



Severe Weather Forecasting Demonstration Project (SWFDP-BoB):

भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

Severe Weather Forecasting Demonstration Project (SWFDP)

SWFDP Main Goals

- ❖ **Improve Severe Weather Forecasting**
- ❖ **Improve lead-time of Warnings**
- ❖ **Improve interaction of NMHSs with users:
media, disaster management, civil protection
authorities and public**



SWFDP Cascading Forecasting Process

- ❖ Global NWP centres to provide available NWP/EPS and sat-based products, including in the form of probabilities
- ❖ Regional centres to interpret information received from global centres, prepare daily guidance products (out to day-5) for NMCs, run limited-area model to refine products, maintain RSMC Web site, liaise with the participating NMCs;
- ❖ NMCs to issue alerts, advisories, severe weather warnings; to liaise with user communities, and to contribute feedback and evaluation of the project;
- ❖ NMCs have access to all products, and maintained responsibility and authority over national warnings and services.



SWFDP – Bay of Bengal

Focus: Coastal communities and activities



- Bangladesh
- India
- Maldives
- Myanmar
- Sri Lanka
- Thailand
- Bhutan
- Nepal
- Pakistan
- Afghanistan

*Severe Weather from TCs,
severe thunderstorms and monsoon:*
**Heavy precipitation, Strong winds
Large waves / swell, Storm Surge**

Improved severe weather forecasting, warning services to disaster management (PWS) and with agriculture

SWFDP- Bay of Bengal - severe weather events

- a) Heavy rain (due to tropical cyclone, thunderstorm, monsoon, etc) /flooding;
- b) Strong winds (due to tropical cyclone, thunderstorm, monsoon, etc);
- c) High waves / swells;
- d) Storm surge;

To be taken up later

- a) Heat waves and cold waves / frost;
- b) Fog
- c) Deficit of precipitation/dry spells;



THRESHOLD VALUES USED IN RSMC DAILY SEVERE WEATHER FORECASTING GUIDANCE

HAZARD	THRESHOLD	COMMENTS
Heavy Rain	≥ 50 mm in 24 hours ≥ 100 mm in 24 hours (the risk over 200mm/24 should be described in discussion in the Regional Guidance)	The operational country-thresholds may differ widely among participating countries of SWFDP-Bay of Bengal. NMHSs may translate the heavy rain into potential flooding in areas likely to be affected by heavy rain depending upon the soil condition, topography and drainage systems in respective areas
Strong winds	≥ 17 knots (over land and Sea) ≥ 34 knots (over Sea)	Affecting oceanic and coastal areas especially. Gusts on land from severe convective systems are not predictable on this time scale effectively
High Waves	≥ 2.5 m	NMHSs may use the information contained in the RSMC Guidance Product to generate impact-based forecasts and risk-based warnings for use by the coastal communities, fisheries, disaster managers etc. at national levels.
Storm Surge	≥ 1 m	



Responsibilities of RSMC New Delhi

- ❖ to redirect toward the NMHSs relevant products issued from the Global Centres (if necessary);
- ❖ to provide NMHSs with its own interpretation of the medium-range guidance, including EPS products;
- ❖ to provide the NMHSs with the short-range NWP guidance (including products adapted to severe weather events), as frequently as possible;
- ❖ to indicate existing satellite/radar imagery and satellite/radar based products that could be used for nowcasting purposes;
- ❖ to issue Daily Severe Weather Forecasting Guidance products summarizing interpretation of NWP products with respect to severe weather over the responsibility area of the NMHSs;
- ❖ to provide the other centres with short-range NWP guidance and EPS output including probabilistic products specially adapted to the concerned severe weather events;



Responsibilities of RSMC New Delhi

- ❖ to tailor products to requirements of the National Centres including the provision of sub-domain and probabilistic products.
- ❖ to evaluate its own interpretation of EPS products and its NWP guidance;
- ❖ to provide global centres with a feedback about the usefulness and efficiency of global products;
- ❖ to facilitate flow of all forecasting guidance information to all participating Centres through a dedicated password protected Web site and portal. Ideally this Web site would be maintained on a 24/7 basis and dedicated for the Regional Subproject;
- ❖ to coordinate real-time communications among the participating centres in the region of the project (to maintain a list of contact information; e-mail , telephone, fax).
- ❖ to help the RSMTTC to organize training workshops;
- ❖ to provide the NMHSs with technical support in response to requests;
- ❖ to provide guidance and advice on use of multi-media facilities at training workshops.

