RegCM3 in simulating cyclone developed over the Bay of Bengal

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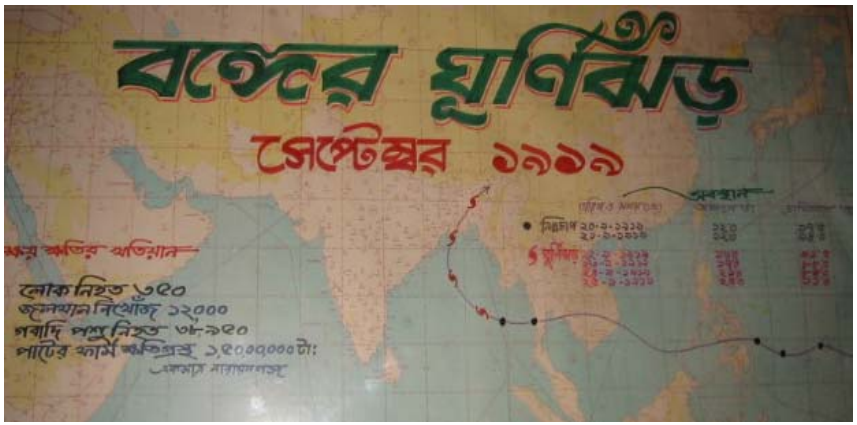
Classification of Cyclone developed over the Bay of Bengal

Types of Disturbances	Associated wind speed
1. Low Pressure Area	Less than 17 knots (< 31 km/h)
2. Depression	17 to 27 knots (31 to 49 km/h)
3. Deep Depression	28 to 33 knots (50 to 61 km/h)
4. Cyclonic Storm	34 to 47 knots (62 to 88 km/h)
5. Severe Cyclonic Storm	48 to 63 knots (89 to 118 km/h)
6. Very Severe Cyclonic Storm	64 to 119 knots (119 to 221 km/h)
7. Super Cyclonic Storm	120 knots and above (222 km/h and above)

Major Hurricanes, Typhoons, Cyclones, and other Storms since 1960

Date	Event	Location	Death
May 28-29, 1963	cyclone	Bangladesh	22,000
May 11-12, 1965	cyclone	Bangladesh	17,000
November 12-13, 1970	cyclone	Bangladesh	>300,000
May 25, 1985	cyclone	Bangladesh	10,000
March 12-18, 1990	storms	Bangladesh	242
April 30, 1991	cyclone	Bangladesh	138,866
May 2, 1994	cyclone	Bangladesh	165
May 13, 1996	tornado	Bangladesh	>600
May 19-20, 1997	cyclone	Bangladesh	100
September 27, 1997	cyclone	Bangladesh	>45

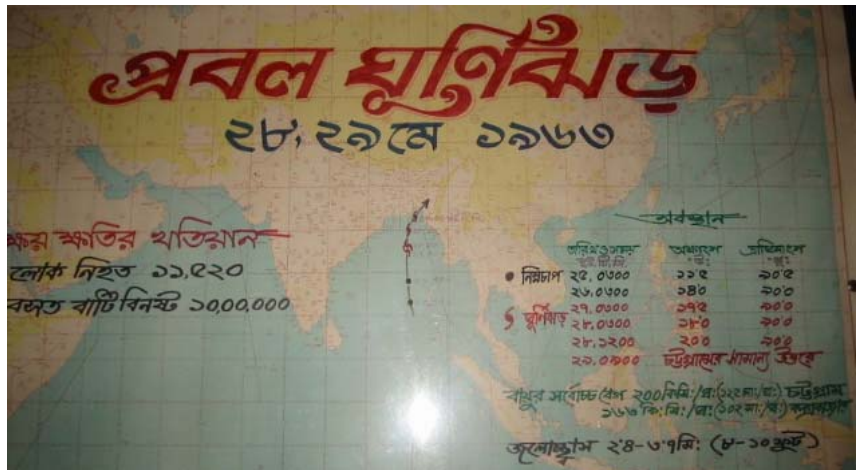
Record of some historical Cyclones in the Bangladesh Meteorological Department



