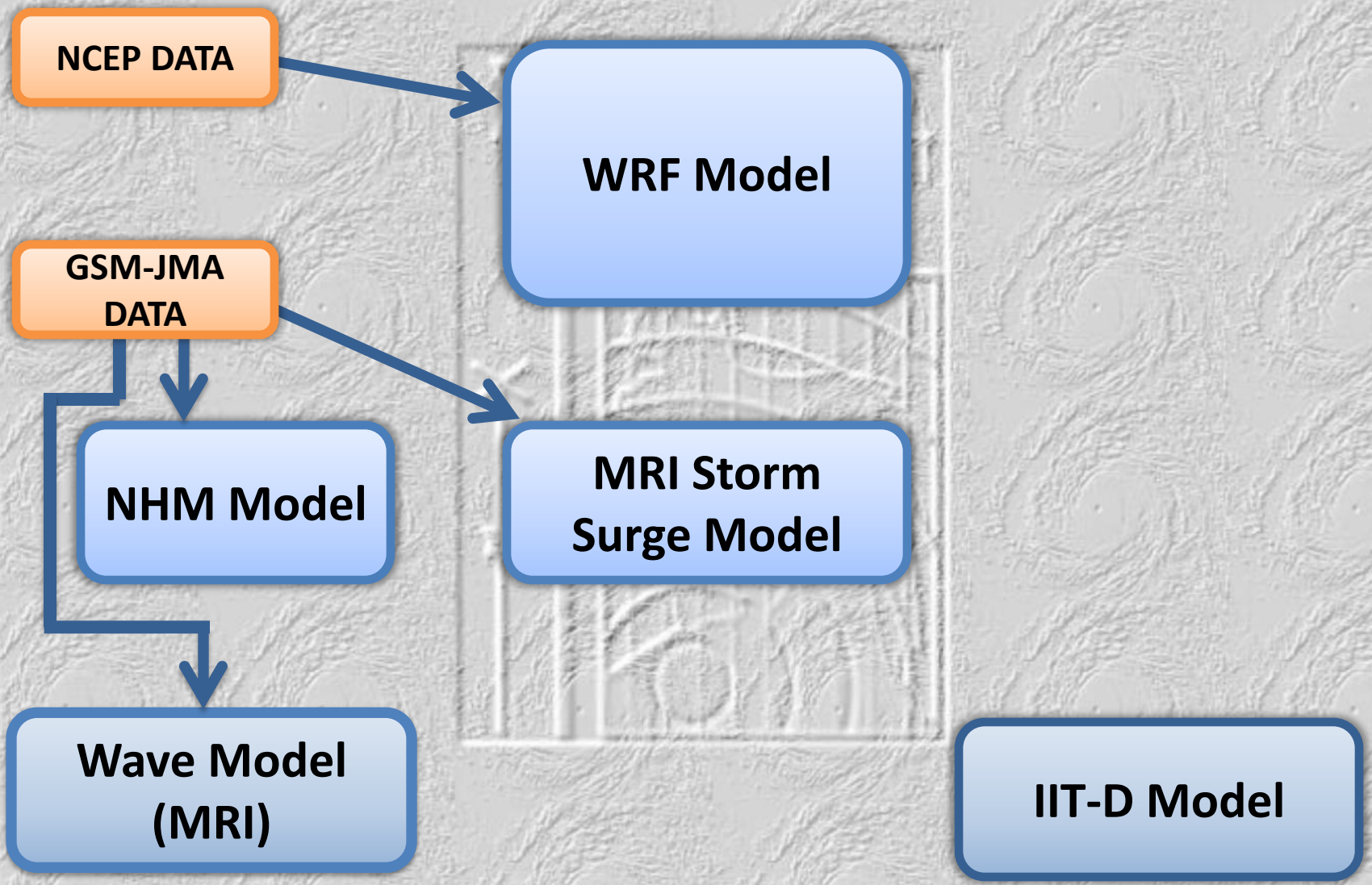
0.2
Rain Accum in mm

Present Status of NWP in BMD



WRF Model

- WRF model is running in BMD since July 2010.
- Resolution : 9 Kms
- Start at : 10:00 AM
- Time required: About 1 hour.
- Products Generating: Rainfall forecast for 24, 48 & 72 hours and 7 days accumulate rainfall forecast with district boundary.
- Model running automatically.

NHM Model

- NHM model is running in BMD since July 2011.
- Time : 72 hours, at 00 UTC
- Resolution : 20 Kms
- Start at : 10:30 AM
- Time required: About 1 hour.
- Model running semi-automatically.

IIT-D Model

- ✓ Operationally using in BMD
- ✓ Well tested and simulated for different cyclones with different parameter
- ✓ Both LINUX and Windows version are installed in BMD.

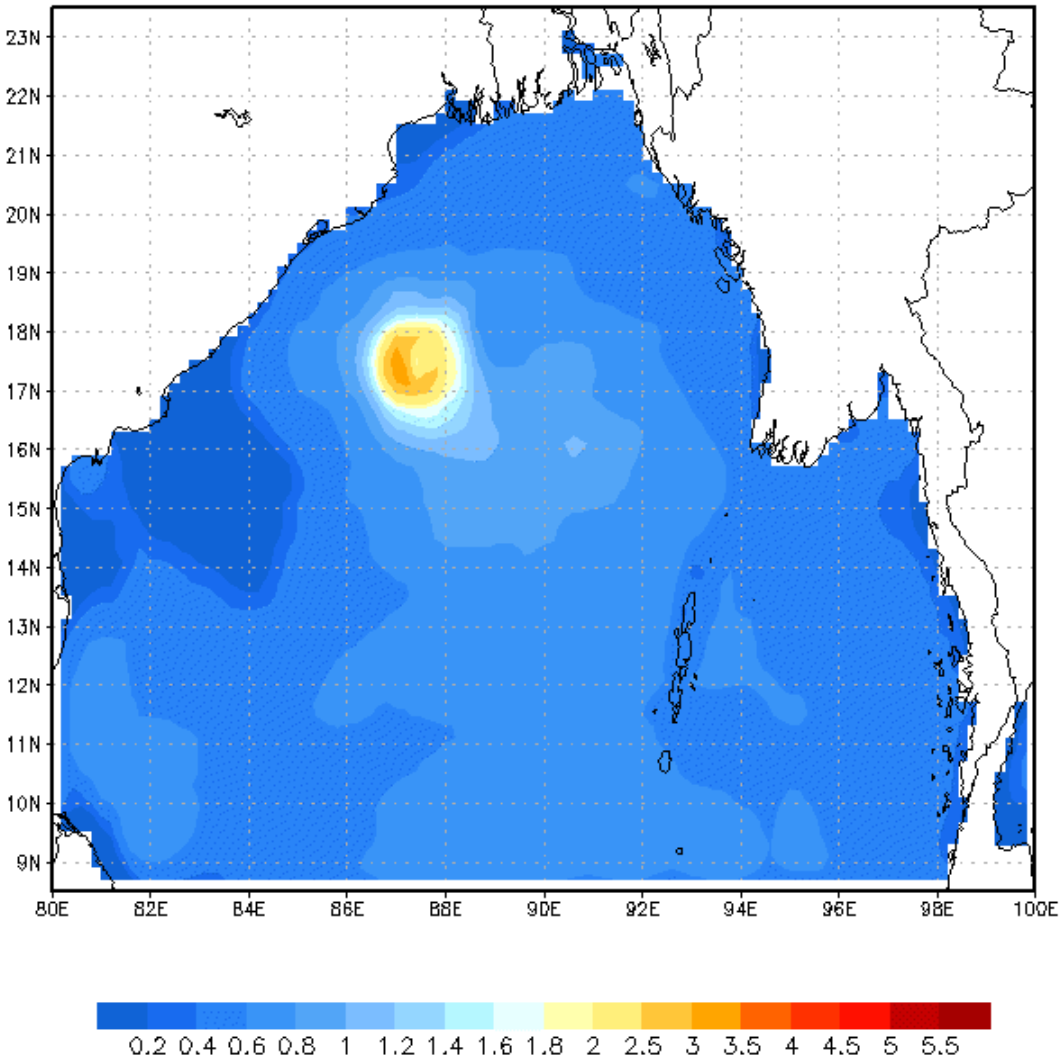
MRI Storm Surge Model

- ✓ Other model products (surface wind, pressure) can be used as input of the model.
- ✓ GSM data of JMA are using to run the model along with conventional parameters.