Data and Products to be issued from *Regional Centre*

- ❖ *Current deterministic Limited Area Model (WRF) fields up to 3 days*
- ❖ **Products are provided at 6-hour intervals. Products could include:**
- ❖ **Upper air charts to depict the large-scale flow (e.g. 200 hPa, 300hPa, 500 hPa, 700 hPa, 850 hPa geopotential height, temperature, specific humidity, tropopause height, upper air winds);**
- ❖ **Surface charts to depict the large-scale flow (e.g. MSLP, surface streamlines, wind flow)**
- ❖ **Surface weather elements and parameters (e.g. 6-hour accumulated precipitation, surface (10m) wind-speed and gusts (if available), 2m temperature, humidity);**
- ❖ **Maps of vertical motion, potential vorticity or height of specified PV surface;**



Data and Products to be issued from *Regional Centre*

- ❖ Maps of convective indices such as CAPE, Lifting Index, helicity
- ❖ relevant satellite images;
- ❖ Special products derived from satellite images (e.g. derived precipitation or images annotated with guidance notes).
- ❖ Special charts to assist with forecasts of tropical cyclone formation, movement and intensification (e.g. 850hPa, 200hPa relative vorticity and convergence, 850-200hPa deep layer mean flow, 500-200hPa deep layer mean flow, 850-200hPa vertical wind shear, vertical motion).



RSMC Daily Severe Weather Forecasting Guidance

- ❖ Daily Severe Weather Forecasting Guidance should be issued by RSMC New Delhi once per day at 0800UTC to indicate the likelihood of severe weather occurrence:
- ❖ a short range (up to 72 h) guidance, including the risk-table, and a medium range (up to 5 days) guidance.
- ❖ This guidance contains:
 - Synopsis of weather (analysis and forecast);
 - the interpretation of deterministic and ensemble NWP products from the Global and Regional Centres;
 - severe weather predictions (risk or probability estimates) including tropical cyclone information.



RSMC, New Delhi Products

Parameters	IMD GFS T1534	IMD WRF (ARW)	HWRF
Every 6 hours and 24 hours total accumulated precipitation	X	X	X
2 meters temperature and dew point	X	X	X
2 meters RH or specific humidity	X	X	X
10 meters wind (speed and direction)	X	X	X
Mean sea level pressure (MSLP)	X	X	X
Parameters: wind (streamlines and speed/direction), temperature, geopotential height, humidity Levels: 1000mb, 925mb, 850mb, 700mb, 500mb, 300mb, 200mb, 200mb	X	X	X
vorticity: 850mb, 700mb, 500mb, 300mb	X	X	X
divergence: 500mb, 300mb, 200mb	X	X	X
vertical velocity: 850mb, 700mb, 500mb	X	X	X
potential temperature and equivalent potential temperature: 850mb, 700mb	X	X	X
Parameter: lifted index, K index, total totals index, CAPE, CIN, Showalter index, etc.	X	X	X
SKEW-T logarithmic forecast plots for selected grid points based on NWP output (out to 144 hours, 12-hourly)	X	X	X

SWFDP-BoB (Through IMD webpage and RSMC)

<http://www.imd.gov.in> → cyclone (RSMC) → SWFDP-BoB

The screenshot shows the website for the Regional Specialized Meteorological Centre for Tropical Cyclones Over North Indian Ocean. The page features a navigation menu with the following items: Home, RSMC, CWD, Cyclone Awareness, Publications, Tools And Data, Forecast Verification, Archive, Climatology, and Contact. A large satellite image of a cyclone is displayed in the center. To the right of the image is a 'Quick Links' section with the following items: Press Release, Feedback, International Training Workshop (NEW!), All India Weather Forecast, NWP, Satellite, Imagery, Bulletin, OceanSat-2, Radar, Imagery, Bulletin, FDP Cyclone, SWFDP-BoB (circled in red), WMO/ESCAP Panel Member Countries, Other RSMCs, and TCWCs. Below the satellite image is a scale bar and the text 'IMD/Delhi'.