21 Sep 1919

31 Oct 1960

9 May 1961



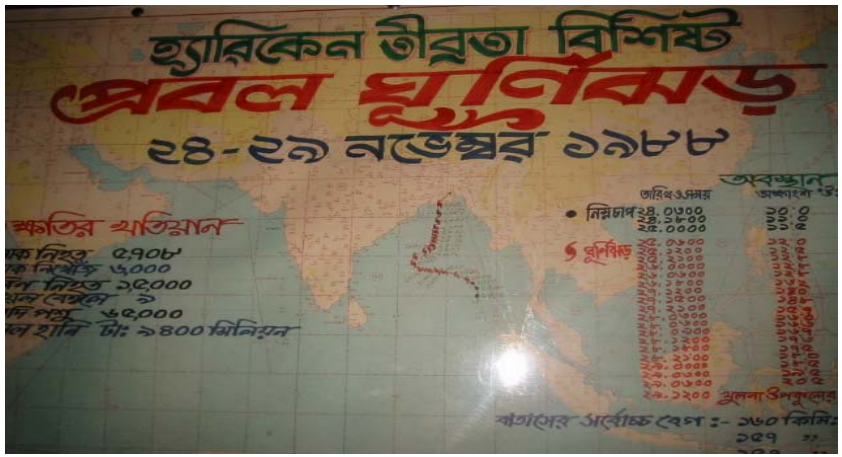
29 May 1963

15 Dec 1965

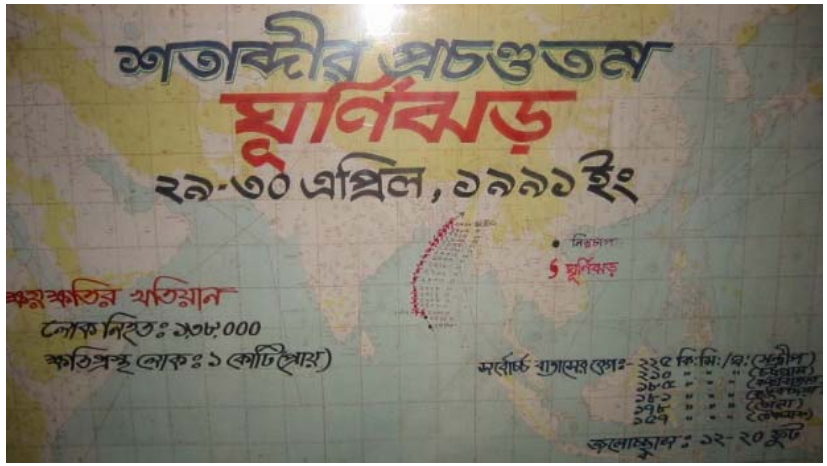
13 Nov 1970

28 Nov 1974

25 May 1985



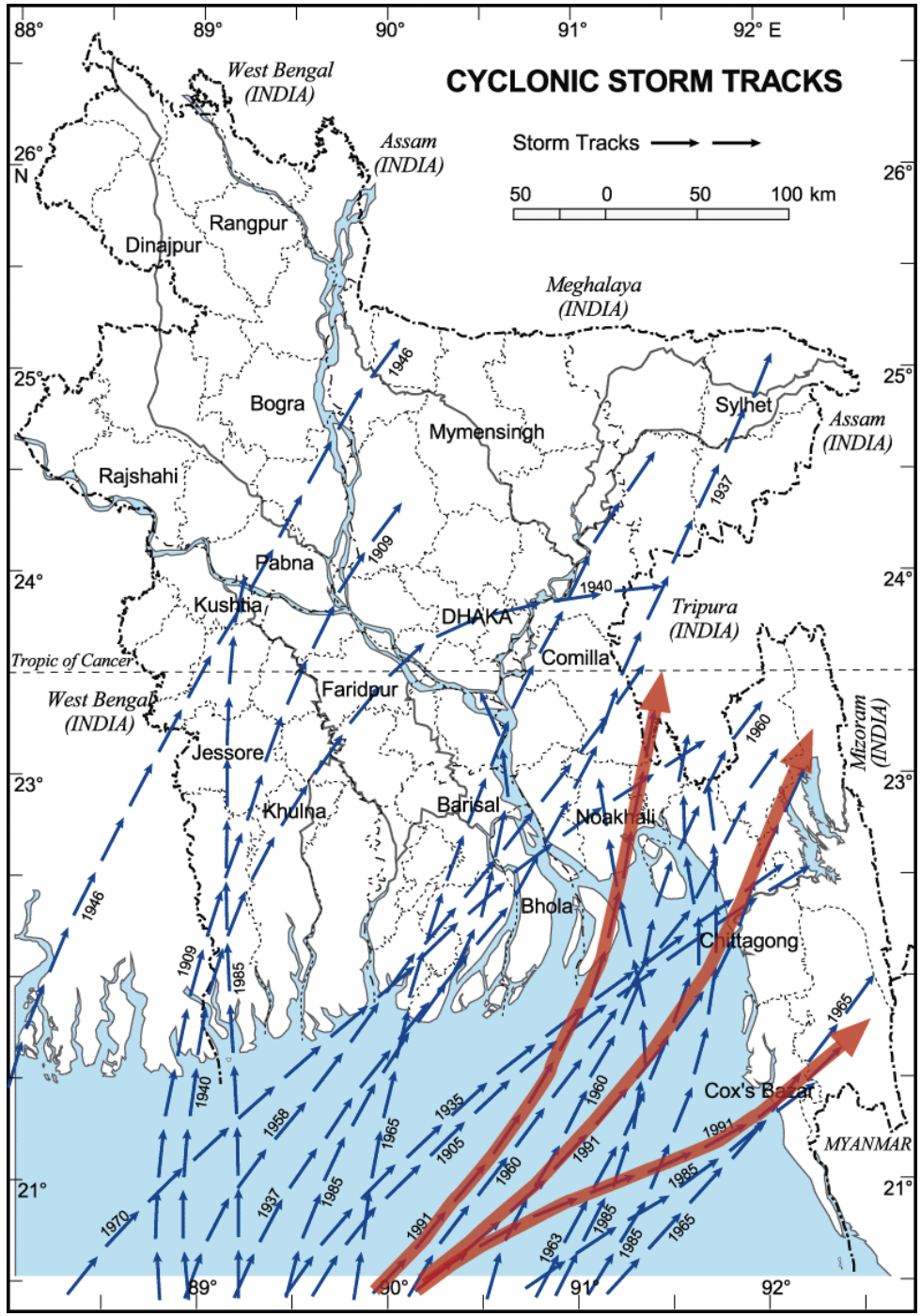
29 Nov 1988



30 Apr 1991

29 Apr 1994

Track of some historical CYCLONES developed over the Bay of Bengal since 1900.



Model Run

Used LBC: NCEP re-analysis data (NNRP2) OI_SST

Projection: Rotated Mercator

Analysis Period: Last Decade

Analysis domain: South Asia region (65E-117E, 5N-35N)

Grid resolution: dx =60 km horizontal grid mesh
Time step: dt =200 sec

Model physics: Grell convective scheme with Arakawa Schubert (GAS) and Fritch-Chappell (GFC) assumption. Betts-Miller and Kuo schemes are also checked.