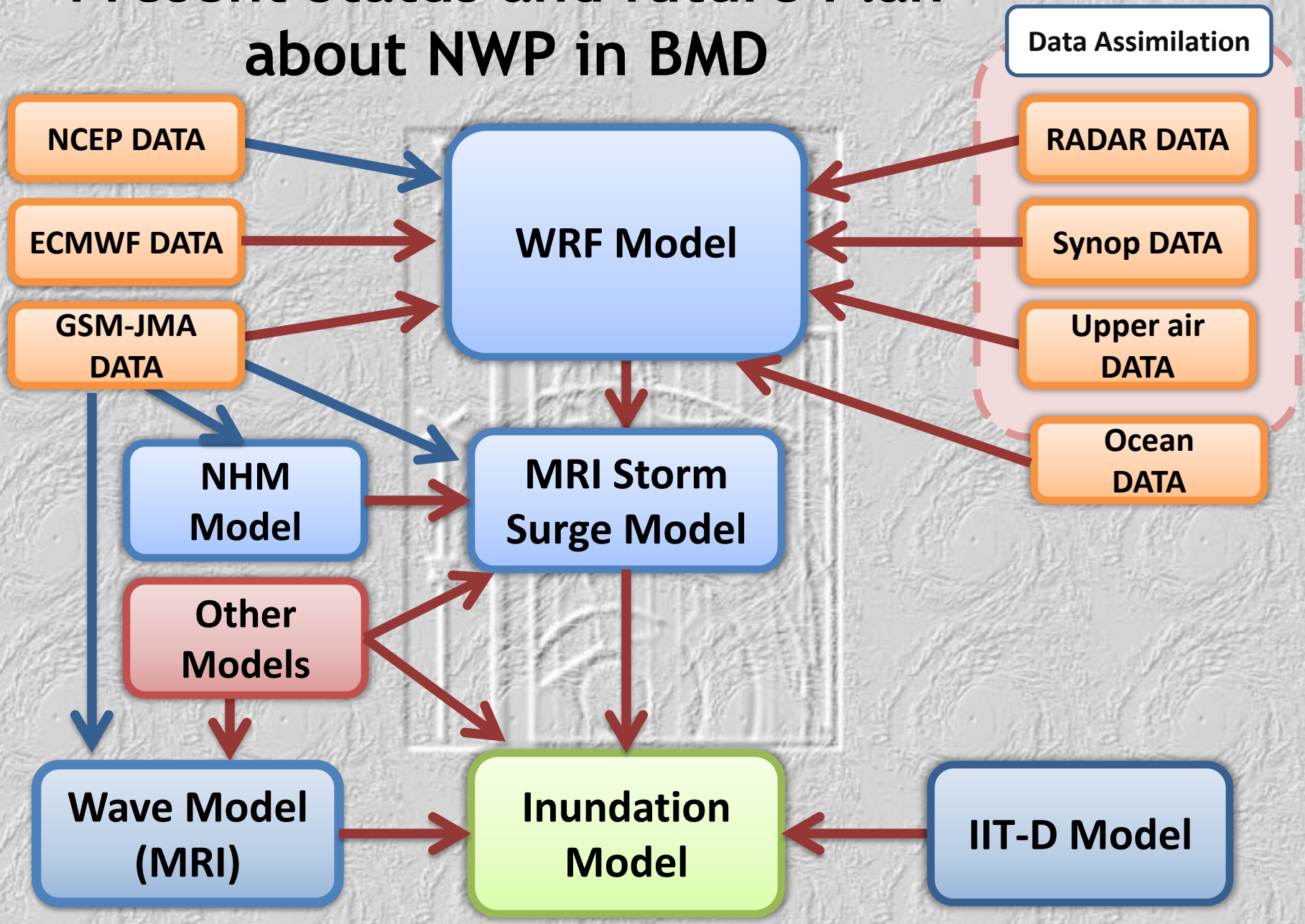
MRI Wave Model

- Regularly running once a day for 36 hours using GSM data from JMA.
- Automatically
- Outputs:
  - Significant Wave Height (m)
  - Significant Wave period (sec)
  - Wave direction
  - Sea Surface Wind (m/s)
  - Swell Height (m)
  - Sea Surface Pressure (hPa)

Significant Wave Height(m),00Z of 15.05.13 +03H



Present Status and future Plan about NWP in BMD

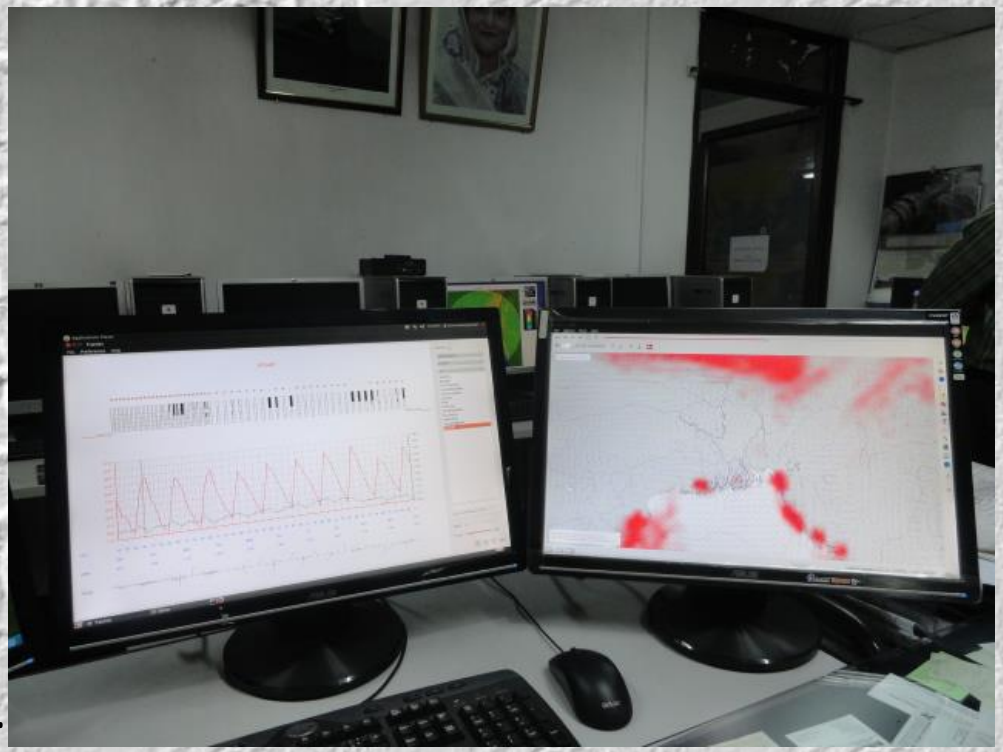


Collaboration

- **Norwegian Meteorological Institute (Metno)**
  - **DIANA** (**DI**gital **ANA**lysis)

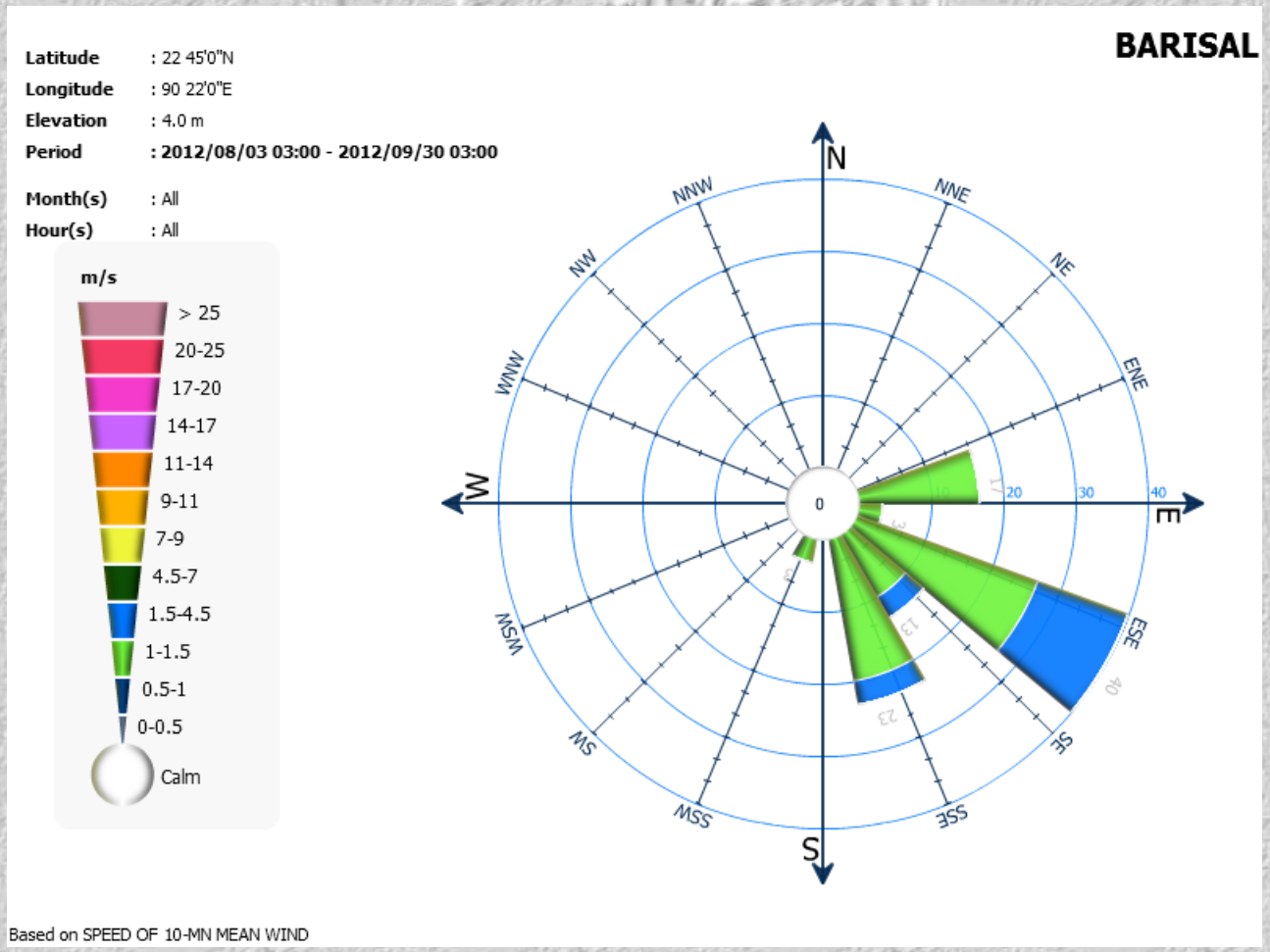
    Diana is an open source meteorological visualization and production software developed at the Norwegian Meteorological Institute (met.no).

- NWP
- Satellite and radar images
- Surface observations
- Trajectories in isosurfaces
- Weather charts
- Soundings
- Vertical cross sections
- Time series
- Field modification
- Drawing of weather symbols etc.



Collaboration

- Meteo France International (MFI)
  - CliSysis



1. Present status of Agro-meteorological services of BMD

Activities of Agromet division has been started through an UNDP project in the year 1978-79 and ended in the year 1984. Installation of agromet instruments and data collection has been started from 1982.

Following data are archiving in the agro-met Division of BMD

(1) 7 days accumulated rainfall
(2) Rainy days in the week
(3) Air temperature with Maximum & Minimum temperature
(4) Global Solar Radiation
(5) Bright Sun shine hour
(6) Soil moisture at different depths (5, 10, 20, 30, 50 cm)
(7) Soil temperature at different depths (5, 10, 20, 30, 50 cm)
(8) Evaporation
(9) Pan water temperature
(10) Wind at 2m. height
(11) Amount of Dew
(12) Grass minimum temparatur
(13) Estimation of evapotranspiration with Penman-Monteith equation
(14) Relative humidity.

Agro-met bulletin contains the following information:

(a) Distribution of last 7 days actual rainfall
(b) Deviation from the normal rainfall by GIS map
(c) 7 days accumulated rainfall forecast with geospatial distribution
(d) Next 7 days extended outlook
(e) No. of rainy days in last 7 days
(f) Average maximum temperature of last week
(g) Normal maximum temperature of last week
(h) Minimum temperature of last week
(i) Normal minimum temperature of last week
(j) Temperature outlook for next week
(k) Average evaporation of last week
(l) Average Sunshine hours of last week
(m) Evaporation and Bright sunshine hour forecast for next week
(n) Advisories for the farmers for next week.

