

Welcome to

**United Nations/Austria/European Space Agency
Symposium on “Space Tools and Solutions for
Monitoring the Atmosphere in Support of
Sustainable Development”**

**Graz, Austria,
11 to 14 September 2007**

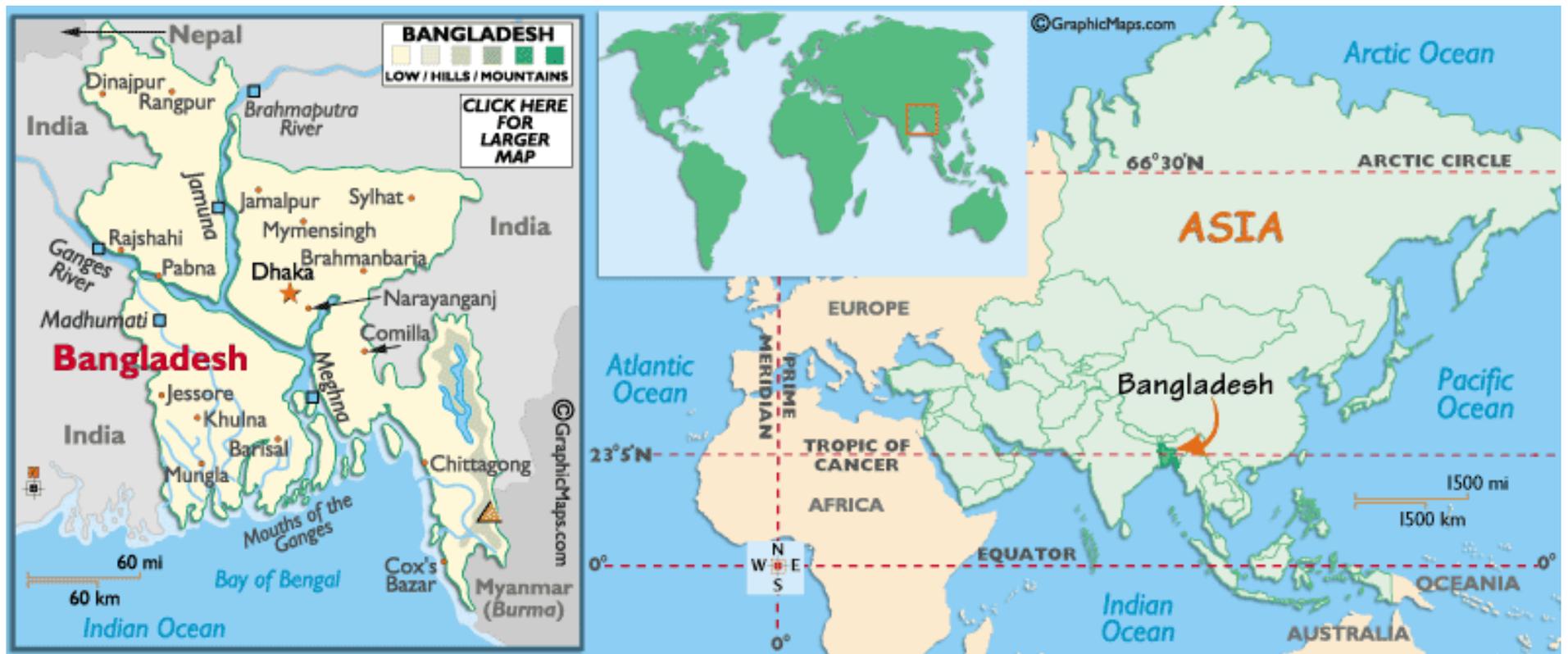
**Application of Satellite imageries for monitoring
atmospheric events and Sustainable Development in
Bangladesh**

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Dhaka, Bangladesh

Position of Bangladesh in the World map and Asia map



Position of Bangladesh in the Indian Sub-continent

Bangladesh





***BANGLADESH METEOROLOGICAL DEPARTMENT
COMPLEX***

The Service Objectives of BMD

- **To collect different meteorological parameters both for surface and upper air all over Bangladesh round the clock.**
- **To provide weather forecasts for public, farmers, mariners and aviators on routine basis and also to issue warnings for severe weather phenomena such as tropical cyclones, tornadoes, nor'westers, heavy rainfall, heat and cold waves warnings etc.**
- **To maintain surveillance of weather radars for probing impending tropical cyclones, nor'westers and tornadoes.**

- To exchange meteorological data, forecasts and warnings to meet national and international requirements.
- To receive round the clock satellite imageries for timely use in operational meteorology.
- To provide meteorological data, radar echoes and Satellite imageries and weather forecast for flood forecasting and warning centre.
- To monitor micro seismic events and earth quake round the clock.

Satellite Observational Facilities of BMD

- Satellite Ground Receiving Station of GMS (MTSAT), NOAA, METEOSAT and INSAT
- World Area Forecasts System (WAFS) from the World Area Forecasting Center, Braknell London.
- Receiving System of Satellite Distribution (SADIS)
- MICAPS PCVSAT Receiving System

Introduction

- **The Tropical Cyclones are simply the most fascinating weather events of the tropics.**
- **They have got significant impact on the weather and climate of the tropical countries (Riehl, 1970).**
- **Most of the tropical cyclones of North Indian Ocean strike east cost of India or Bangladesh coast.**

Forecasting Technique in BMD

- The DFO's of BMD perform routinely manual isobaric and streamline analyses of surface and upper air data in a regular interval of WMO standard.
- Computer analyses are conducted using different software.
- Additional analyses and/or data plotting are conducted during periods of significant or unusual activity at intermediate synoptic times.
- Special products such as station-time plot diagrams and pressure-change charts are produced during these periods.

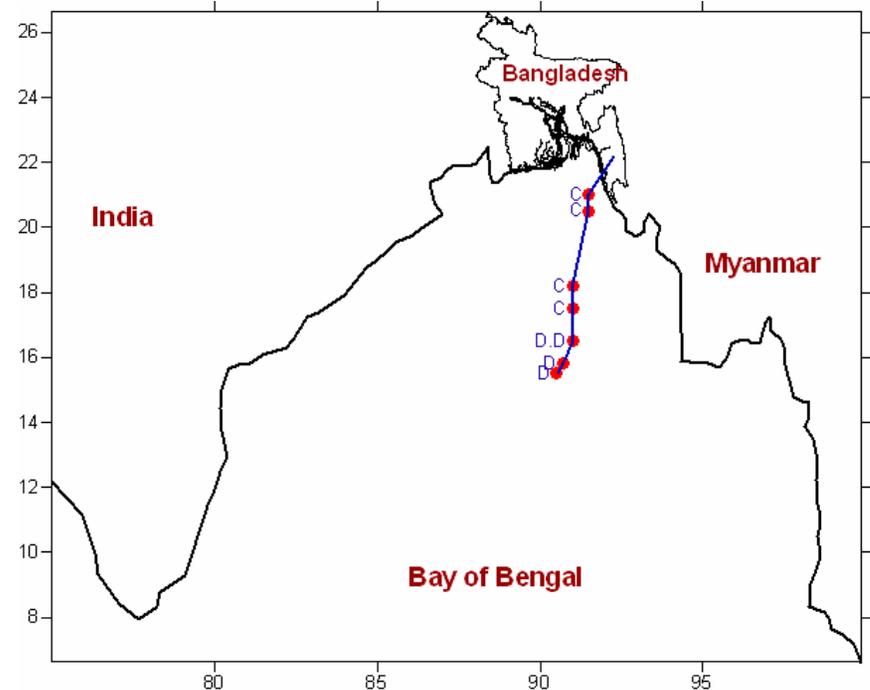
**Use of Satellite Images in the
forecasting of Cyclone “Akash” formed
in the Bay of Bengal (12-15 May, 2007)**

Description of the Cyclone "Akash"

- **A low pressure area developed over EC Bay and adjoining area on 12, 0300 UTC.**
- **At 13, 0300 UTC it intensified into a Well Marked Low over the same area.**
- **At 13, 0300 UTC it intensified again into a Depression over the same area and its centre was located at lat. 15.5⁰N and Long. 90.5⁰E.**
- **Then the system started to move north-northeastwards initially and was centred at lat. 15.8⁰ N and Long. 90.7⁰ E on 13, 1800 UTC.**
- **At 14, 0000 UTC it intensified into a Deep Depression and reached EC Bay and Adjoining North Bay (Lat. 16.50N and Long. 91.00E) .**

➤ At 14, 0600 UTC the system again intensified into a Cyclonic Storm 'Akash' over the same area and centred at lat 17.5°N and Long. 91.0°E).

➤ Then it moved northwards into North Bay. At 15, 0300 UTC the system crossed Chittagong-Cox's Bazar coast near Chittagong grazing Chittagong-Cox's Bazar coast.



Track of Cyclone Akash

Microwave image analysis

In this technique, firstly microwave imagery of different satellites (polar orbital and geostationary) are collected.

- Then these imageries are overlapped with each other.**
- These images are capable to provide cloud top temperature, cloud band, band pattern and changing properties which help to measure intensity of cyclone.**
- Figure 2 (a-l) shows the satellite imageries using microwave technique provided by NOAA with the coverage of the Bay of Bengal and adjoining area.**
- The figures show that the different stages of Cyclone “Akash” during its life cycle providing different information.**