Killer Cyclone on 29-30 APRIL 1991

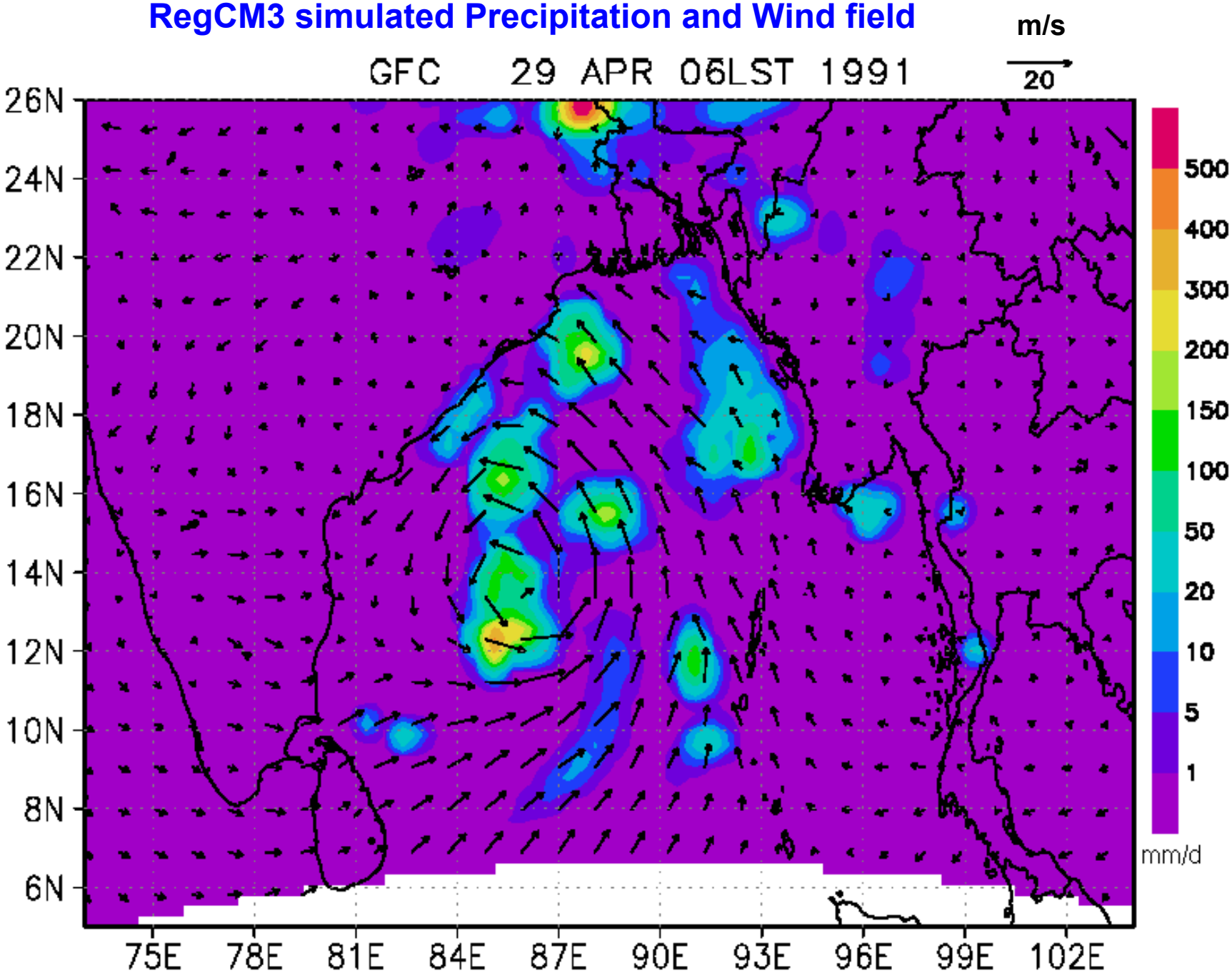
Death: 138,000

Sufferer: 10 million

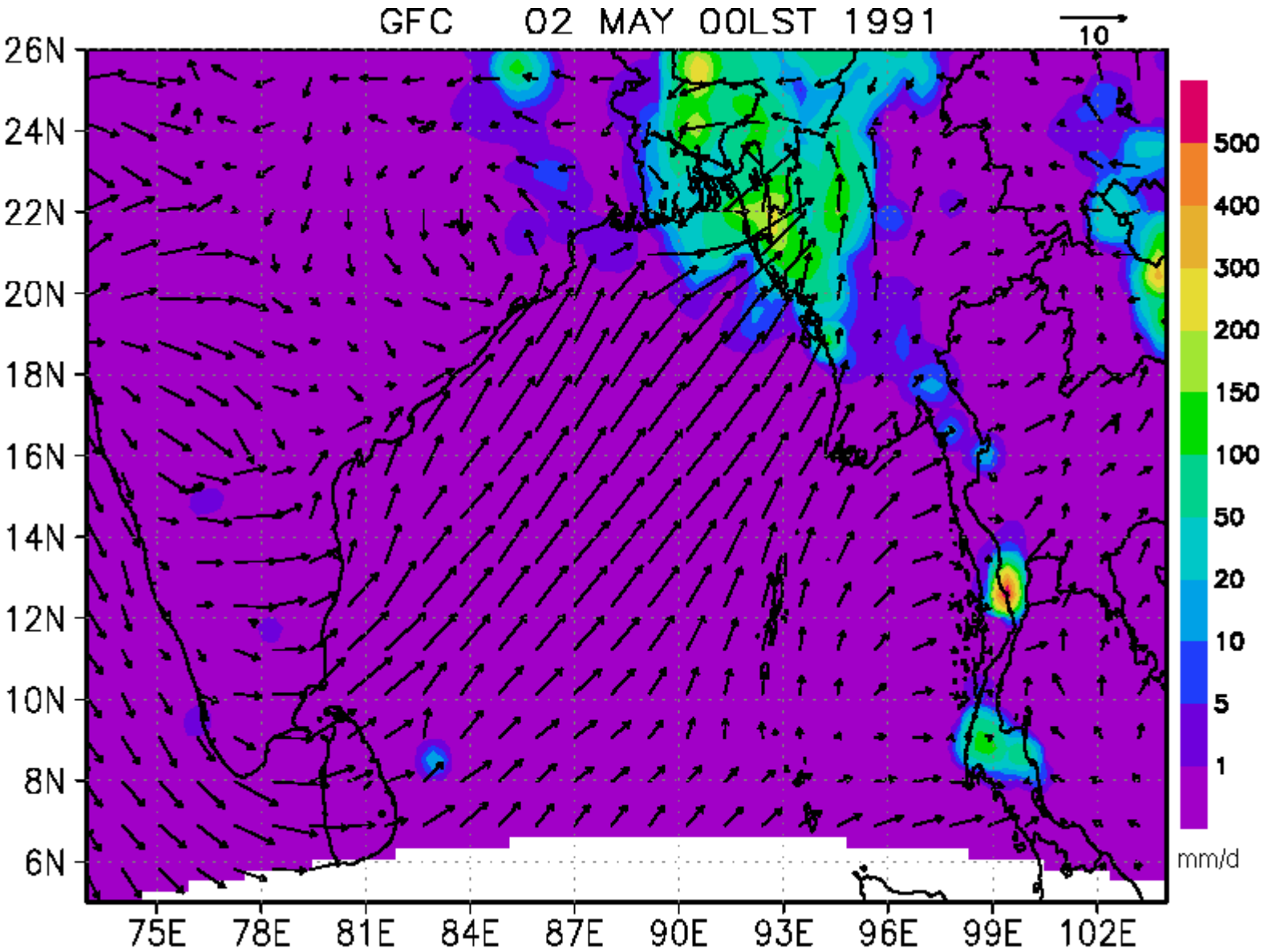