We are disseminating 7 days agromet bulletin by Fax, Internet and website

Some e-mail address:

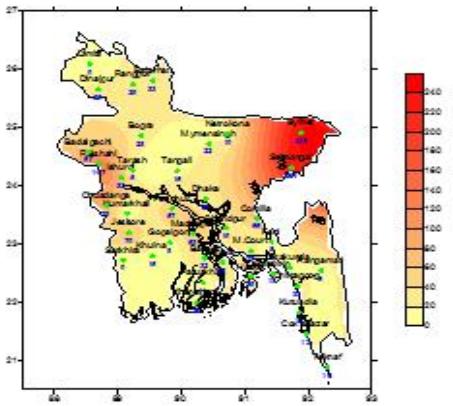
dsinput@moa.gov.bd, "Chittagong 41977" <bmd.chtg@gmail.com>, "Agriculture Ministry" <hossain1110@yahoo.com>, "Agromet Office" <agrometoffice@yahoo.com>, "AIS" <dirais@ais.gov.bd>, "Army HQ" <modte@army.mil.bd>, "BARI" <dg.bari@bari.gov.bd>, "BARI" <baridres@citechco.net>, "BARI" <dir.ss@bari.gov.bd>, "BARI" <dirwheat@bttb.net.bd>, "BARI" <dtcrc@bdonline.com>, "BARI" <pdoprc@bari.gov.bd>, "BARI" <PDPGRC@bari.gov.bd>, "BARI" <ssdbari@dhaka.net>, "BARI" <csoagro@bari.gov.bd>, "BARI" <ppdbari@citechco.net>, "BARI" <entoipm@bdcom.com>, "BARI" <mdismail53@yahoo.com>, "BARI" <ofrdjoy@bttb.net.bd>, "BARI" <barifmpe@bttb.net.bd>, "BARI" <sislambari@yahoo.com>, "BARI" <csoseed@bari.gov.bd>, "BARI" <csovert@bari.gov.bd>, "BARI" <alamin09@yahoo.com>, "BARI" <szamanwrc@yahoo.com>, "BARI" <donbox69@gmail.com>, "BAU" <library_bau@yahoo.com>, "Shameem BMD" <shameem_dd@yahoo.com>, "BMD SWC" <swc@bmd.gov.bd>, "BMD-Khulna" <khulnabmd@yahoo.com>, "BMD-Rangpur" <bmdrangpur@yahoo.com>, "BMD Bogra" <bograbmd@yahoo.com>, "BMD Bogra" <bmdbogra@yahoo.com>, "BMD Ishardi" <abdulkhalek.sarker@yahoo.com>, "BMD Mominul" <momenulislam799@hotmail.com>, "BMD Nooruddin" <noor2kmisha2000@yahoo.com>, "BMD Patuakhali" <bmd.ptkl@gmail.com>, "BMD Quamrul" <smquamrul77@yahoo.com>, "BMD Rangpur" <rangpurbmd@yahoo.com>, "BMD Sayeed" <sayeed1965@hotmail.com>, "BMD Sylhet" <dmo_syl@yahoo.com>, "BMD Taslima Apa" <mdabulkashem@hotmail.com>, "BMDDirector" <directorbmd2005@yahoo.com>, "BMDManzurul Haque" <mhkhan_bmd@yahoo.com>, "BMDRahim" <abdur_rr@yahoo.com>, "BMDSWC" <swcbmd@yahoo.com>, "BRRI" <msislam52@yahoo.com>, "BRRI" <brrihq@bdonline.com>, "BRRI" <enrecabd@bdonline.com>, "BSBSericulture Board" <bsbraj@bttb.net.bd>, "BSRI Sugar Research" <economics@bsri.gov.bd>, "BUETWRE" <mamatin@wre.buet.ac.bd>, "Tasdiq CDMP" <tasdiq.ahmed@cdmp.org.bd>, "DMB CDMP" <info@cdmp.org.bd>, "CEGIS" <mahossain@cegisbd.com>, "CEGIS" <ahassan@cegisbd.com>, "DAE" <fozlulhaquedrm@yahoo.com>, "DAE" <sikder_my@yahoo.com>, "DAE" <ddagrdin@bttb.net.bd>, "DAE" <l_kabir05@yahoo.com>, "FAO-Bangladesh" <FAO-BD@fao.org>, "FFWC" <ffwc05@yahoo.com>, "FFWC" <bhuiyan_salim@yahoo.com>, "FPMU" <fpmu@bttb.net.bd>, "FPMU" <mof@bttb.net.bd>, "FPMU" <hajiqul.islam@nfpcsp.org>, "FPMU" <data@nfpcsp.org>, "FPMU" <abdur.rahman@nfpcsp.org>, "FPMU" <alima.jahan@nfpcsp.org>, "FPMU" <amdadul.huq@nfpcsp.org>, "LACC-2" <s_mehabib@yahoo.com>, "LACC-2" <biddutpaul@gmail.com>, "LACC-2" <jahangir.rf@gmail.com>, "LACC-2" <ashad_1971@yahoo.com>, "LACC-2" <prodip64@yahoo.com>, "LACC-2" <asadhoqag@yahoo.com>, "LACC-2" <hassan58_dae@yahoo.com>, "LACC-2" <abul007@gmail.com>, "MOF" <dirfe@mofabd.org>, "MOFA-1" <asfe@mofabd.org>, "p.b.o ishurdi Pabna" <bmd.isrd@yahoo.com>, "Shaikh Siraj" <rmom@bdcom.com>, slzf06@yahoo.com, "SPARRSO" <nhsharifee@yahoo.com>, "SPARRSO" <azmd_zahed@yahoo.com>, "SPARRSO Dr. Quadir" <dquadir@yahoo.com>, "Sugar" <chinikal@bttb.net.bd>, "UNB" <cosmos@citechco.net>, "WFP" <john.mcharris@wfp.org>, "WFP" <malik.kabir@wfp.org>, "R Stefanski" <RStefanski@wmo.int>, "jiban biswas" <biswas.jiban@gmail.com>, "ADPC" <atiqka@yahoo.com>, "BARI" <hossainbd60@yahoo.co.uk>, "BARI" <hossain60@bdonline.com>, "TCRC" <mahmud.tcrc@yahoo.com>, "IRRI" <M.Z.abedin@irri.org>, "LIBRARY" <library@nfpcsp.org>, "SHOHELA" <sohela.khanam@nfpcsp.org>... more

Government of the People's Republic of Bangladesh
Bangladesh Meteorological Department
(Agro-meteorology Division)
Meteorological Complex, Agargaon, Dhaka-1207.

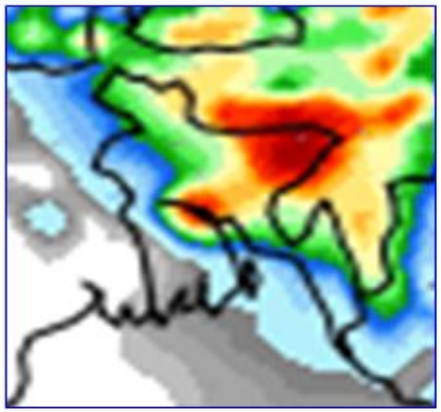
Agm-3 (2)/2016/14 **Issue date: 10-04-2016**

Forecast for the period: 10.04.2016 to 16.04.2016

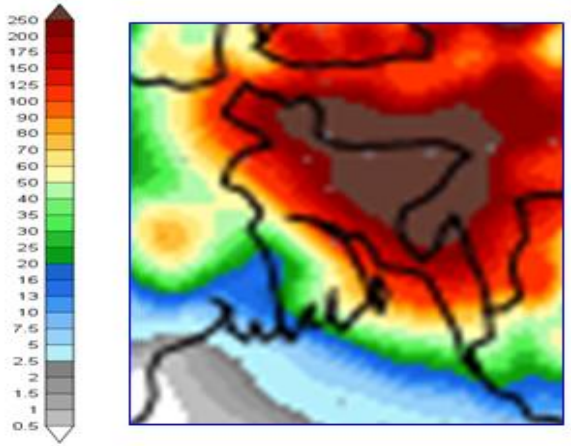
Spatial distribution of Rainfall
(Period: 01-04-2016 to 07-04-2016)



Accumulative Rainfall forecast
(Period: 10-04-2016 to 16-04-2016)



Extended Outlook for accumulative rain
(Period: 17-04-2016 to 23-04-2016)



Highlights:

Country average of bright sunshine hour was 4.17 hours per day during last week.

Country average of free water loss during the previous week was 3.36 mm per day.

(Agro-meteorology Division)

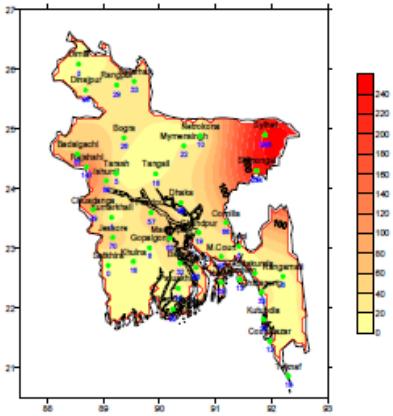
Meteorological Complex, Agargaon, Dhaka-1207.

Agm-3 (2)/2016/14 Issue date: 13-04-2016

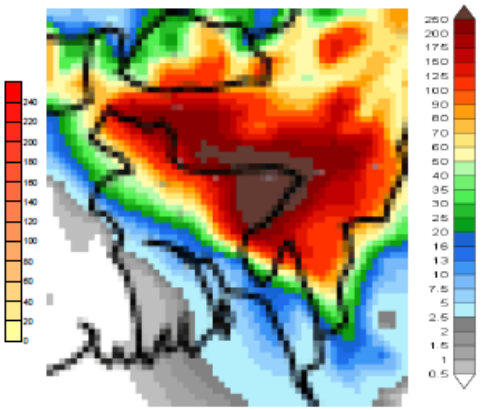
Special Agromet Bulletin for North Eastern part of Bangladesh

Validity : 13.04.2016 to 20.04.2016

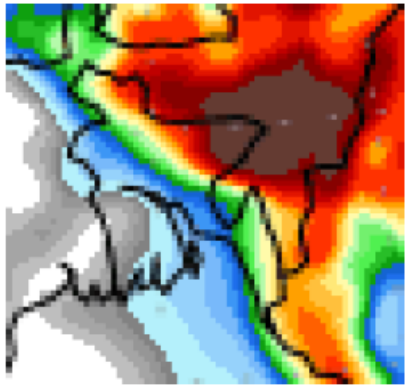
Spatial distribution of Rainfall
(Period: 01-04-2016 to 07-04-2016)



Accumulative Rainfall forecast
(Period: 13-04-2016 to 20-04-2016)



Extended Outlook for accumulative rain
(Period: 21-04-2016 to 29-04-2016)



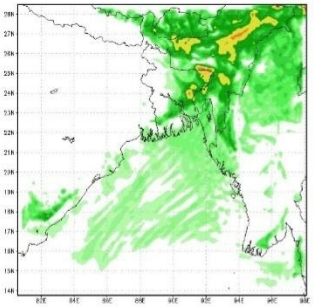
Weather Forecast and Advisory for the Period of 13.04.2016 to 20.04.2016.