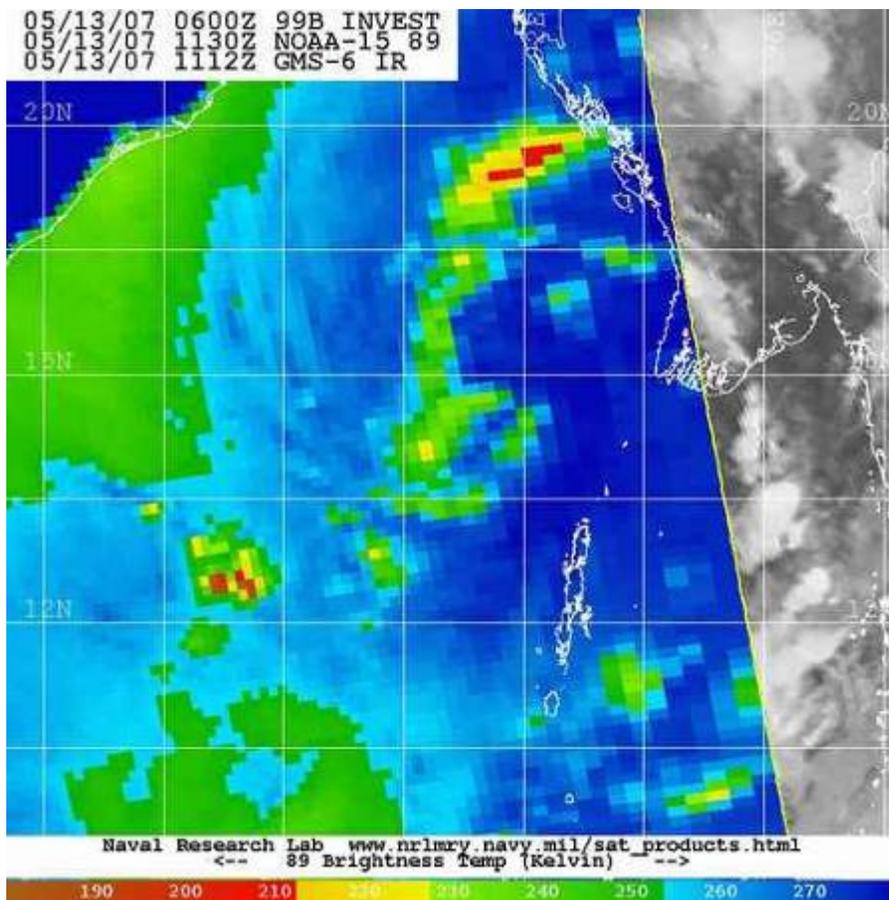


Figure 2(a): Microwave image at 1130UTC of 13May, 2007

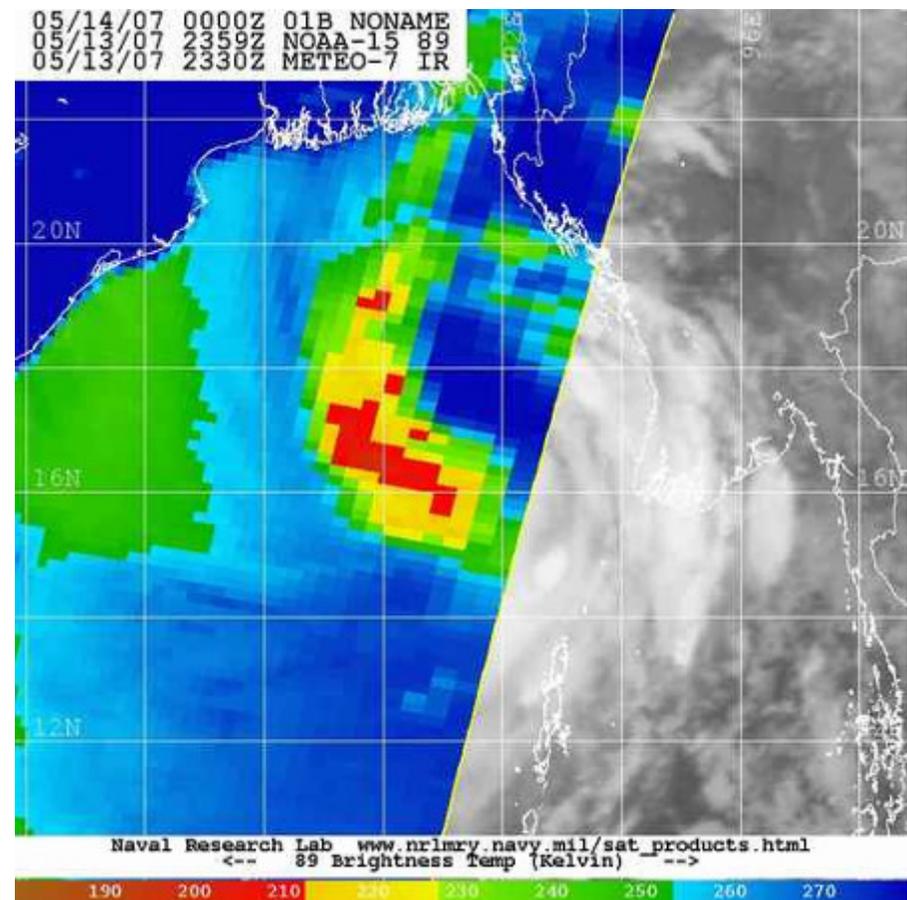


Figure 2(b): Microwave image at 2359 UTC of 13 May, 2007

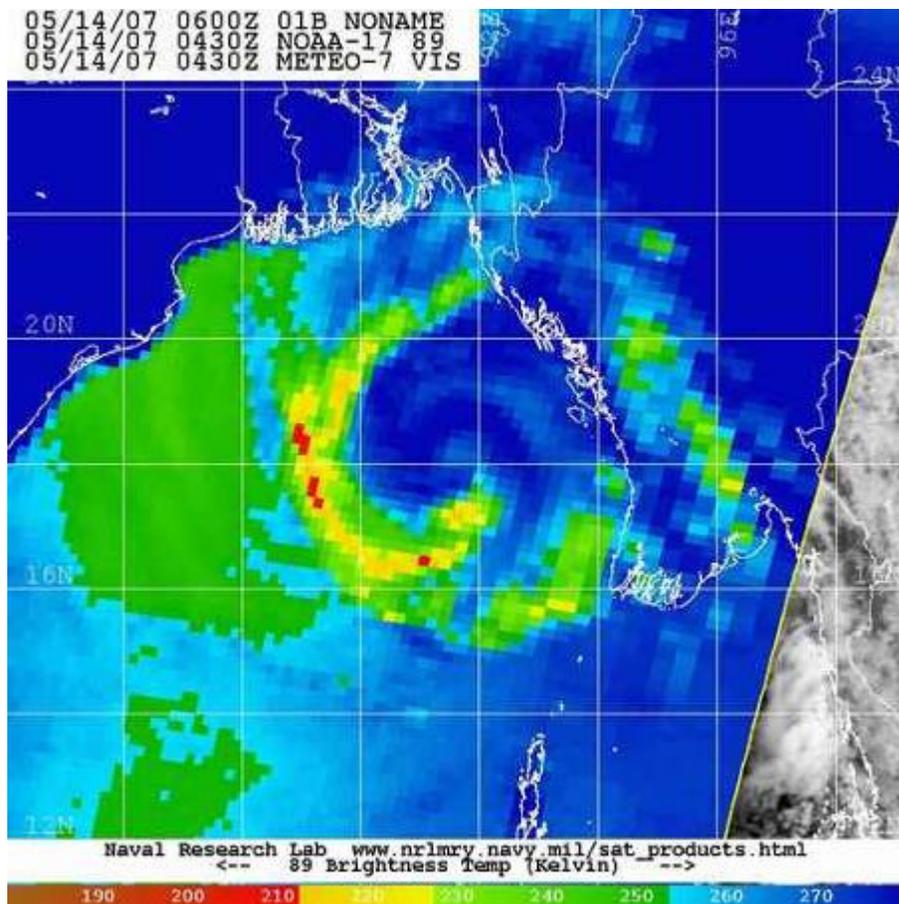


Figure 2(c): Microwave image at 0430 UTC of 14 May, 2007

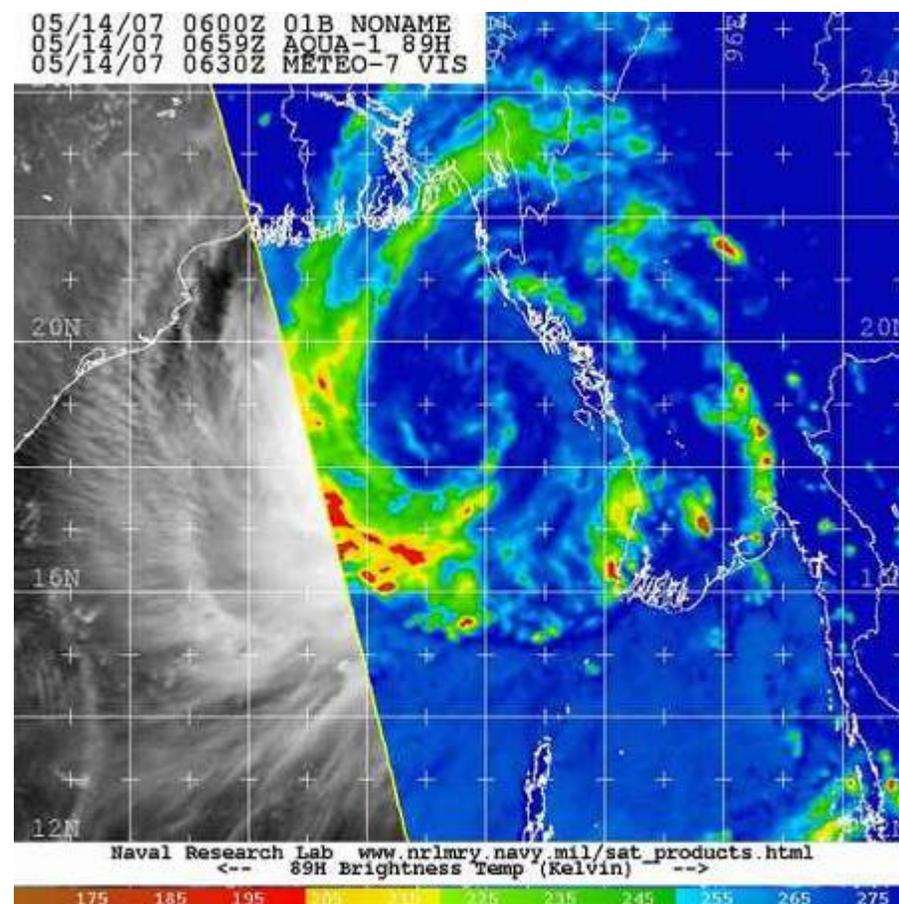


Figure 2(d): Microwave image at 0659UTC of 14 May, 2007

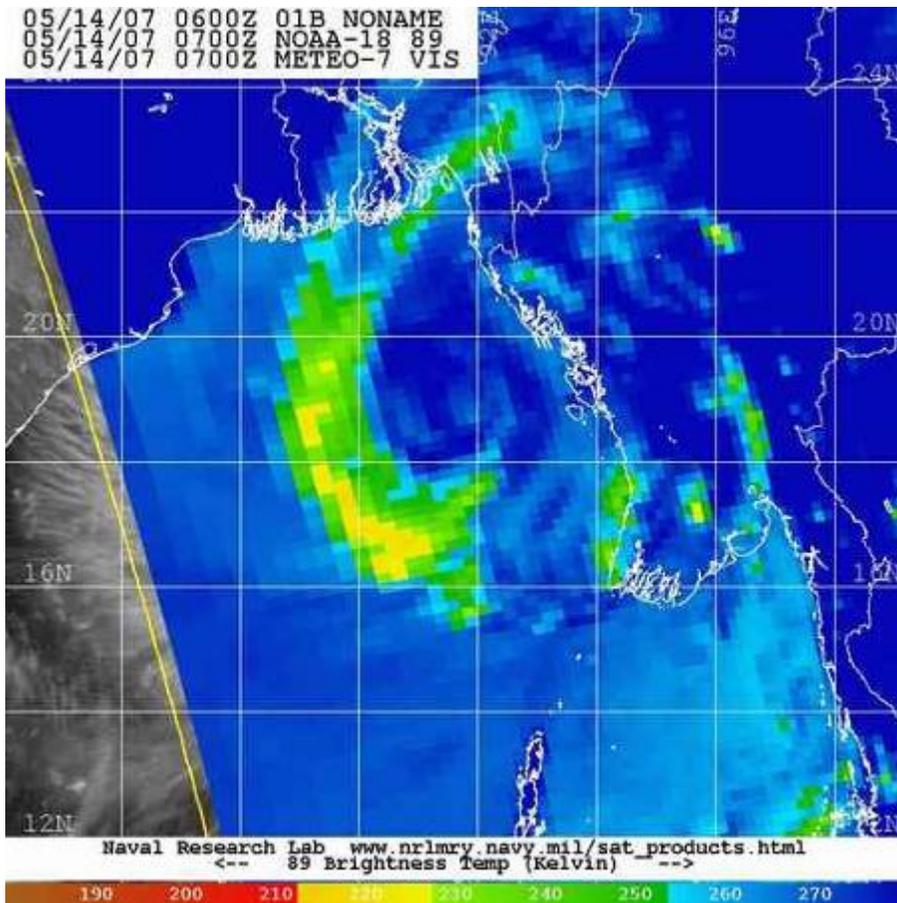


Figure 2(e): Microwave image at 0900 UTC of 14 May, 2007

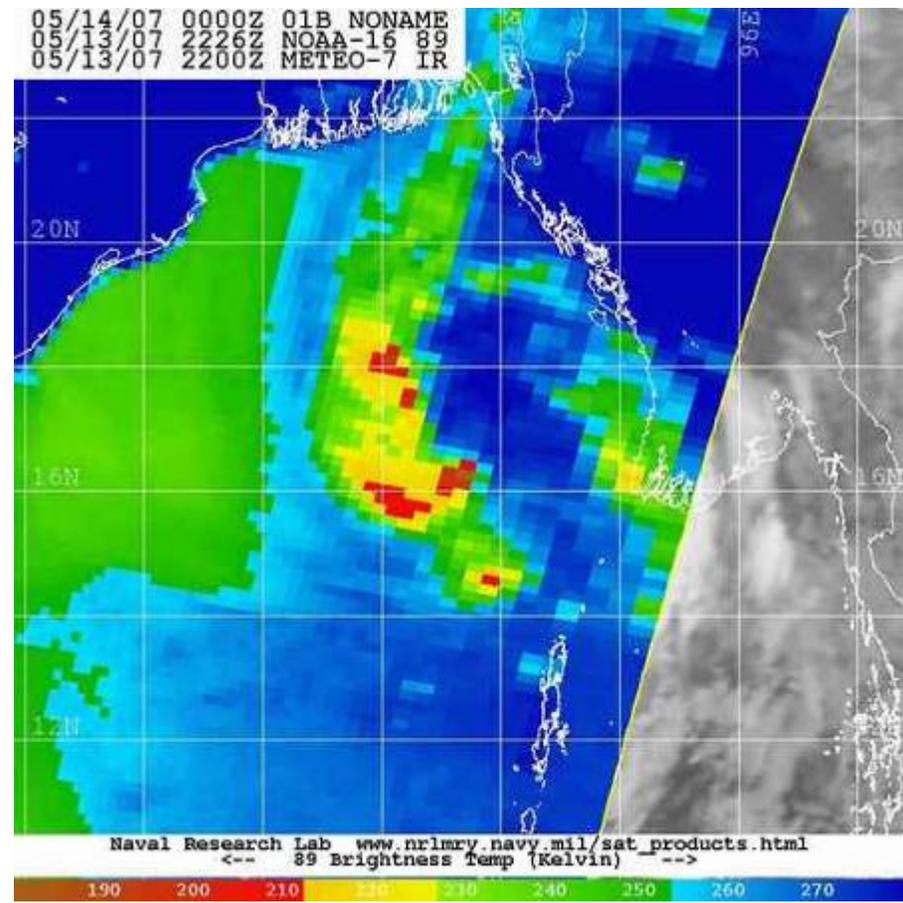