Cyclone Warnings/Advisory

- ▶ National Bulletin
- ▶ RSMC Bulletin
- ▶ TCAC Bulletin
- ▶ Quadrant Wind Forecast
- ▶ GMDSS bulletin

Cyclone Warning Graphics

- ▶ Observed & Forecast Track
- ▶ Severe Weather Warning
- ▶ Storm Surge Model Guidance
- ▶ Quadrant Wind Warning
- ▶ TCAC Graphics

NWP Guidance

- ▶ GPP
- ▶ HWRF
- ▶ MME
- ▶ EPS

Marine Forecast/Warnings

- ▶ Ocean State Forecast
- ▶ Sea Area Bulletin
- ▶ Coastal Weather Bulletin
- ▶ Port Warning
- ▶ Fisherman Warning



SWFDP-BoB (Web Portal)



SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP) -BAY OF BENGAL
REGIONAL SPECIALIZED METEOROLOGICAL CENTRE- NEW DELHI



[Link to IMD](#)

Login here using username and password

User Name :	<input type="text"/>
Password :	<input type="password"/>

Login

**Needs to be modified based on latest data and products from
Global, regional and national centres**





SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP) -BAY OF BENGAL

REGIONAL SPECIALIZED METEOROLOGICAL CENTRE- NEW DELHI



Guidance Prod.

Satellite

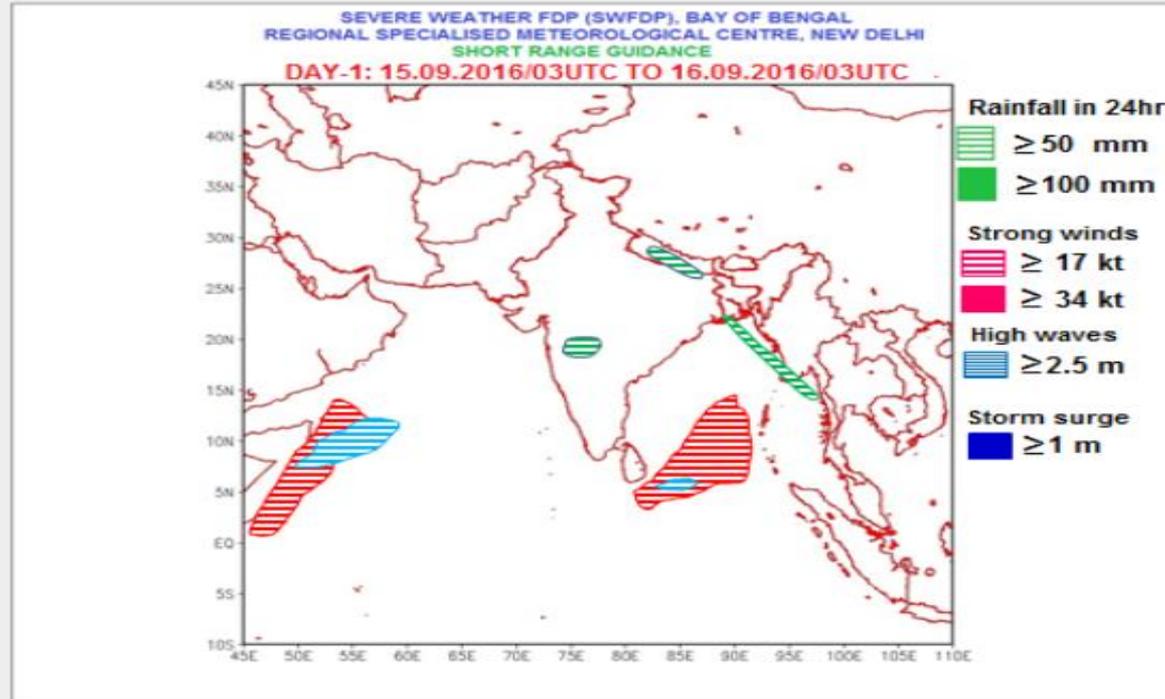
Global/Regional NWP Prod.