- Trough of westerly low lies over Sub-Himalayan West Bengal and adjoining area. Seasonal low lies over South Bay.
- Seven days (13-04-2016 to 20-04-2016) accumulative rainfall forecast of GFS model over Bangladesh and extended outlook for next seven days (21-04-2016 to 29-04-2016) are indicating that more than 250 mm rainfall is likely to occur Over North-Eastern part of Bangladesh and adjoining Assam and Meghalaya region during this period.
- All related departments are requested to take necessary precautions related to heavy rainfall over North-Eastern part of Bangladesh.

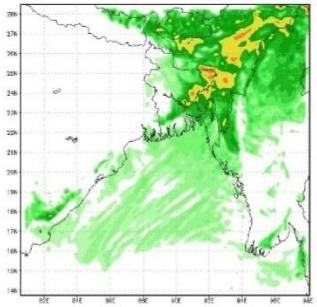
(Md. Shameem Hassan bhuiyan)
Meteorologist
For Director

WRF model simulated rainfall

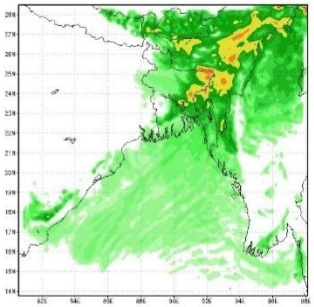
00 UTC, 15 Apr 2016



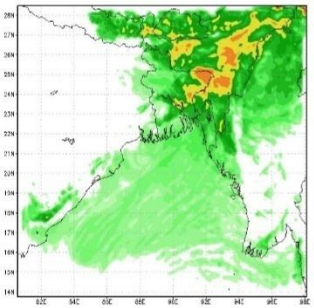
12 UTC, 15 Apr 2016



00 UTC, 16 Apr 2016



12 UTC, 16 Apr 2016



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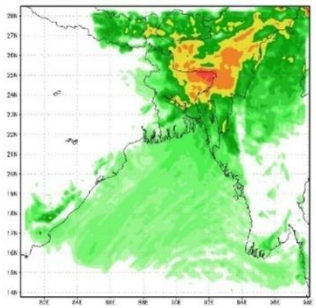

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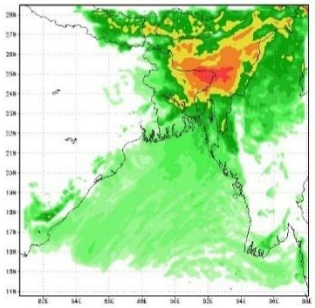

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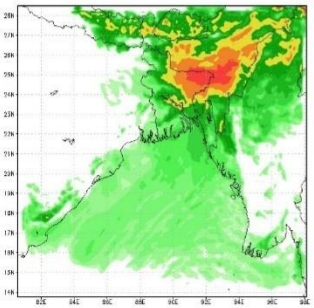

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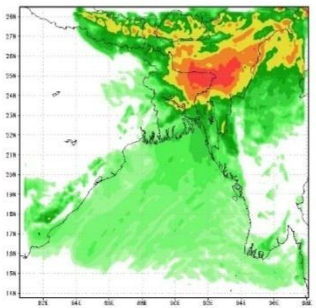

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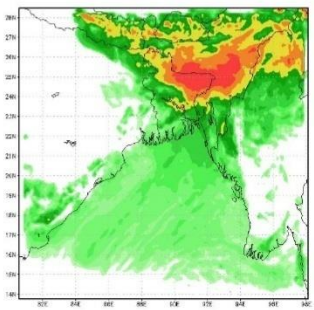
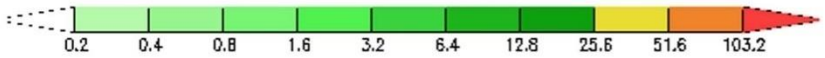


Accumulated Rainfall (mm)



Prepared By

CALIP Project,
BMD Component

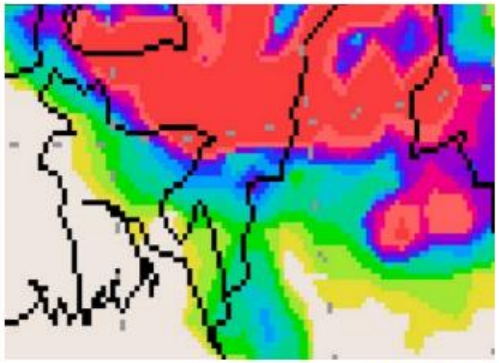
Government of the Peoples' Republic of Bangladesh
Bangladesh Meteorological Department
(Meteorological Headquarter)
Meteorological Complex, Agargaon, Dhaka-1207.

Agm-3 (2)/2010/ **15**

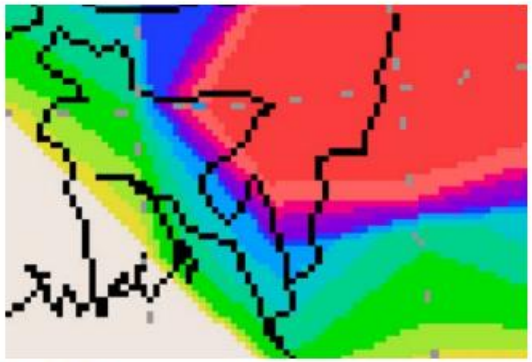
Issue date: 15-04-2010

Forecast for the period: 14.04.2010 to 21.04.2010

Accumulated Rainfall Forecast (15-04-2010 to 21-04-2010)



Extended outlook for the next week (22-04-2010 to 30-04-2010)



Highlights:

Free water loss during 07-04-2010 to 14-04.2010 was averaged 5.28 mm per day.
Sunshine hour during 08.04.2010 to 14-04.2010 was averaged 7.35 hours per day.

Advisory for the period from 15.04.2010 to 21.04.2010.

Free water loss during the Period is expected to be between 5.0 to 5.50 mm per day.
Bright sunshine hour during the Period is expected to be between 6.25 to 7.25 hrs per day.

Weather:

- Light to moderate rain/thunder shower accompanied by temporary gusty/squally wind speed 40-60 km or more may occur at few places over Sylhet, Rangpur and Dhaka divisions and the regions of Jessore, Kustia and one or two places else where over the country with a chance of heavy to very heavy falls at places along with catchment area of Asam and Meghalaya region during this period.
- Day and night temperature may remain nearly unchanged over the country during this period.
- Supplementary irrigation may necessary for the Boro crops over the country except North and North-Eastern part during the period.
- Weather may remain favourable for the application of fertilizer and agricultural chemicals.

(Md. Shameem Hassan Bhuiyan)
Meteorologist
For Director

Flash flood hits Sylhet

MINTU DESHWARA, *back from Gowainghat, Sylhet*

Heavy rain and the onrush water from the hills triggered a flash flood in Gowainghat and Jointapur upazilas of Sylhet yesterday, marooning around 2,000 families in 30 villages.

Water flooded low-lying areas of the upazilas. The water also flowed into Sylhet Sadar and Kanaighat upazilas two or three days ago.

Nijpath, Fotepur, Dorbost and Chiknapur villages of Jointapur and Pachim Jaflong, Purbo Jaflong, Rustompur, Dhobari, Lengura and Toakul villages in Gowainghat upazila went under water as the rain continued, locals said.

Abdul Alim, 58, of Unanpur village in Gowainghat, said heavy rain in the last two days caused the flooding. "Water from the Gowain river started to enter our home since Saturday evening."

Another victim Joynul Miah, 65, of Jaflong tea garden in Gowainghat, said water from the hills began to flood the area since Saturday night, forcing the villagers to take shelter on road.

Joynal Abedin, Jointapur upazila chairman, said floodwater entered 13 villages in the upazila and around 1,200 families were affected.

On information, Water Development Board officials visited the areas.