Maximum wind speed: 225 km/h

Storm surge: 12-29 ft

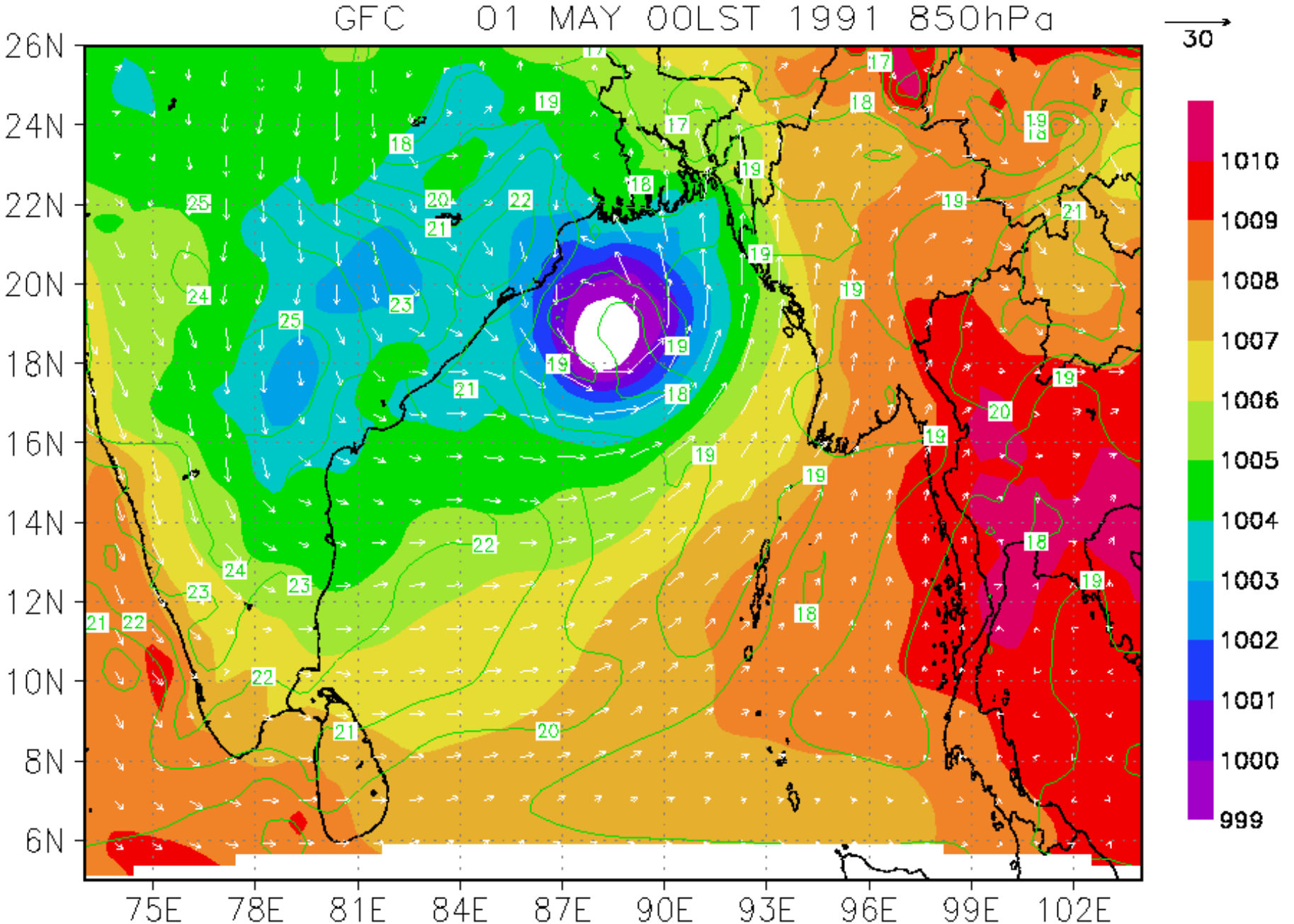
RegCM3 simulated Precipitation and Wind field