Figure 2(f): Microwave image at 2226 UTC of 13 May, 2007

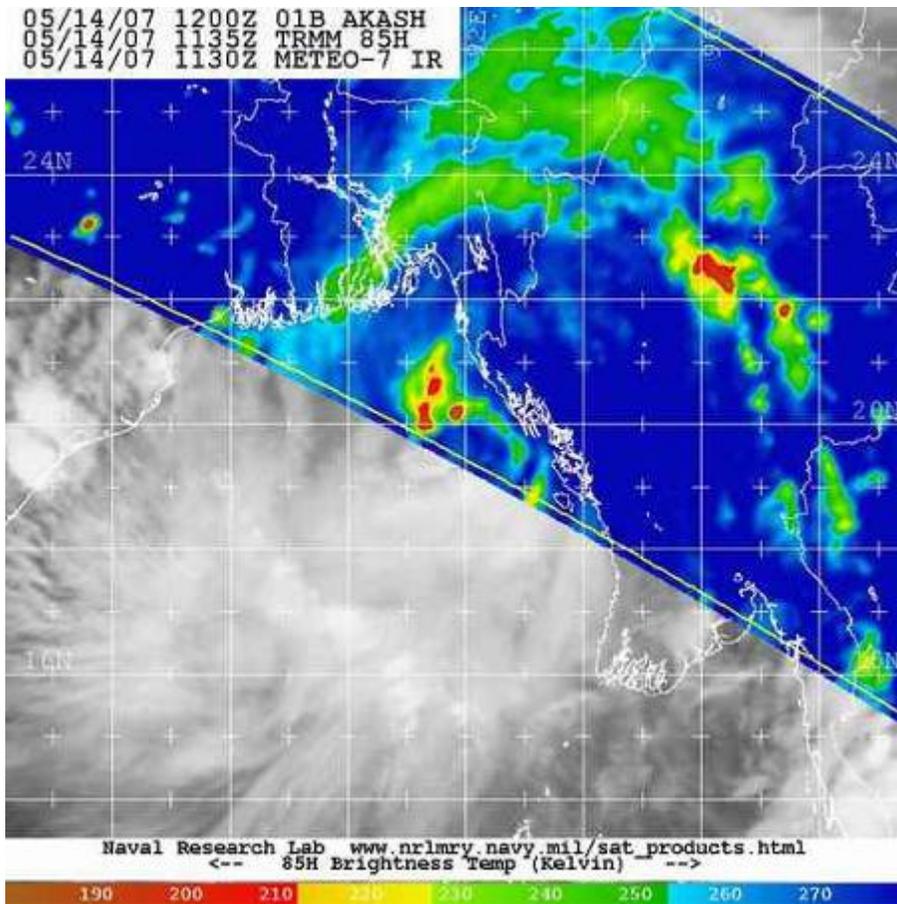


Fig 2(g): Microwave image at 1135 UTC of 14 May, 2007

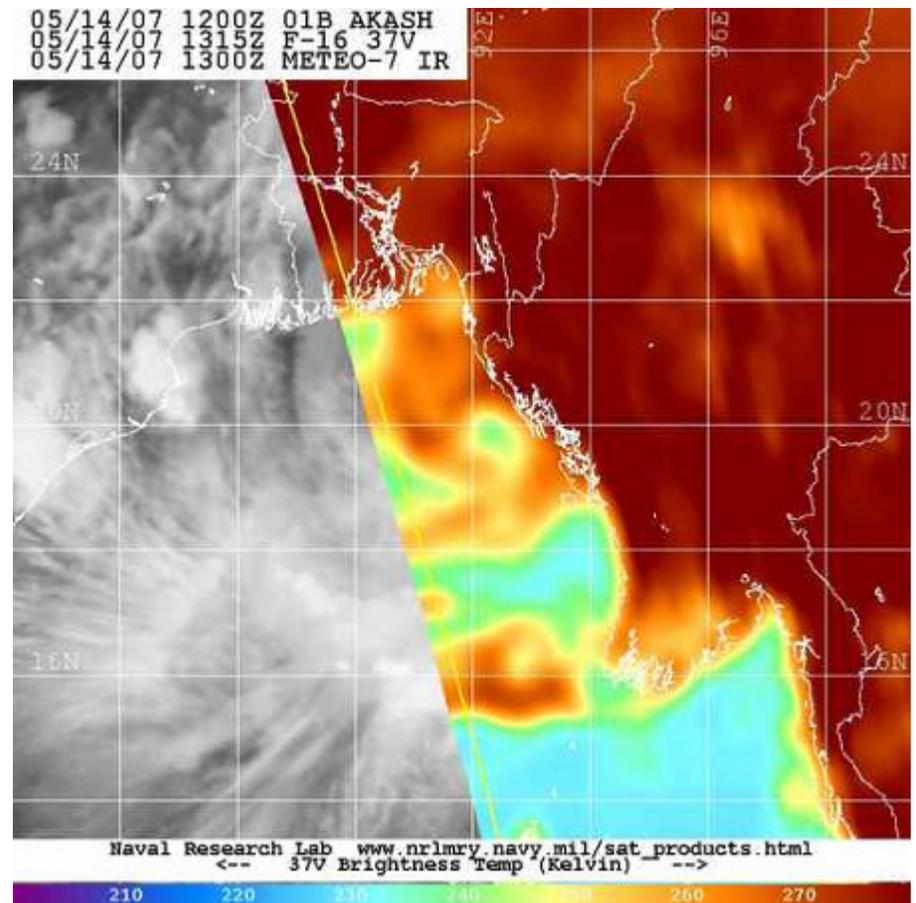


Figure 2(h): Microwave image at 1315 UTC of 14 May, 2007

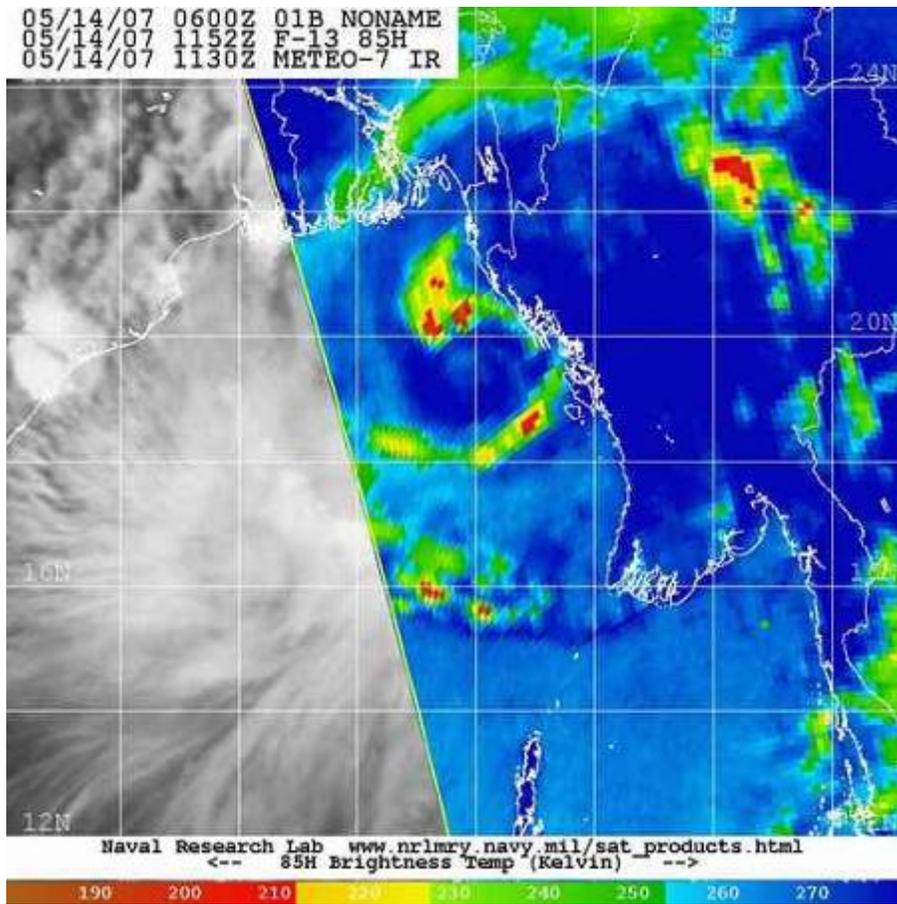


Figure 2(i): Microwave image at 1152 UTC of 14 May, 2007

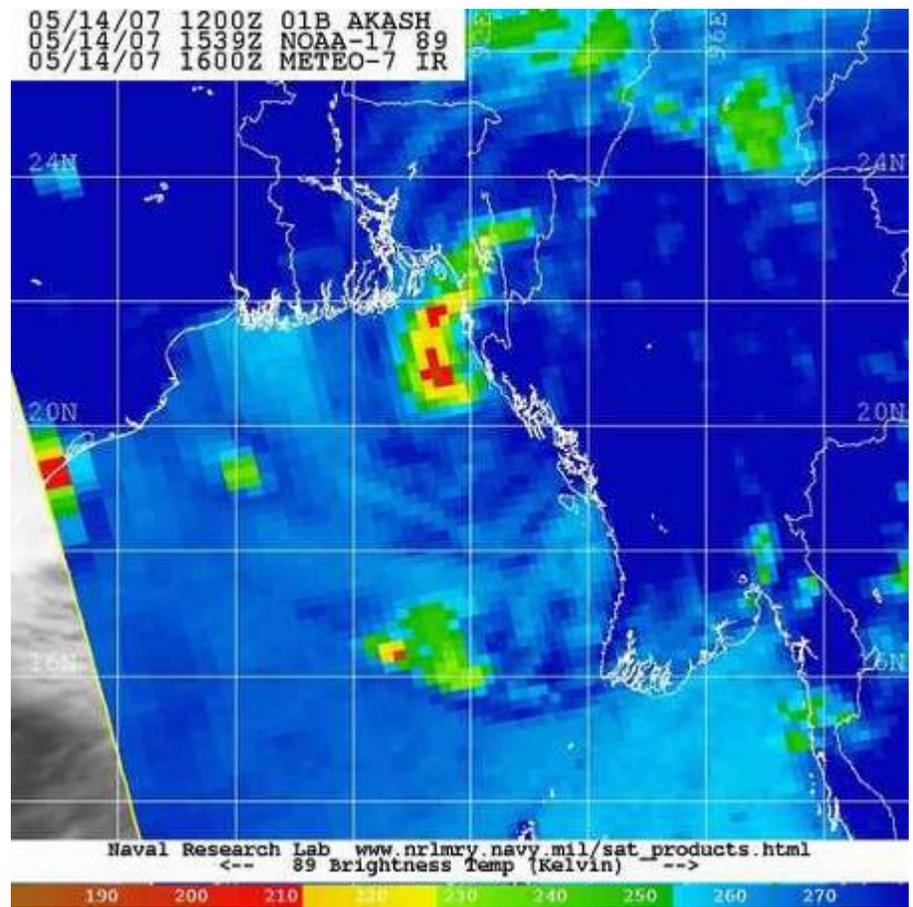


Figure 2(j): Microwave image at 1539 UTC of 14 May, 2007

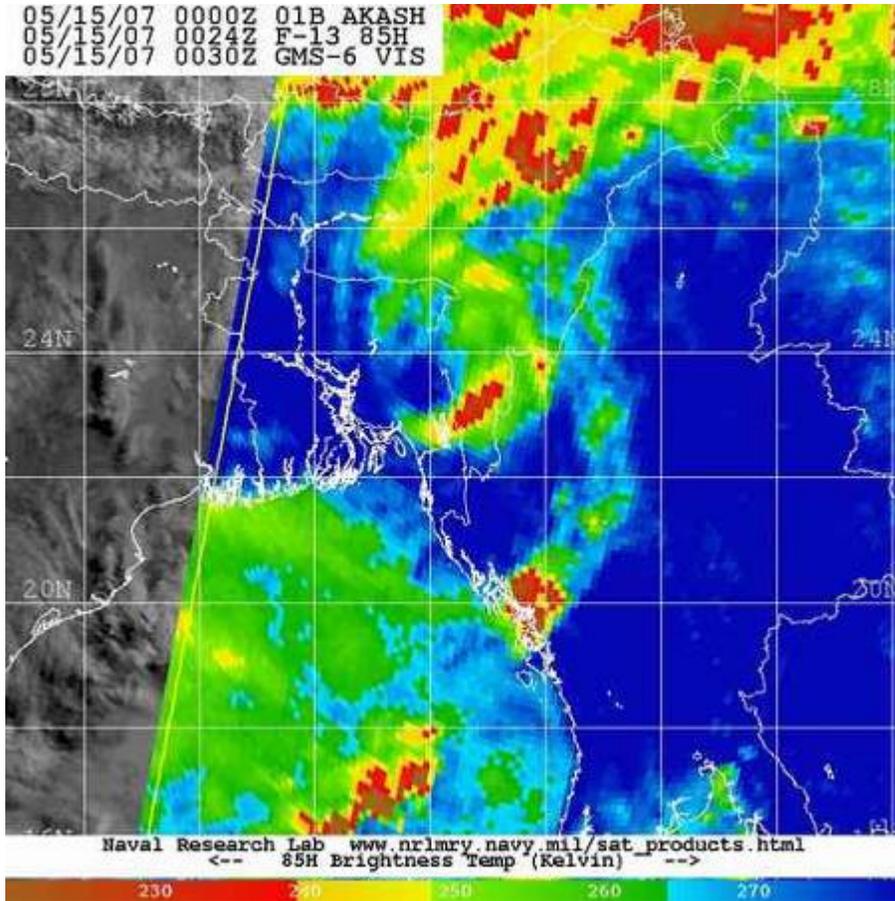


Figure 2(k): Microwave image at 0024 UTC of 15 May, 2007

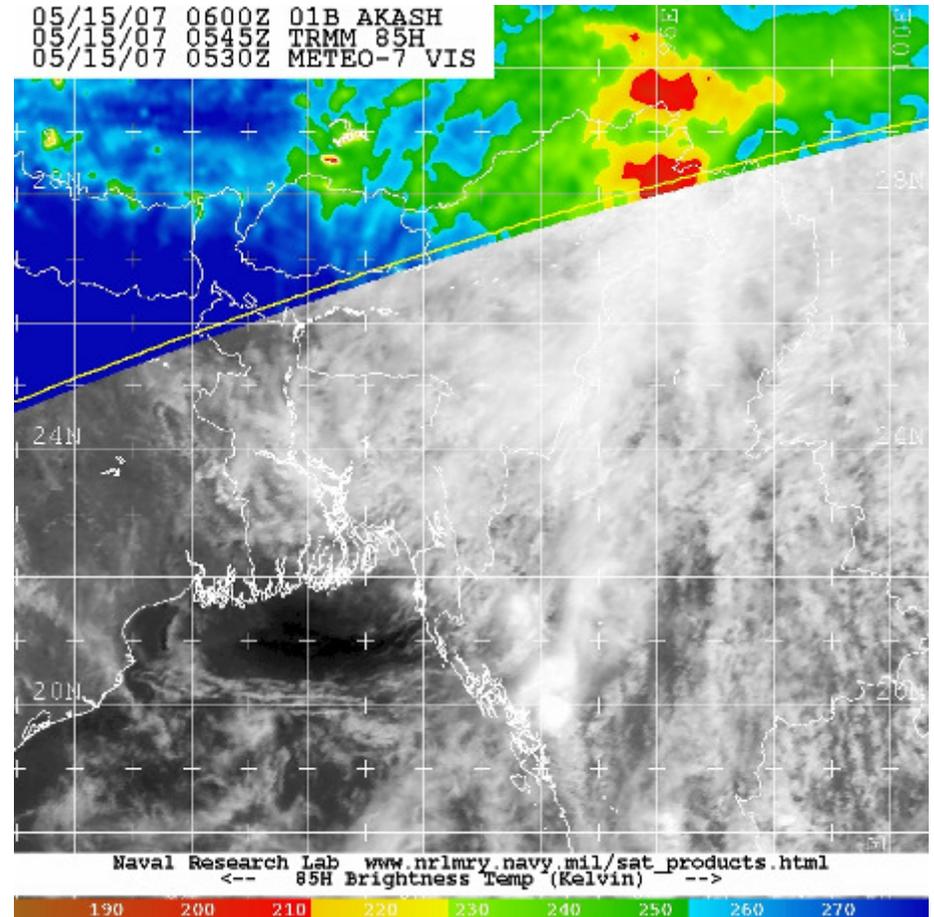