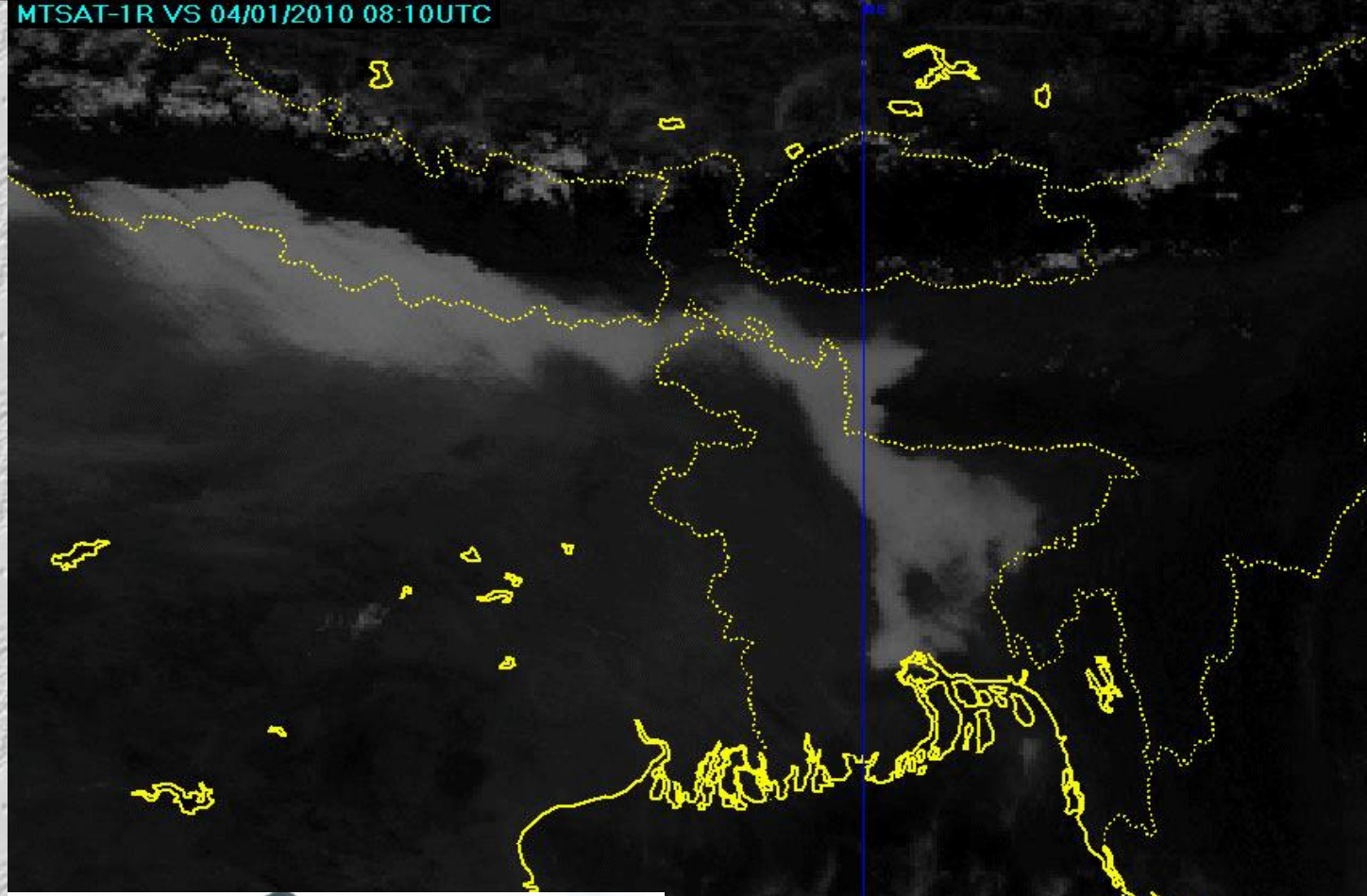
Abdul Hakim Chowdhury, chairman of Gowainghat upazila, said road communications between the upazila headquarters and Pachim Jaflong, Purbo Jaflong, Rustompur, Dhobari and Lengura unions remained snapped.

Dykes at Nayeakhel, Bhittikhel, Thubang, Baladara and Shurkhel had already been damaged. As water level in the Gowain and

Locals pushing a human haulier from behind after it got stuck in a flash flood in Alirgaon union in Sylhet's Jointapur upazila yesterday. *Bottom right*, a CNG-run auto-rickshaw wade through water in the same area. The flash flood, triggered by heavy rain and the onrush of hill waters, has left thousands of people marooned in the district.

PHOTO: SHEIKH NASIR

Fog is a common phenomenon in winter season. Moderate to thick fog may cause late blight debases in potato crops. Agro-met division forecast fog and farmers are advised to apply fungicides for potato crops before persistence thick fog events.



- *Highlights:*
- Free water loss during 22.12.2010 to 31.12.2010 was averaged to 2.26 mm per day.
- Sunshine hours during 22.12.2010 to 31.12.2010 were averaged to 7.08 hours per day.
- *Advisory for the period from 01.01.2011 to 07.01.2011.*
- Free water loss during the 1st week of January 2011 is expected to be between 2.00 to 2.50 mm per day.
- Bright sunshine hour during the 1st week of January 2011 is expected to be between 5.50 to 6.50 hrs per day.
- *Weather:*
- Seasonal low lies over South Bay.

- Weather is likely to remain mainly dry with temporary partly cloudy sky over the country during this period.

- Moderate to thick advection fog may occur over the country during the middle of this period.

- Mild cold wave may sweep over Rajshahi, Rangpur and Sylhet divisions and the regions of Jessore, Satkhira, Kustia and Mymensingh during the end of this period.
- Fungicides should be applied to potato crops to save it from late blight disease.
- Weather condition of this period is suitable for applying fertilizer and aerial spray.

- Supplementary irrigation should be applied for Robi crops to save it from moisture stress.

Future scope to enhance the Agro-meteorological services

a. Improvement of seasonal forecast

b. Integrated Irrigation management

c. Early agro meteorological Crop yield estimation

d. Integrated drought management & Early Warning

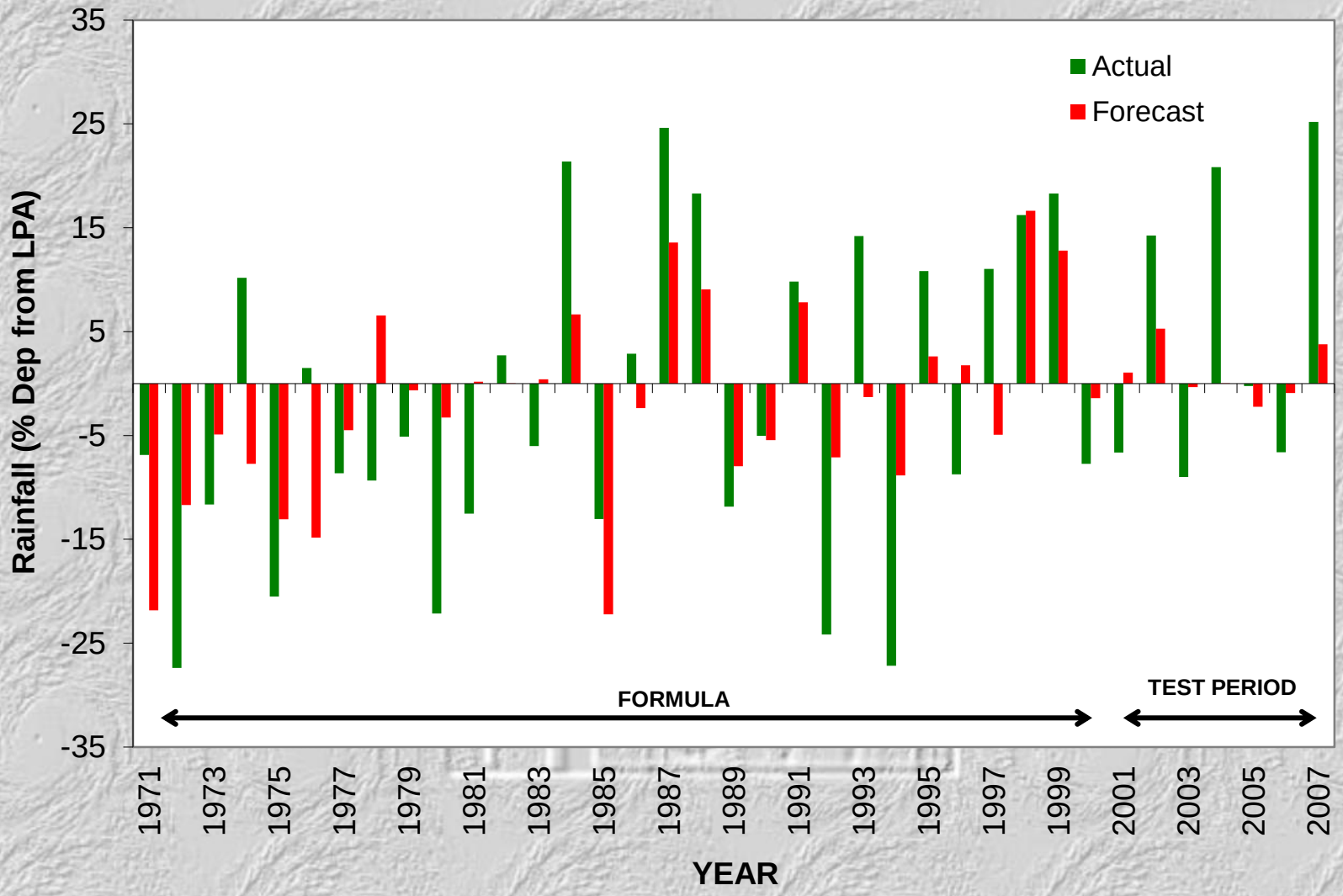
e. Damage assessment due to natural disaster

f. Crop suitability map with agro ecological zone

g. Pest and disease control and management

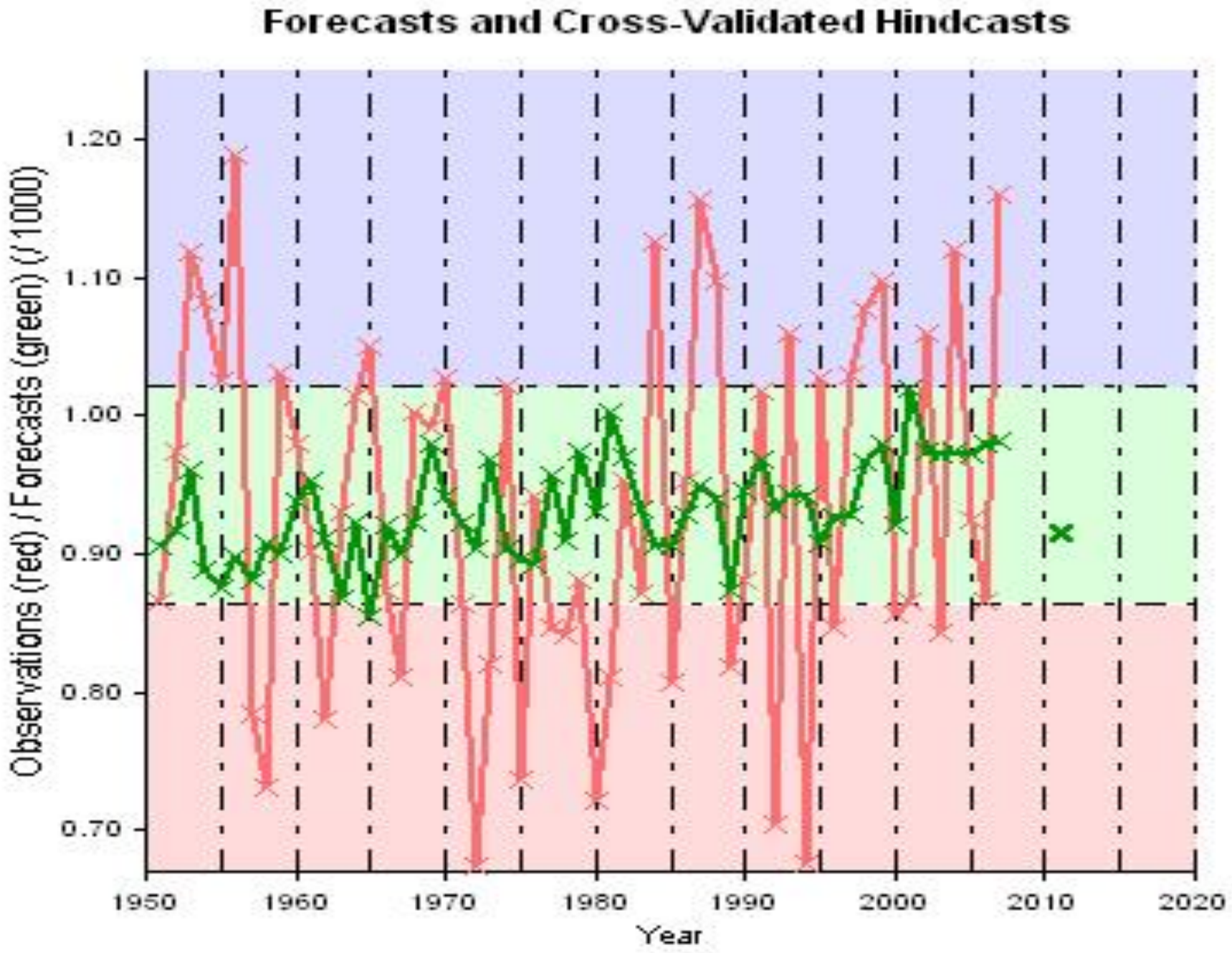
h. To select Suitable time for applying fertilizer & pesticides