Global EPS Prod.

Ocean Forecast

BOB-NWS Links

SWFDP-BOB Links



Disclaimer : The country boundaries shown here do not necessarily correspond to the political boundary.

Best Viewed in Google Chrome, Mozilla Firefox 3.5 or higher. Designed & Maintained by NWP Division, India Meteorological Department, Lodi Road, New Delhi @ 2015

Regional Guidance



SEVERE WEATHER FORECASTING DEMONSTRATION PROJECT (SWFDP) -BAY OF BENGAL
REGIONAL SPECIALIZED METEOROLOGICAL CENTRE- NEW DELHI



Guidance Prod.

Satellite

Global/Regional NWP Prod.

Global EPS Prod.

Ocean Forecast

BOB-NWS Links

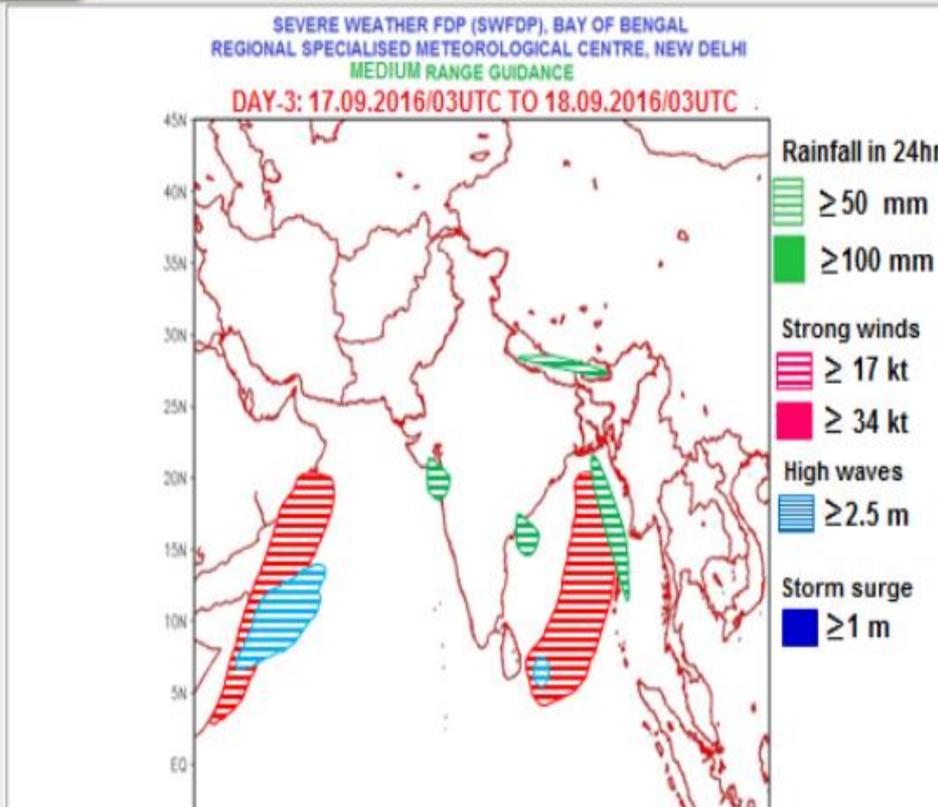
SWFDP-BOB Links

Short-range -->

Day-1

Medium-range -->

Day-2



Regional Guidance

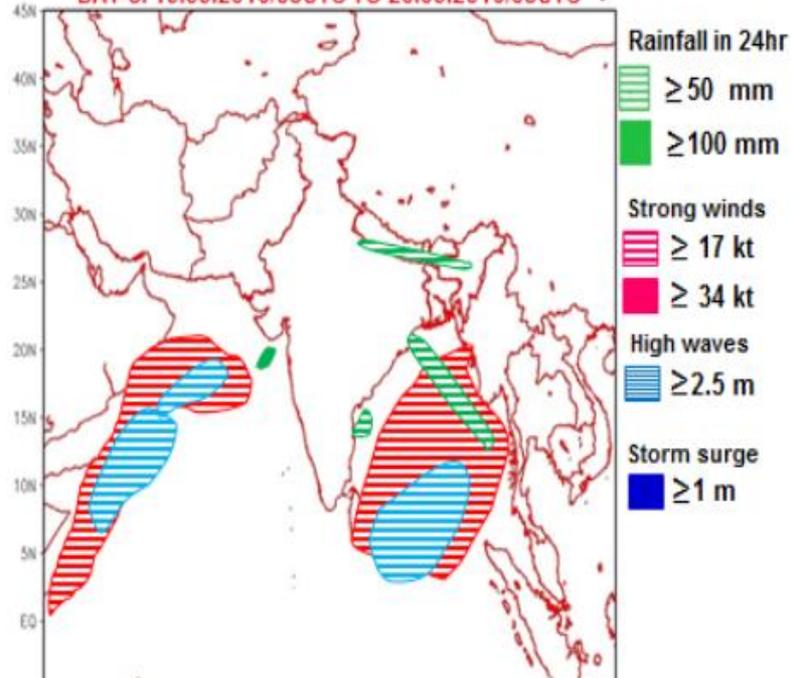


Guidance Prod. Satellite Global/Regional NWP Prod. Global EPS Prod. Ocean Forecast BOB-NWS Links SWFDP-BOB Links

Short-range -->
Medium-range -->

Day-3
Day-4
Day-5

SEVERE WEATHER FDP (SWFDP), BAY OF BENGAL
REGIONAL SPECIALISED METEOROLOGICAL CENTRE, NEW DELHI
MEDIUM RANGE GUIDANCE
DAY-5: 19.09.2016/03UTC TO 20.09.2016/03UTC



Regional Guidance

Regional Guidance

- ❖ **Part A:** Text; depiction of the expected evolution of the weather up to 48 h (for Day 1 and Day 2) and comments about the more representative short range products that are used with reference to figures included in the part B or to charts clearly identified (model, parameter, level, forecast range).
- ❖ **Part B:** Figures; Charts or graphics coming essentially from deterministic models (global or LAM).
- ❖ **Part C:** The assessment of the degree of confidence of the forecast by the forecaster.