Figure 2(l): Microwave image at 0545 UTC of 15 May, 2007

INSAT IR image analysis

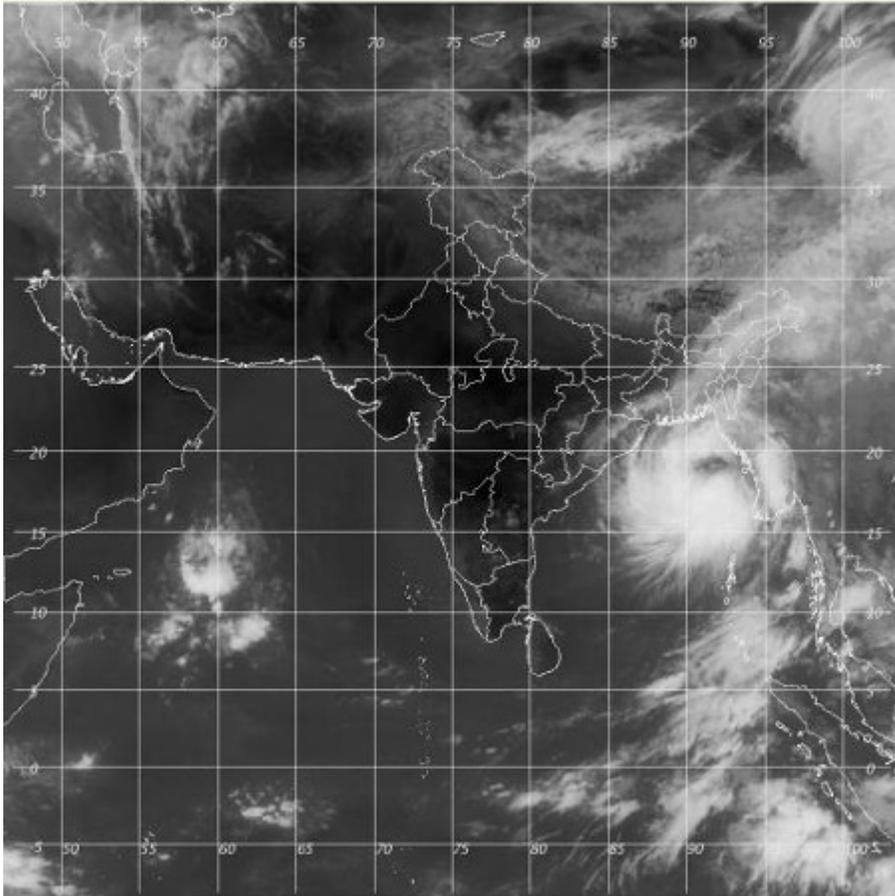


Figure 3(a): Kalpana-1 image at 05:00:03 UTC of 14 May, 2007

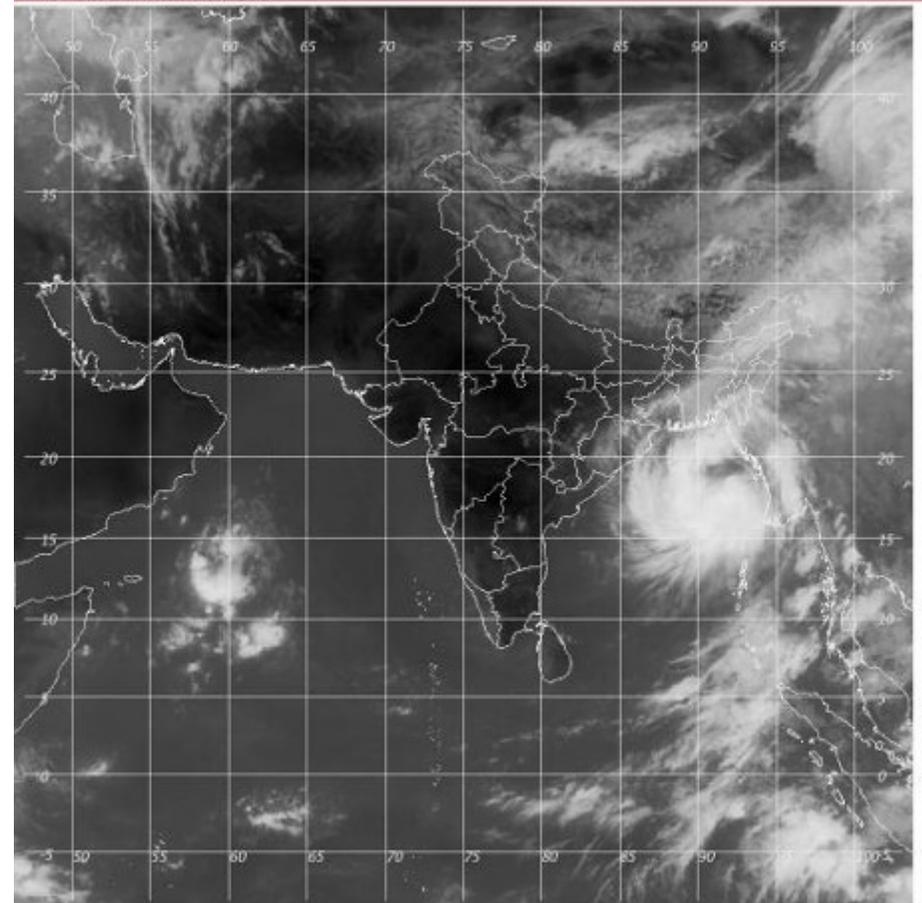


Figure 3(b): Kalpana-1 image at 04:00:03 UTC of 14 May, 2007

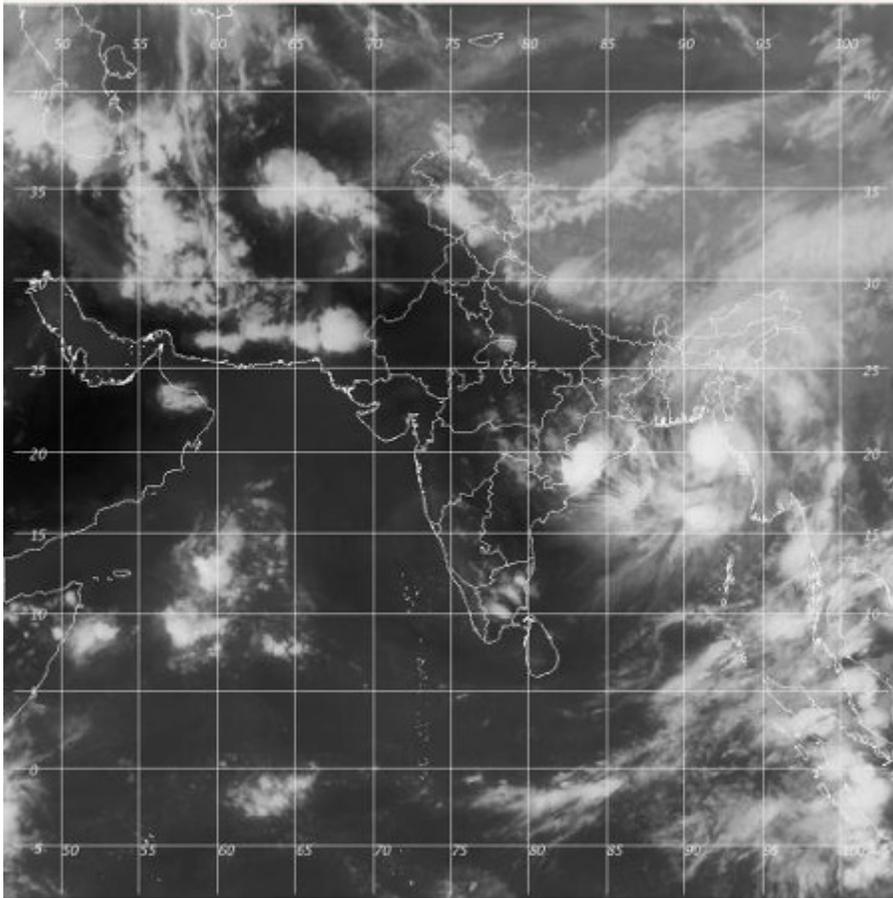


Figure 3(c): Kalpana-1 image at 14:00:03 UTC of 14 May, 2007

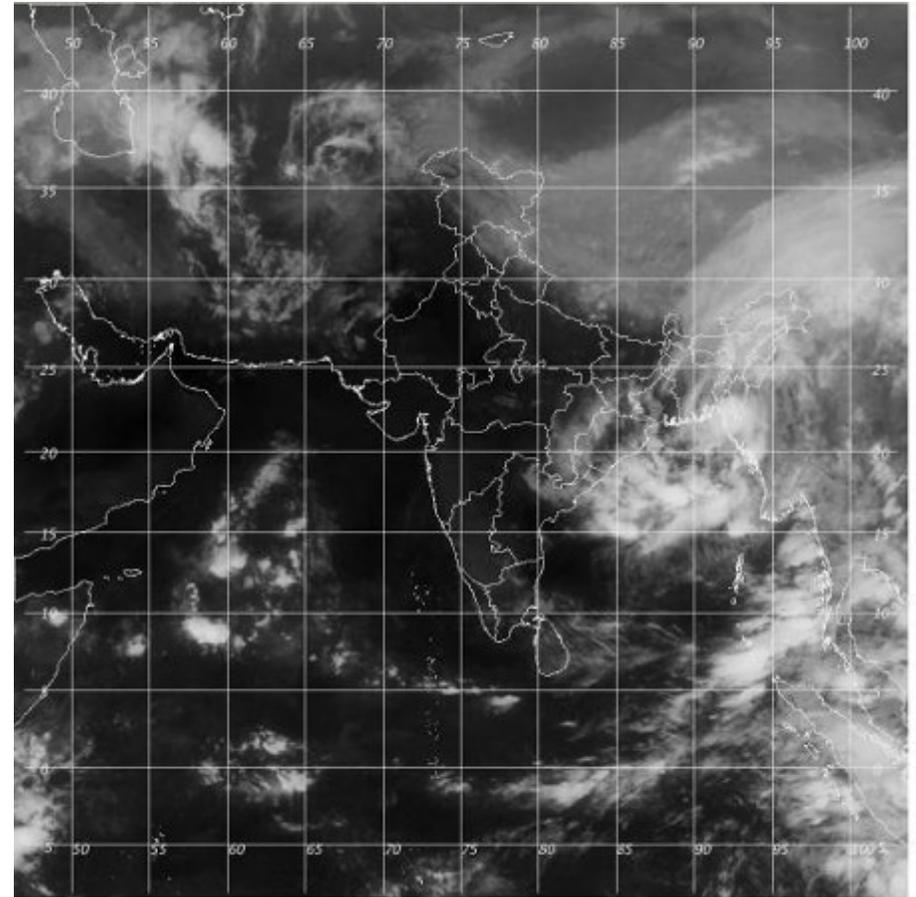


Figure 3(d): Kalpana-1 image at 22:00:03 UTC of 14 May, 2007

GMS IR image analysis

- **GMS series satellites are located over Pacific Ocean. Bay of Bengal is in the ending coverage area of these satellites.**
- **But their resolution are good and capable to provide cloud top temperature.**
- **Moreover the image providers overlapped the image with other satellite image with fine grid facility.**
- **As a result location of cyclone is easier.**
- **Therefore, GMS imageries are very much helpful for monitoring and forecasting cyclone formed in the Bay of Bengal.**
- **Figure 4 (a-f) shows some of the satellite imageries used to forecast monitor Cyclone “Akash” during 13-15 May 2007.**