Performance of MR Model for Bangladesh JJAS Rainfall: 1971-2007



RSME – 11.74

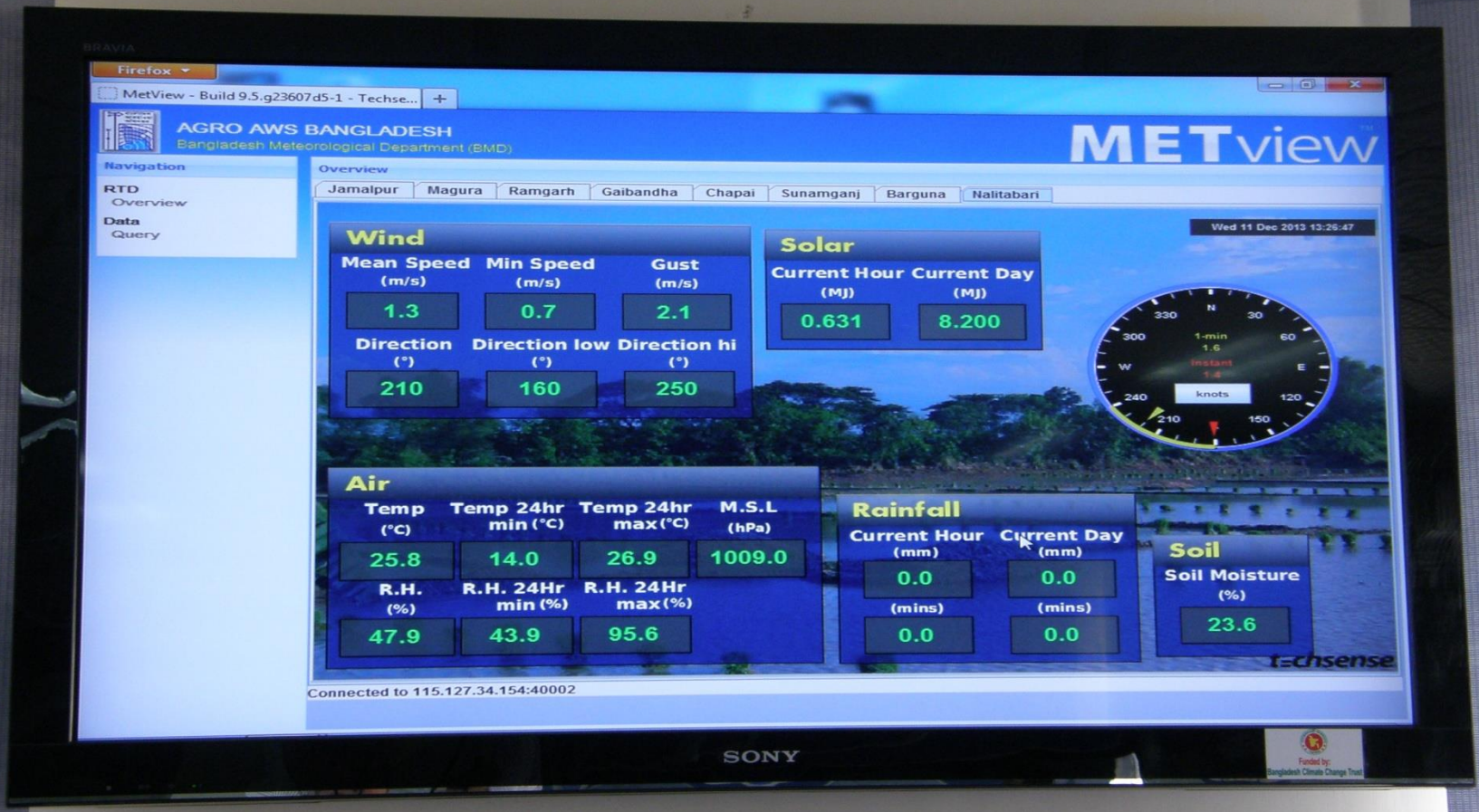
CPT Model output



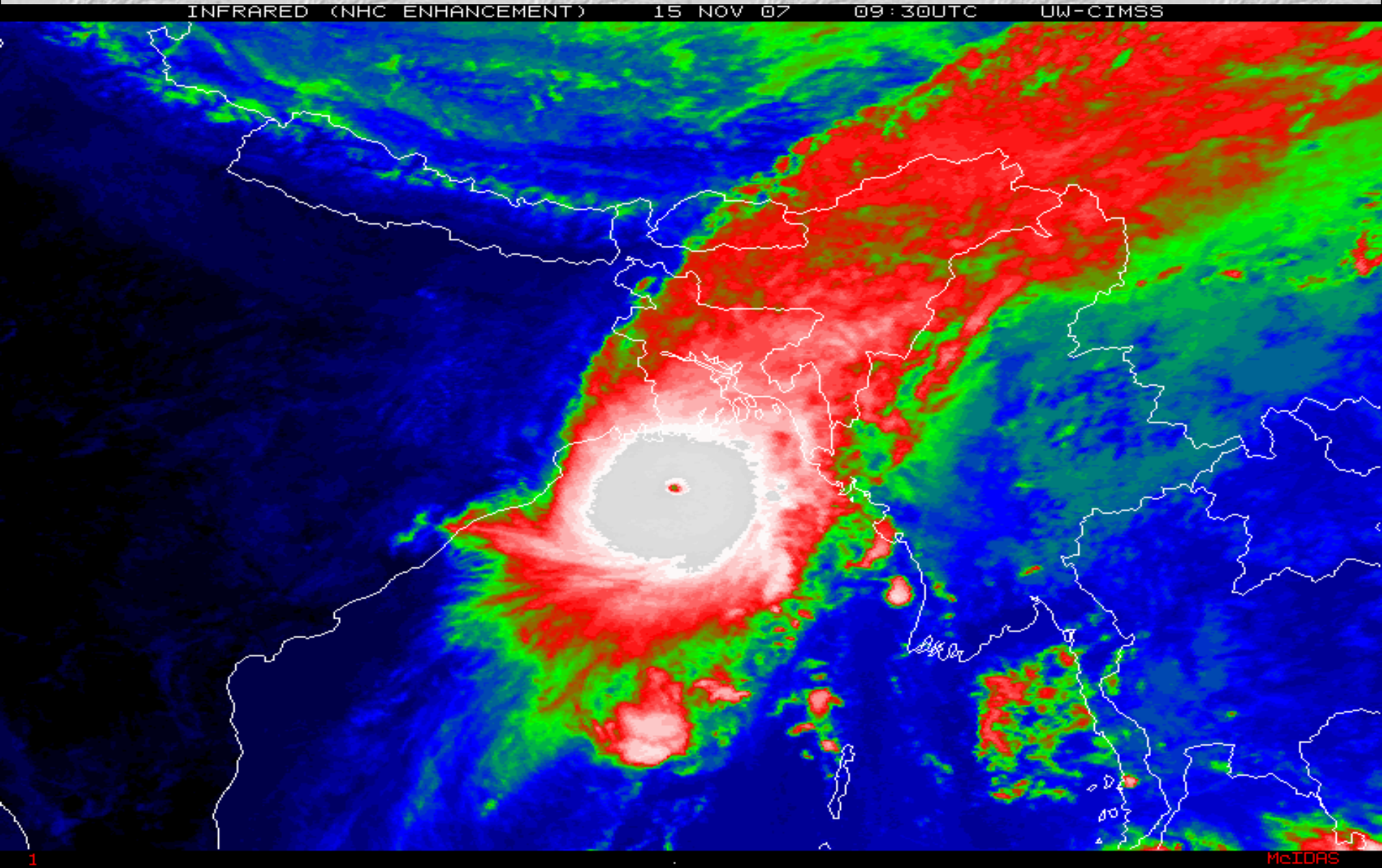
GIS and Remote Sensing Lab of Agromet Division