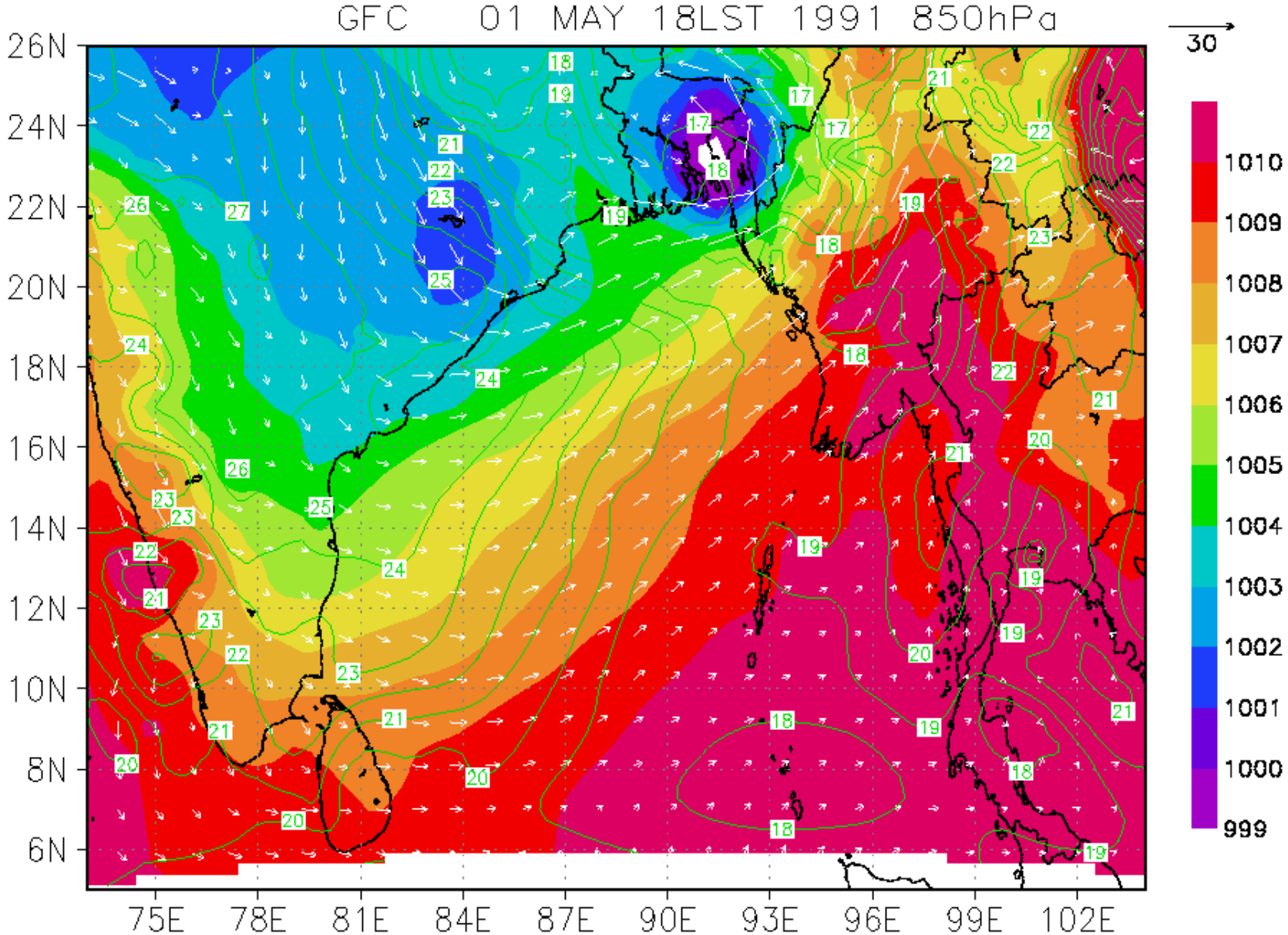
RegCM3 simulated Precipitation and Wind field



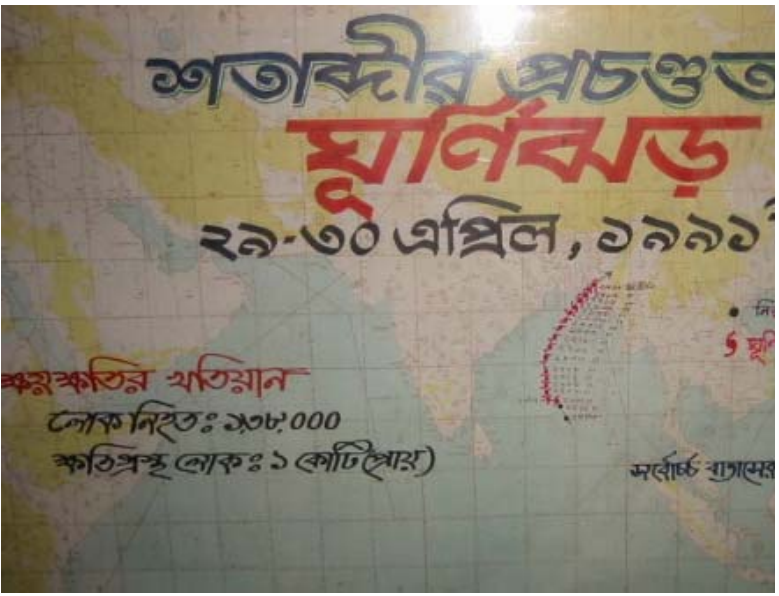
RegCM3 simulated Pressure, Temperature and Wind field