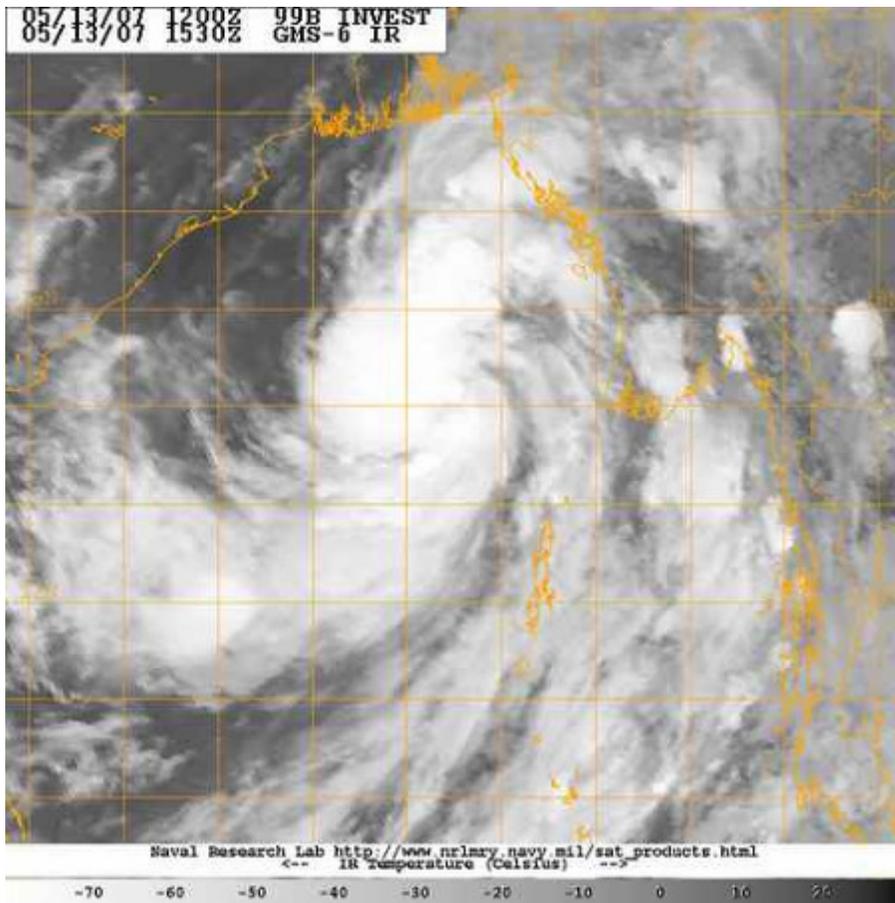


Figure 4(a): GMS6 IR image at 1130 UTC of 13 May, 2007

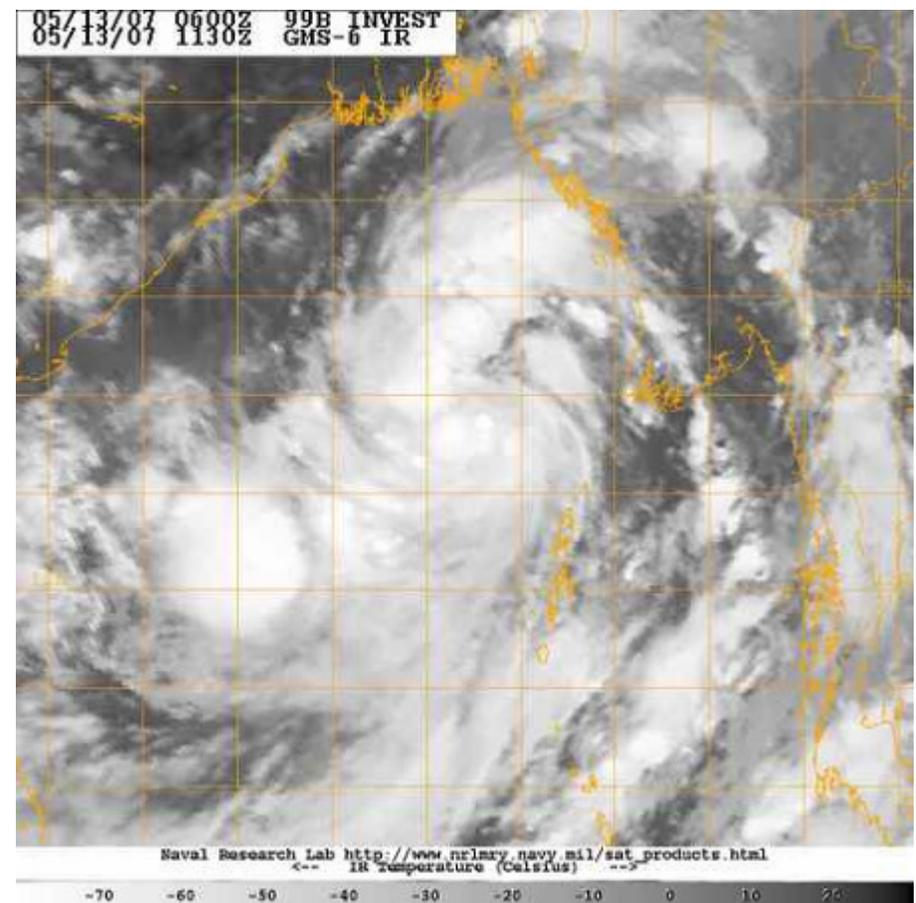


Figure 4(b): GMS6 IR image at 1530 UTC of 13 May, 2007

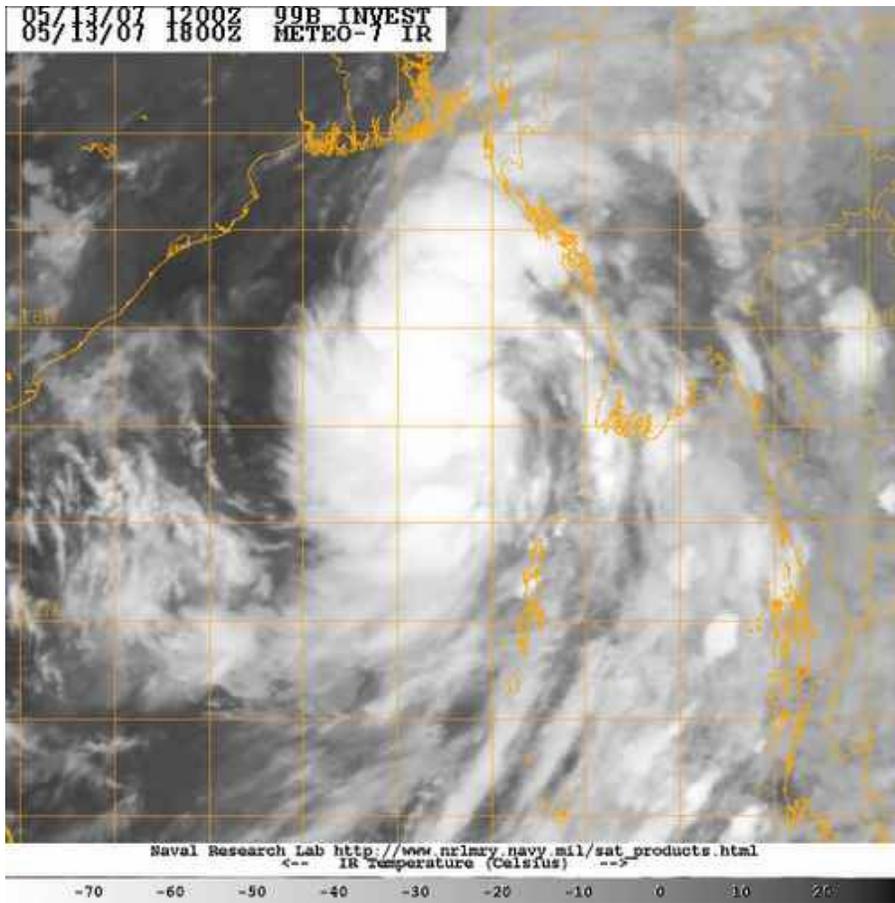


Figure 4(c): GMS6 IR image at 1800 UTC of 13 May, 2007