8 Node PC Cluster of Agromet Division

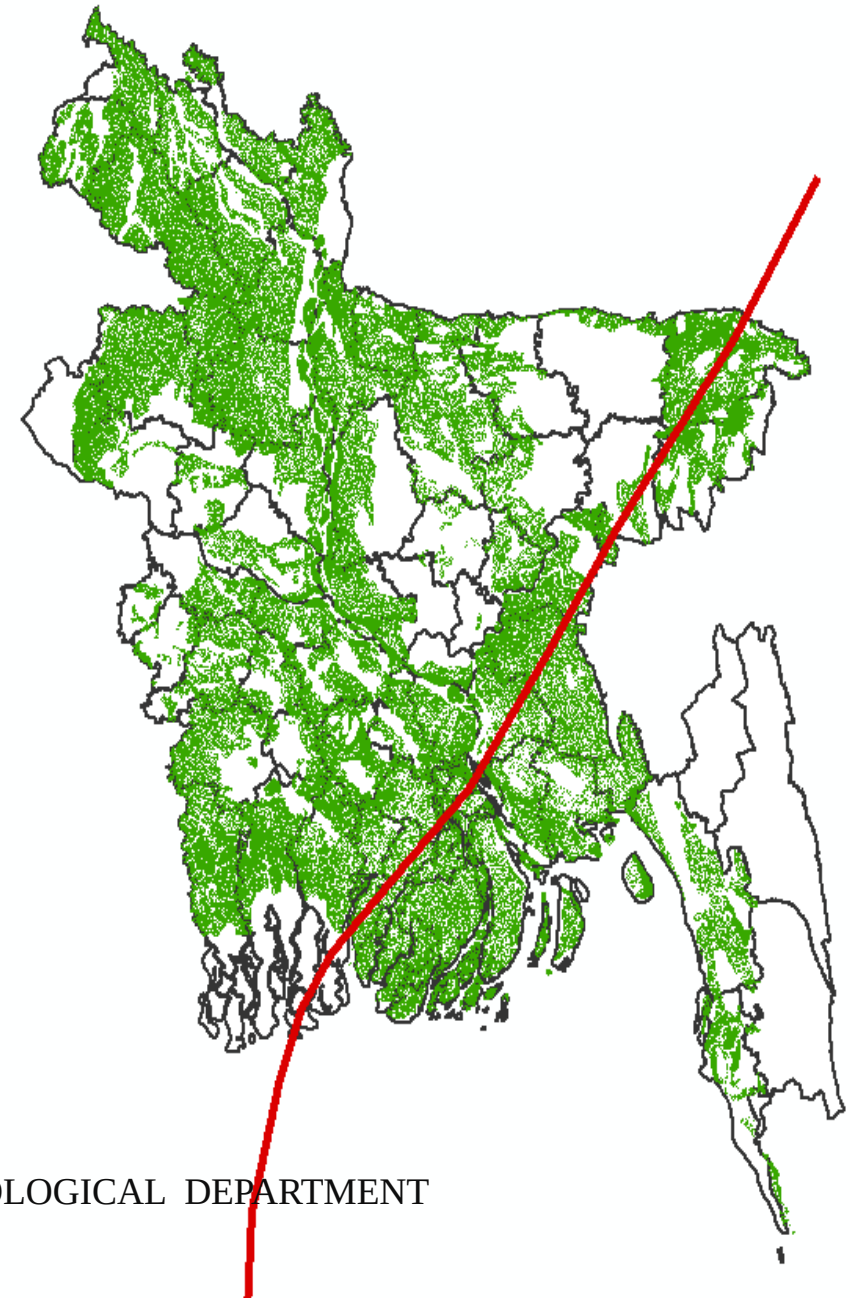
Real time data collection system through AWS at Agromet Division



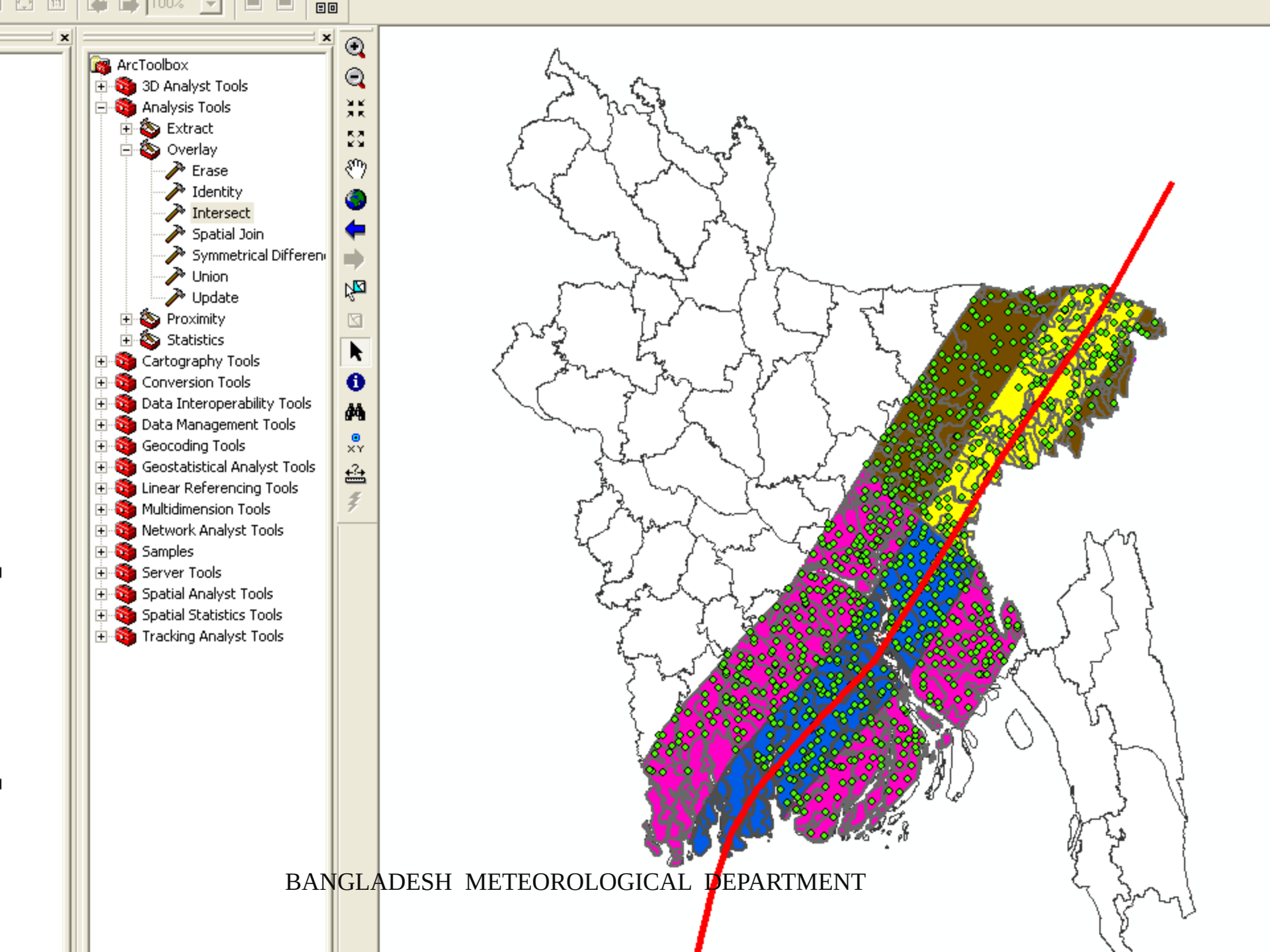
Damage assessment of amon crops due to SIDR



Estimation of Aman area through NOAA-NDVI



BANGLADESH METEOROLOGICAL DEPARTMENT


ArcToolbox
3D Analyst Tools
Analysis Tools
Extract
Overlay
Erase
Identity
Intersect
Spatial Join
Symmetrical Differen
Union
Update
Proximity
Statistics
Cartography Tools
Conversion Tools
Data Interoperability Tools
Data Management Tools
Geocoding Tools
Geostatistical Analyst Tools
Linear Referencing Tools
Multidimension Tools
Network Analyst Tools
Samples
Server Tools
Spatial Analyst Tools
Spatial Statistics Tools
Tracking Analyst Tools
BANGLADESH METEOROLOGICAL DEPARTMENT