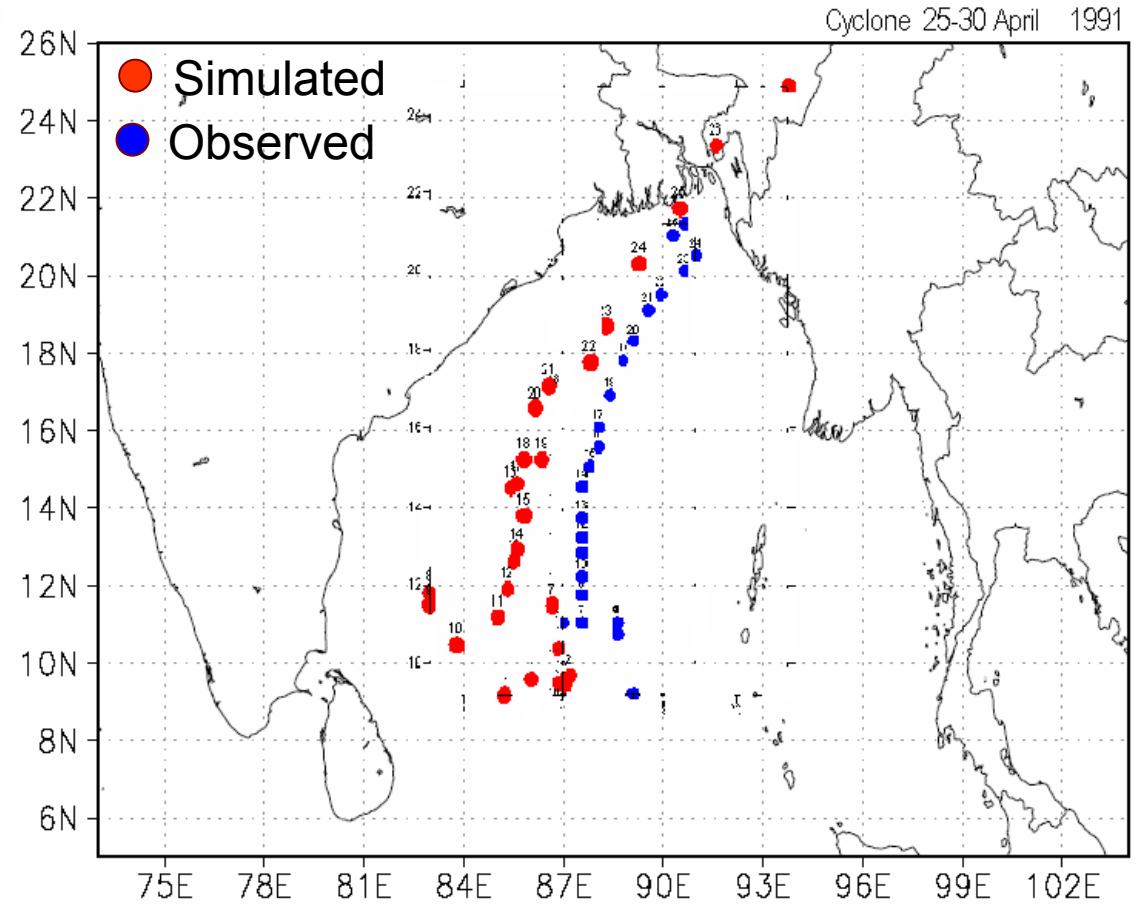


RegCM3 simulated Pressure, Temperature and Wind field



Killer Cyclone on 29-30 APRIL 1991

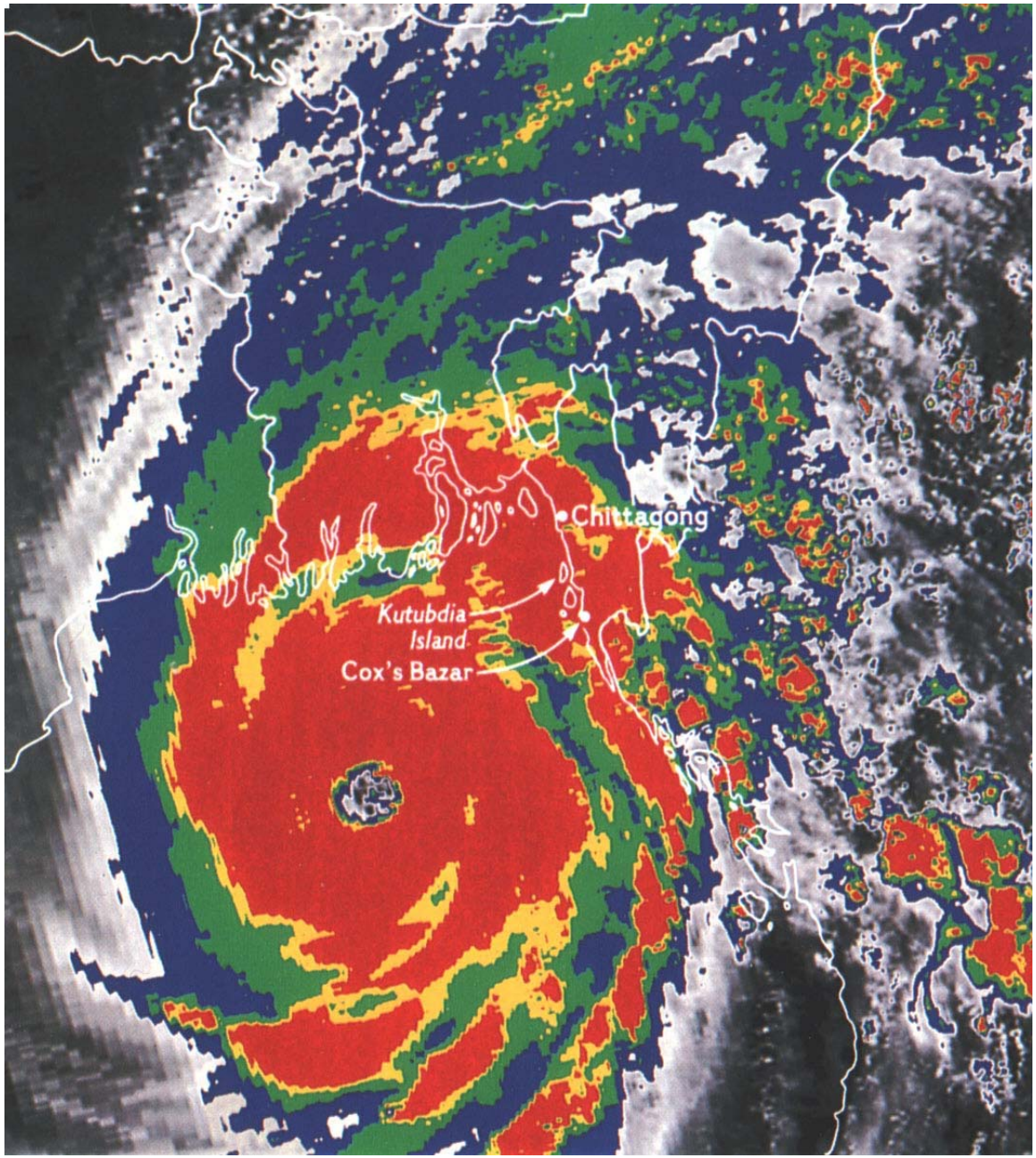




91_RWsurface

91_PTW850

Satellite Image on 29 April 1991



Source: Website

Super Cyclone on 27-29 Oct 1999

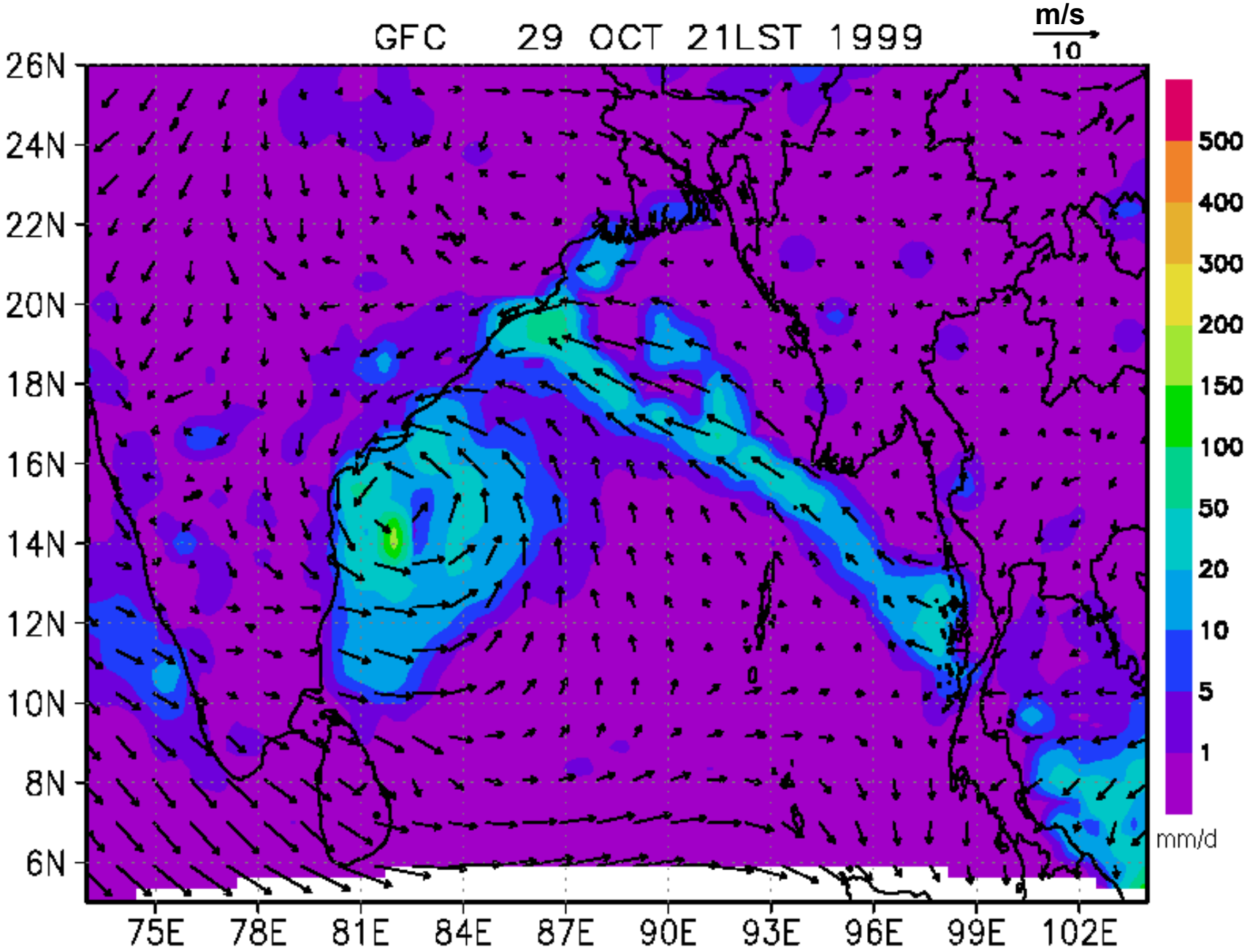
Death: **~10000**

Sufferer: **~15 million**

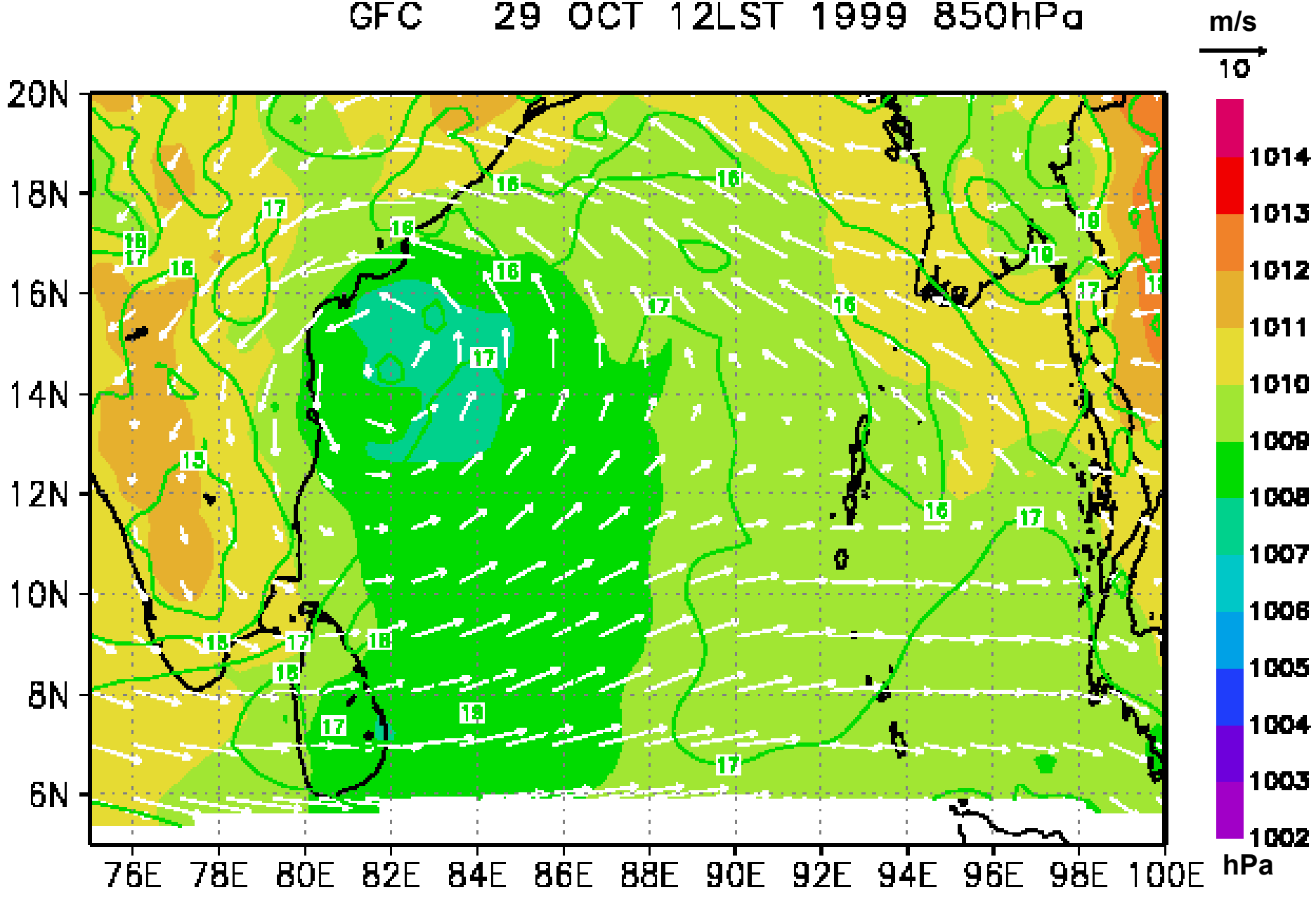
Maximum wind speed: **~310 km/h**

Storm surge: ~23-33 **ft**

RegCM3 simulated Precipitation and Wind field

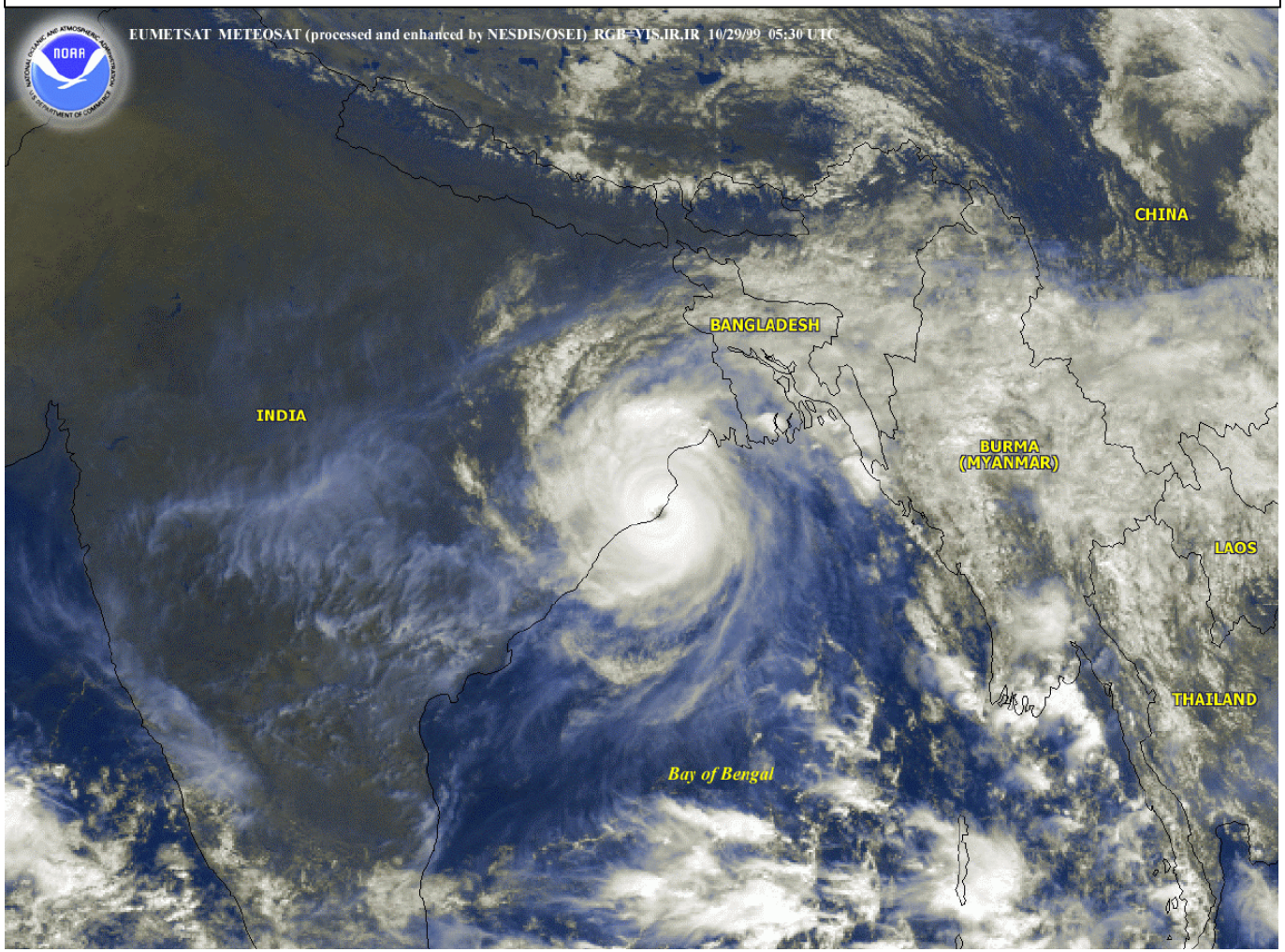


RegCM3 simulated Pressure, Temperature and Wind field