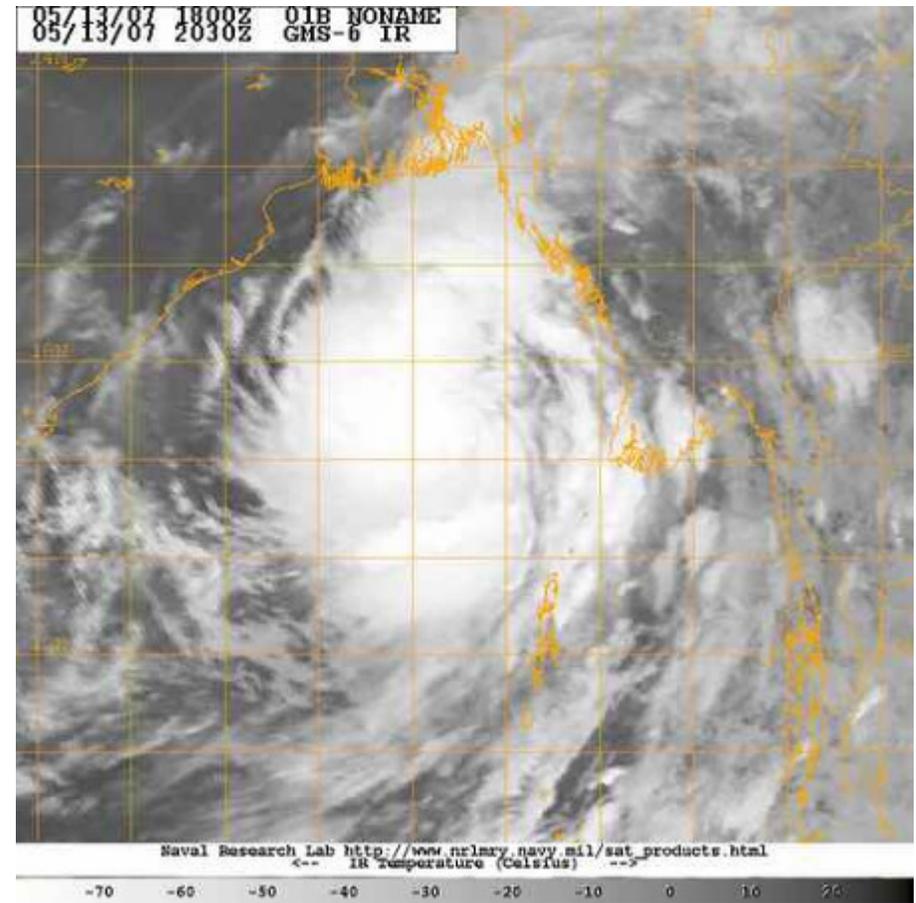


Figure 4(d): GMS6 IR image at 2030 UTC of 13 May, 2007

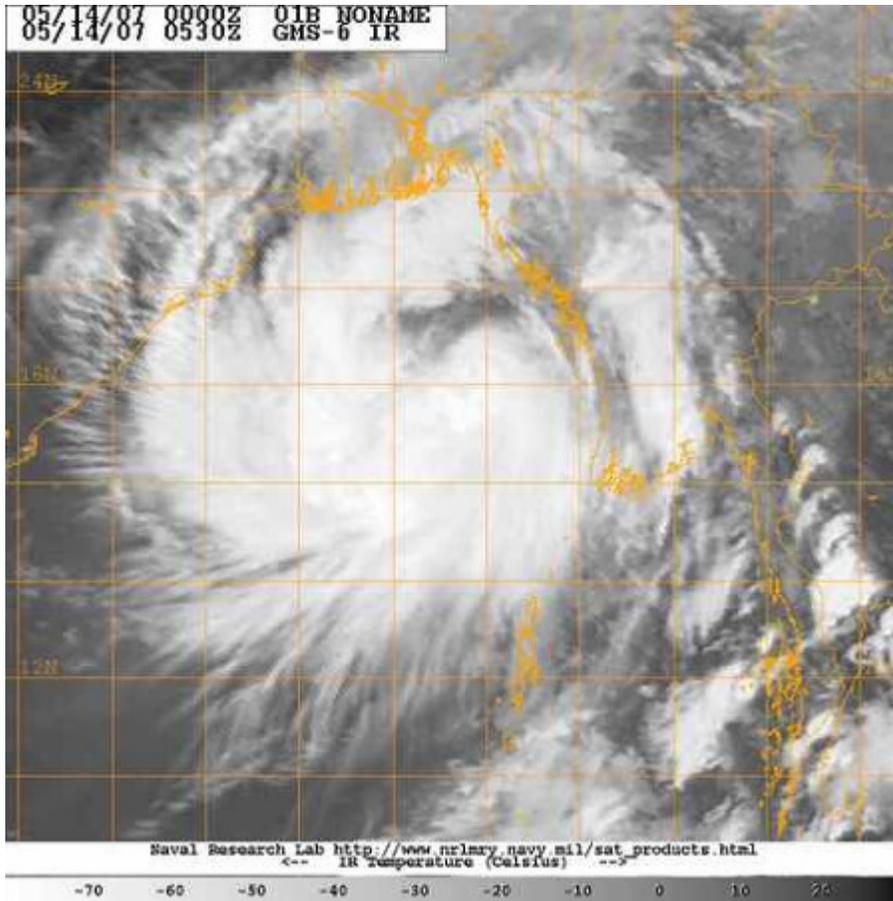


Figure 4(e): GMS6 IR image at 0530 UTC of 14 May, 2007

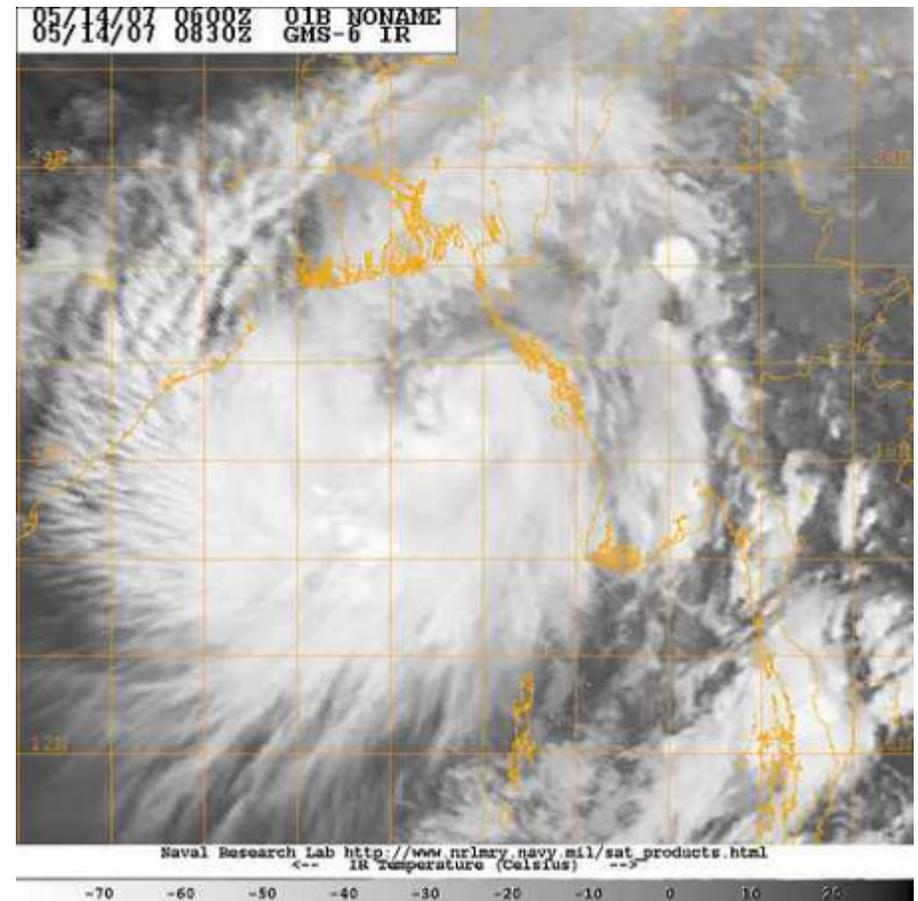
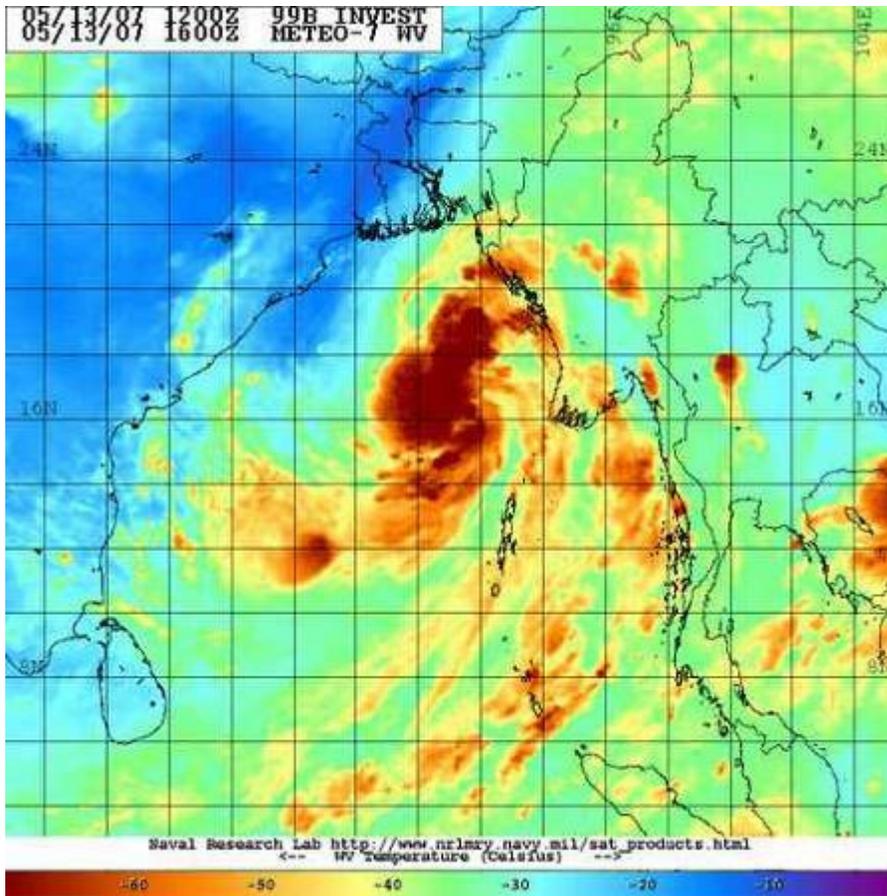