High 1

Wind 200~240 km/h, Buffer 25 km

High 2

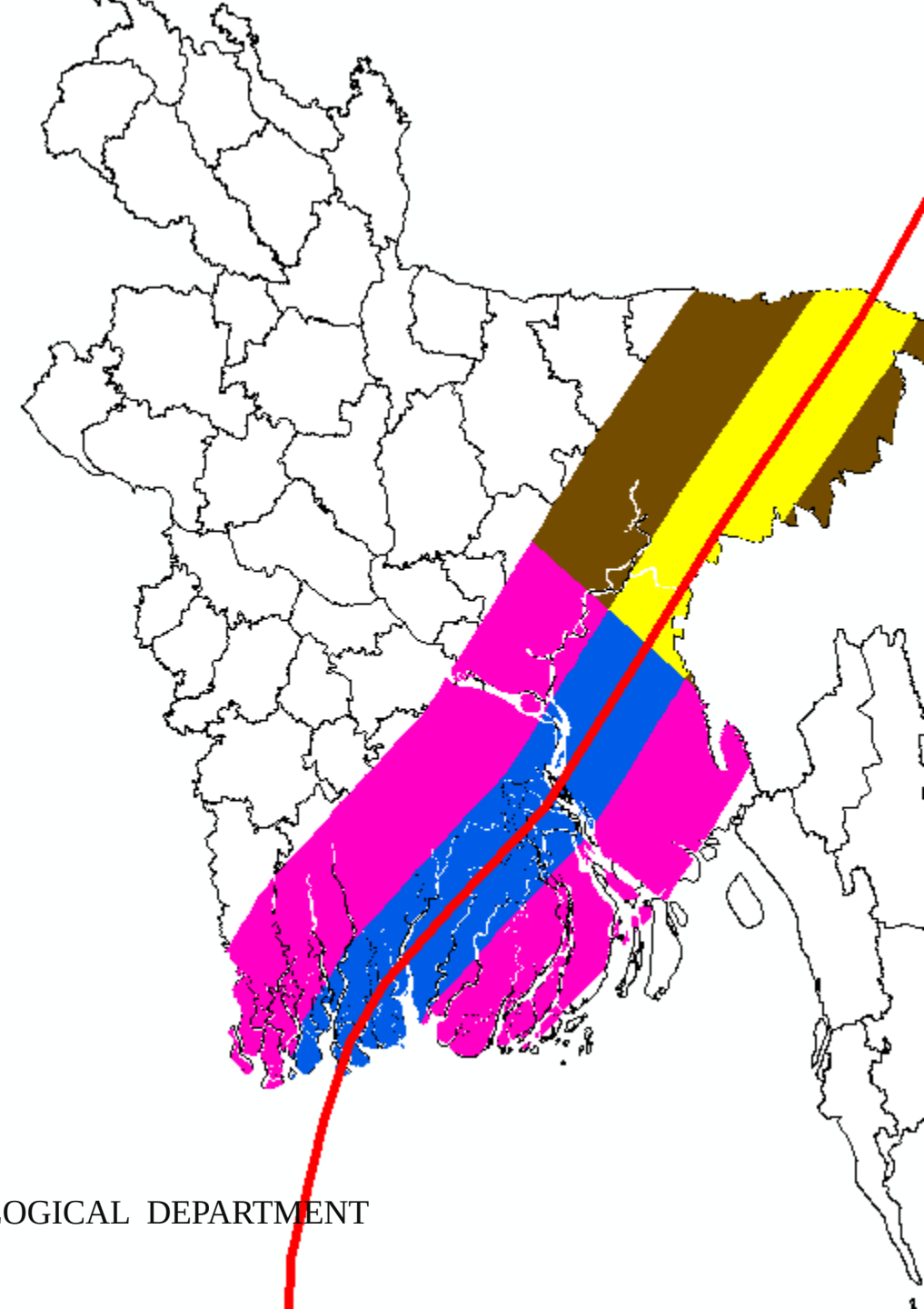
Wind 150~200 km/h, Buffer 75 km

Low 1

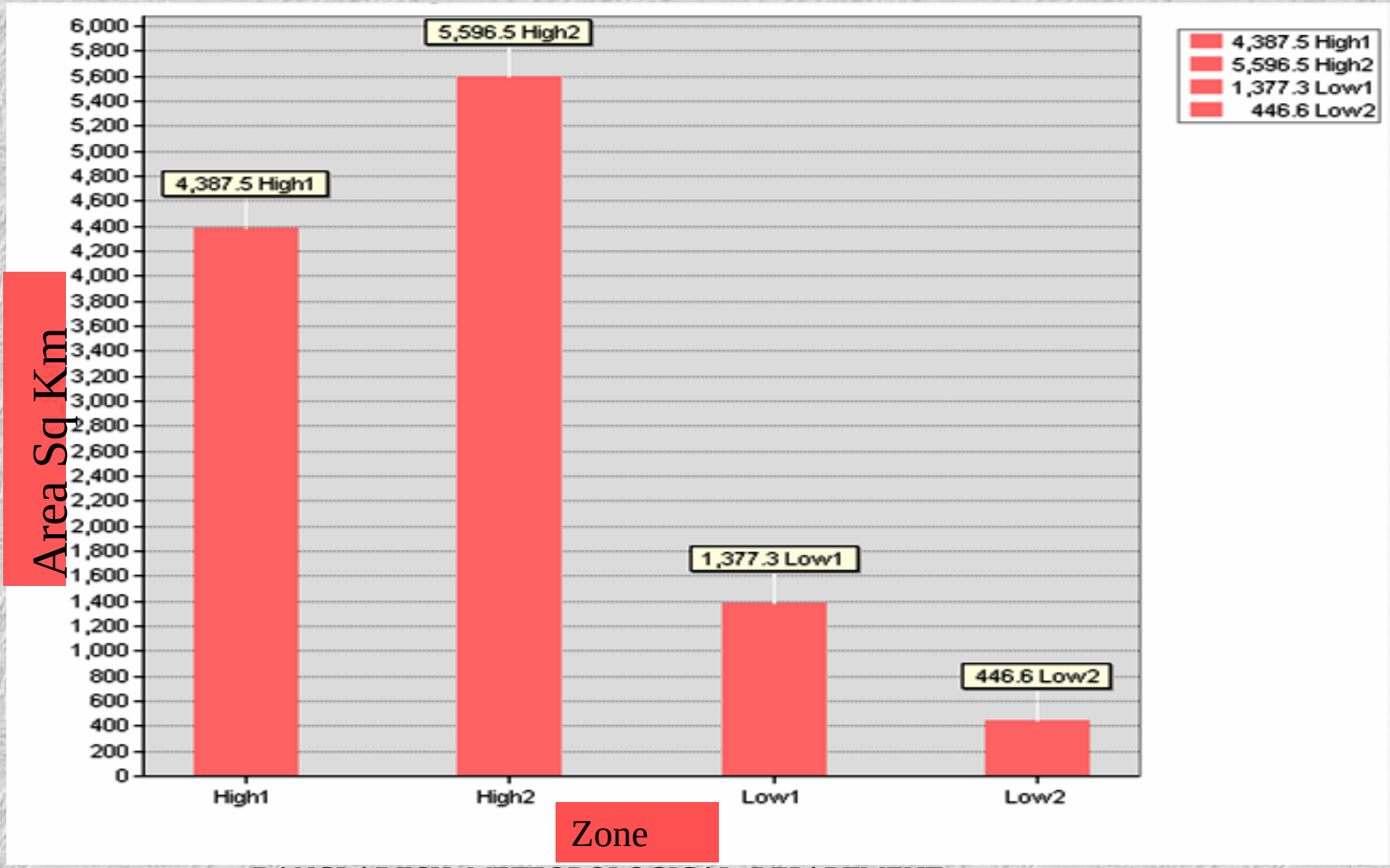
Wind 100~150 km/h, Buffer 25 km

Low 2

Wind 50~100 km/h, Buffer 75 km



Graph on Damaged Zone wise Aman area



Roving seminar for the farmers

ADB

আবহাওয়া পূর্বাভাস

PRACTICAL ACTION

তথ্য উৎস: এগ্রোমেট ডিভিশন, বাংলাদেশ আবহাওয়া অধিদপ্তর

গত সপ্তাহ	চলতি সপ্তাহ	আগামী সপ্তাহ
জুলাই ০১ থেকে ০৭	জুলাই ০৮ থেকে ১৪	জুলাই ১৫ থেকে ২১
০৫৮ মি.মি.	১০ থেকে ০৩৫ মি.মি.	৮০ থেকে ১০০ মি.মি.
২৭ থেকে ৩২.৯ ডিগ্রি সেন্টিগ্রেড	০২৭ থেকে ০৩৩ ডিগ্রি সেন্টিগ্রেড	
৫.০৩ ঘন্টা/ দিন	০৪.৫ ঘন্টা/ দিন	
৩.৯ মি.মি./ দিন	১৪৬ থেকে ১৫৬ মি.মি./ দিন	

জরুরী কৃষি বার্তা

জুলাই ০৮ থেকে ১৪

প্রয়োজনীয় মোবাইল নং

বিপদ সংকেত

গড় বৃষ্টিপাত	তাপমাত্রা	গড় আলোক ঘন্টা	বাষ্পিভবন মাত্রা	খুব সামান্য হতেও পারে নাও পারে (০-১০ মিমি)	হালকা বৃষ্টিপাত (১০-৩৫ মিমি)	মাঝারী ভারি বৃষ্টিপাত (৩৫-৬৫ মিমি)	ভারি বৃষ্টিপাত (৬৫-৮০ মিমি)	খুব ভারি বৃষ্টিপাত (৮০-১২৫ মিমি)	অতি ভারি বৃষ্টিপাত (>-১২৫ মিমি)

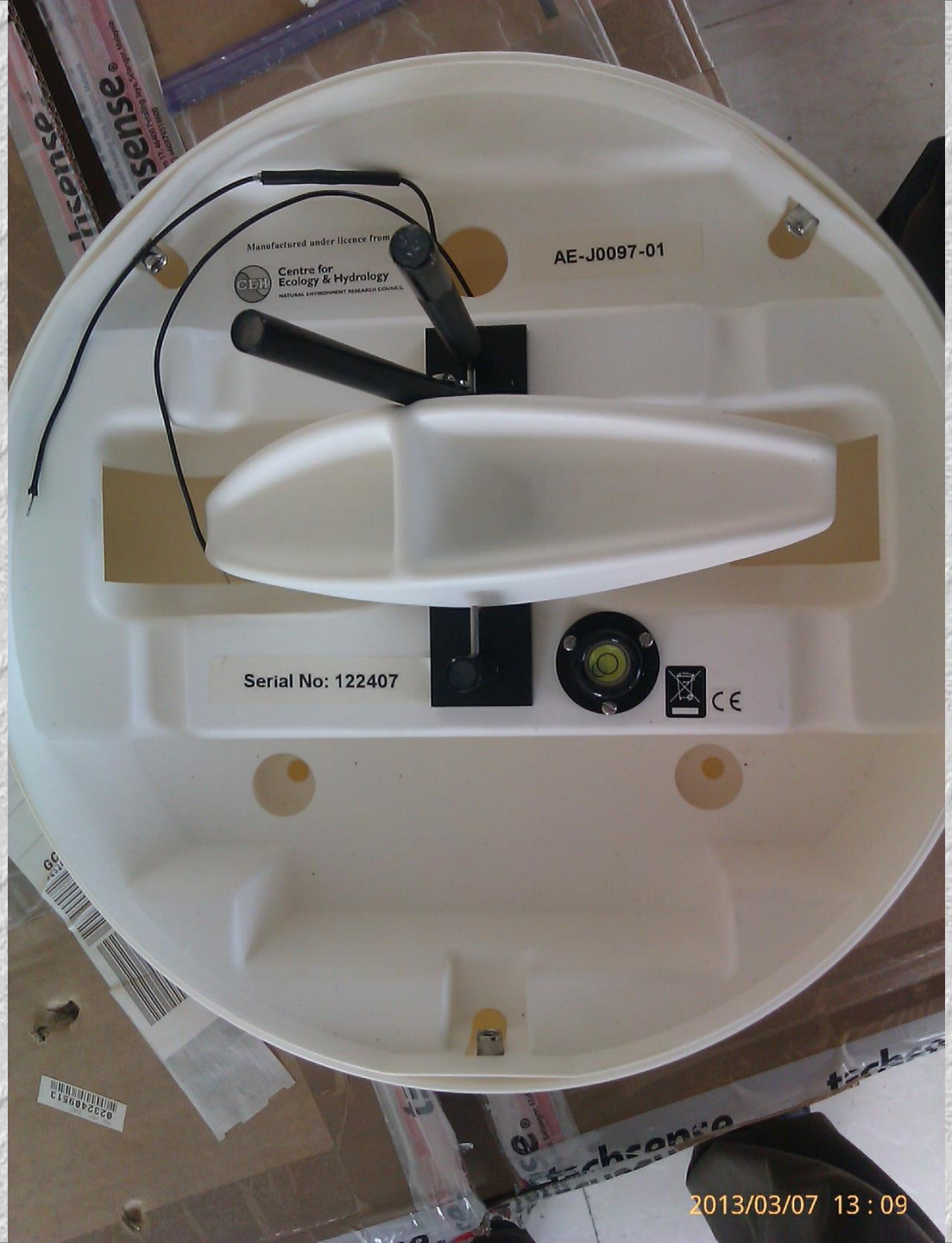
জুন
জুলাই
আগষ্ট
সেপ্টেম্বর

PRACTICAL ACTION
05/08/2012

AWS tower at Chapai Nababganj

Data Logger and communication device at Chapai Nababganj

Rain measuring sensor



Solar Radiation sensor

Conclusion

Agro-met Division of BMD can play a vital role to improve the national food security where it is under tremendous stress due to high population density, climate change, frequent attack by natural disaster and so many other issues.

We want to work together to combat this upcoming challenges.

Thank You