Satellite image on 29 October 1999

Source: website



99_RWsurface

99_PTW850

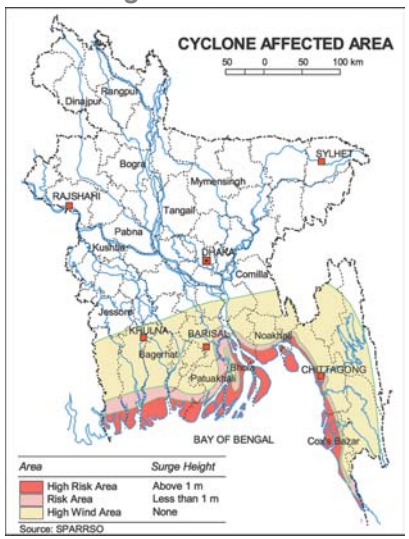
Concluding Remarks

- RegCM3 is able to simulate tropical cyclones developed over the Bay of Bengal of its Grell convective scheme with Fritch-Chappell assumption.
- It is found that the simulated cyclone track is very similar to the observed one and shifted to the west.
- In the initial stage, surface pressure was about 1002-1004 hPa and sea surface temperature is about 27.5°C.
- The surface pressure falls up to 996 hPa and surface temperature fluctuates between 25.1 - 27.5°C.

- Simulated wind speed is underestimated.

- The duration of land fall of the cyclone is delayed from the real one. This may be due to the low wind speed.

- More research is necessary to adopt RegCM in simulating cyclones developed over the Bay of Bengal.


CYCLONE AFFECTED AREA
50 0 50 100 km
Rangpur
Dinajpur
Bogra
SYLHET
Mymensingh
RAJSHAHI
Tangail
Pabna
Kushtia
DHAKA
Comilla
Jessore
KHULNA
BARISAL
Noakhali
Bagerhat
Patuakhali
CHITTAGONG
BAY OF BENGAL
Cox's Bazar
Area
Surge Height
High Risk Area
Above 1 m
Risk Area
Less than 1 m
High Wind Area
None
Source: SPARRSO

Thank You


(COURTESY YANN ARTHUS-BERTRAND)