- ❖ **Part D:** Two tables (for Day1 and Day 2, respectively), summarizing the risk of severe weather as assessed by the RSMC New Delhi based on its degree of confidence as proposed below. In order to provide more information about the geographical location of the severe event, the following convention can be adopted when filling in the cells: X for the whole country, N for the northern part, S for the southern part, W for the western part and E for the eastern part. C for the central part can also be used if so required. Similarly, NE for the northeastern part and SW for the southwestern part etc.
- ❖ **Part E:** Two geographical maps (Day 1 and Day 2, respectively) including the boundaries of the countries with contours identifying the areas which are likely to be hit by the severe weather event.



Regional Guidance

Country	Severe Weather type	No risk	Low risk	Medium risk	High risk
Bangladesh	Heavy Precipitation > 50mm/24h		X		
	Heavy Precipitation > 100mm/24h				
	Strong Winds >17 Knots				
	Strong Winds >34 Knots				
India	Heavy Precipitation > 50mm/24h				
	Heavy Precipitation > 100mm/24h				
	Strong Winds >17 Knots				
	Strong Winds >34 Knots				
Maldives	Heavy Precipitation > 50mm/24h				
	Heavy Precipitation > 100mm/24h				
	Strong Winds >17 Knots				
	Strong Winds >34 Knots				



Regional Guidance

Country	Severe Weather type	No risk	Low risk	Medium risk	High risk
Myanmar	Heavy Precipitation > 50mm/24h			W	
	Heavy Precipitation > 100mm/24h				
	Strong Winds >17 Knots				
	Strong Winds >34 Knots				
Sri Lanka	Heavy Precipitation > 50mm/24h	SE			
	Heavy Precipitation > 100mm/24h				X
	Strong Winds >17 Knots				
	Strong Winds >34 Knots				
Thailand	Heavy Precipitation > 50mm/24h				
	Heavy Precipitation > 100mm/24h				
	Strong Winds >17 Knots				
	Strong Winds >34 Knots				



THANK YOU



भारत मौसम विज्ञान विभाग
INDIA METEOROLOGICAL DEPARTMENT