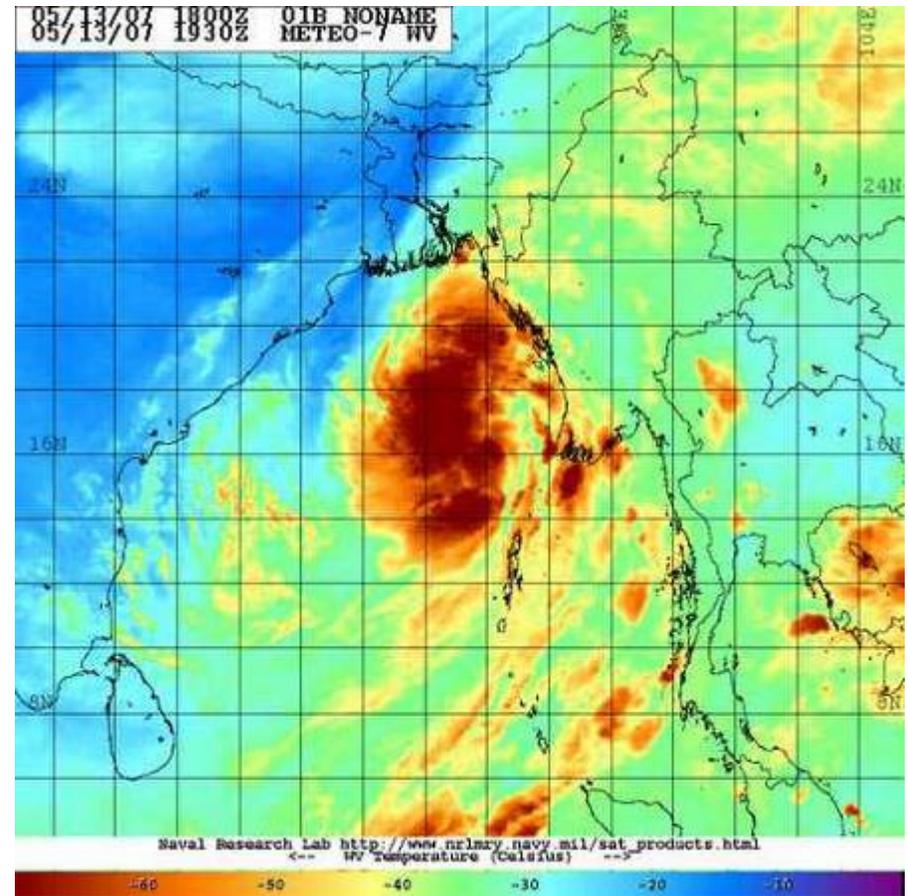
Figure 4(f): GMS6 IR image at 0830 UTC of 14 May, 2007

METEOSAT-7 WV image analysis

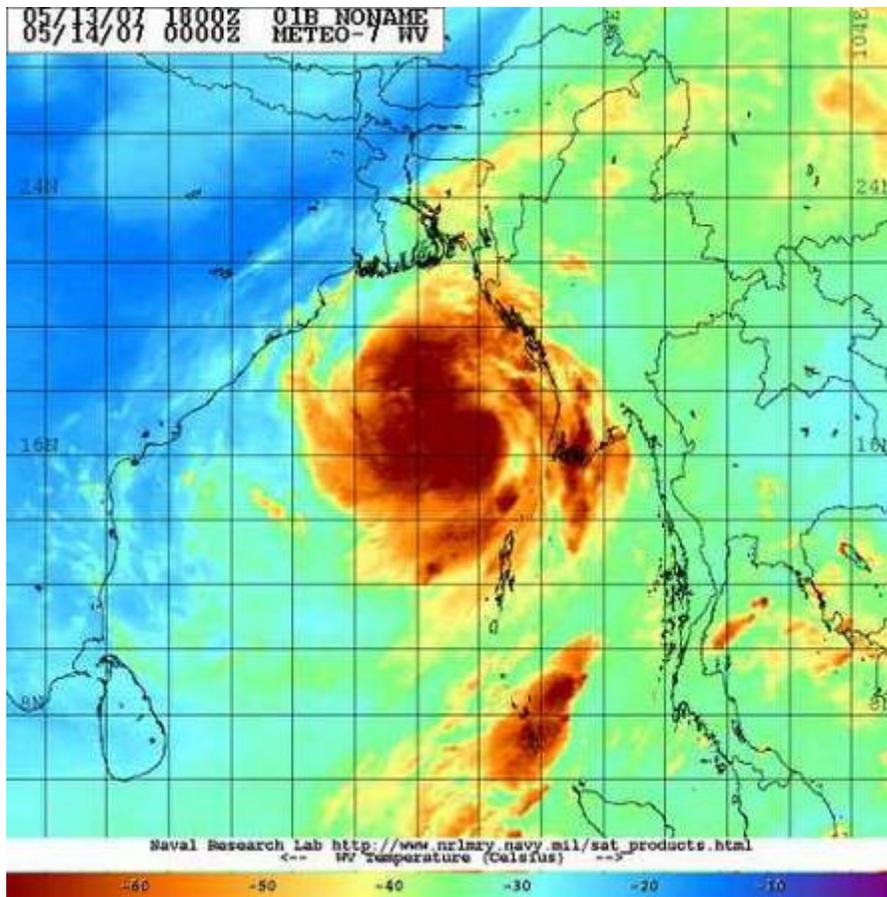
- ❖ **Water Vapour (WV) is the most vital satellite channel for collecting information about cyclone.**
- ❖ **METEOSAT series have a number of satellites to collect information from different basins.**
- ❖ **METEOSAT-7 is providing information about cyclone formed in the Bay of Bengal.**
- ❖ **METEOSAT WV imageries provide information about WV temperature in degree Celsius combined with other satellites with fine grid resolution.**
- ❖ **As result dynamical behaviour (location, movement, intensity) can be determined very easily which helps a lot to the forecasters.**
- ❖ **Figure 5(a-h) shows some of the satellite imageries used to forecast and monitor Cyclone “Akash” during 13-15 May 2007.**



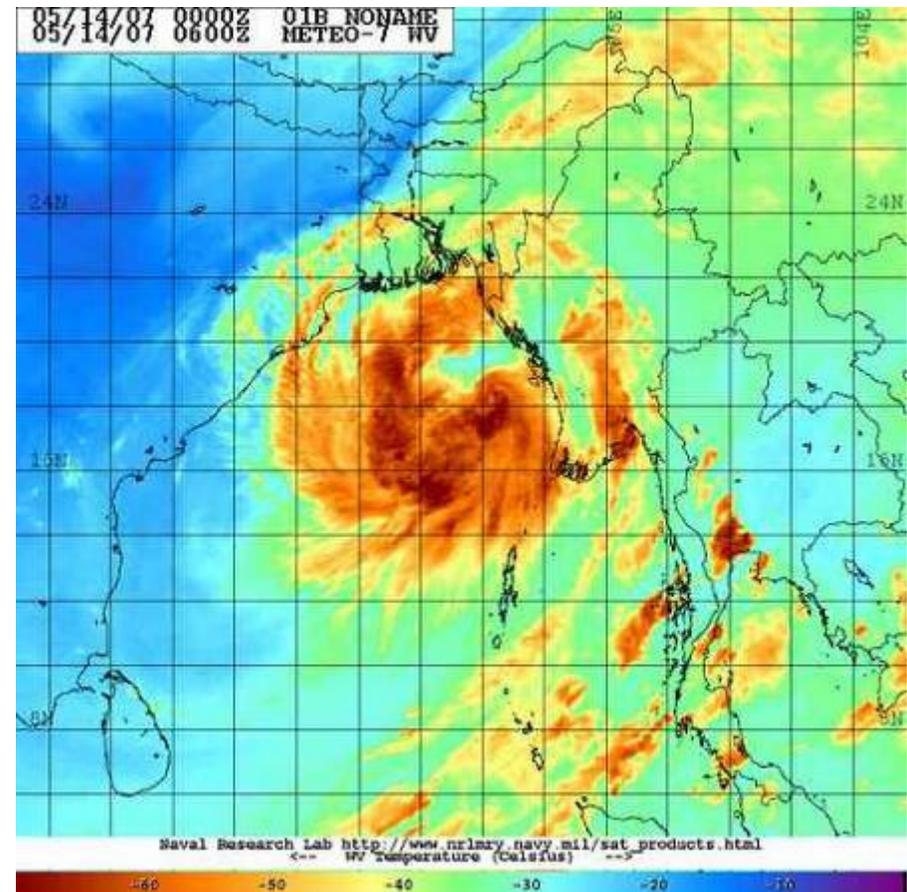
**Figure 5(a): METEOSAT7 WV
image at 1600 UTC of
13 May, 2007**



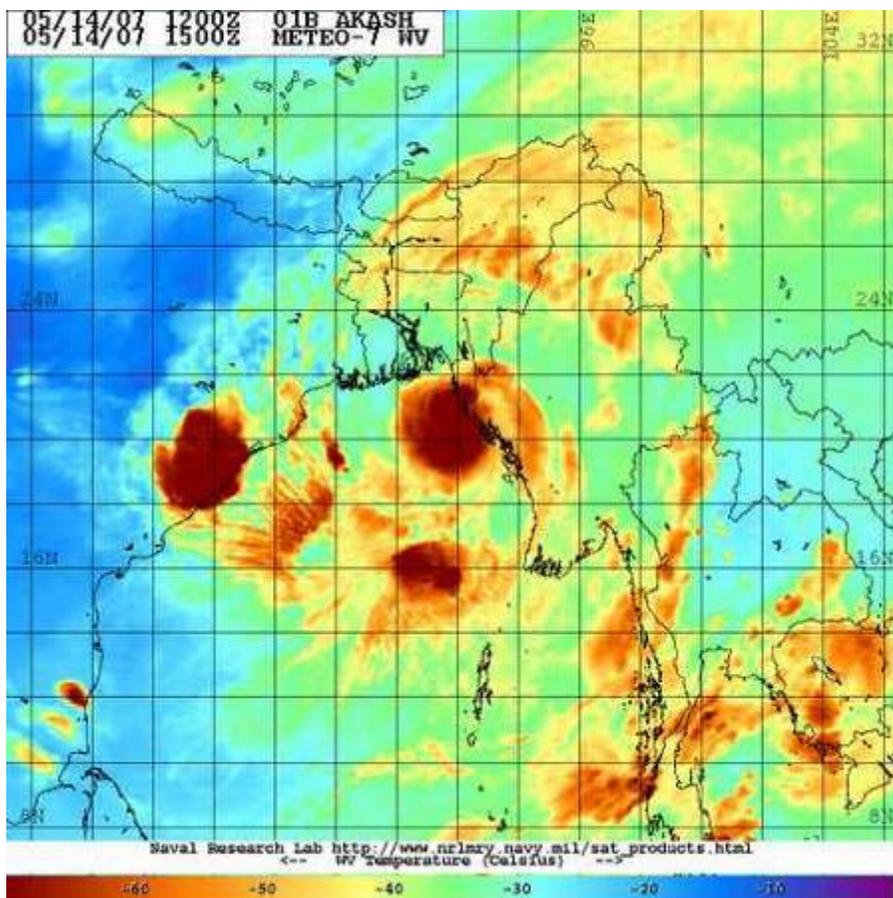
**Figure 5(b): METEOSAT7 WV
image at 1930 UTC of
13 May, 2007**



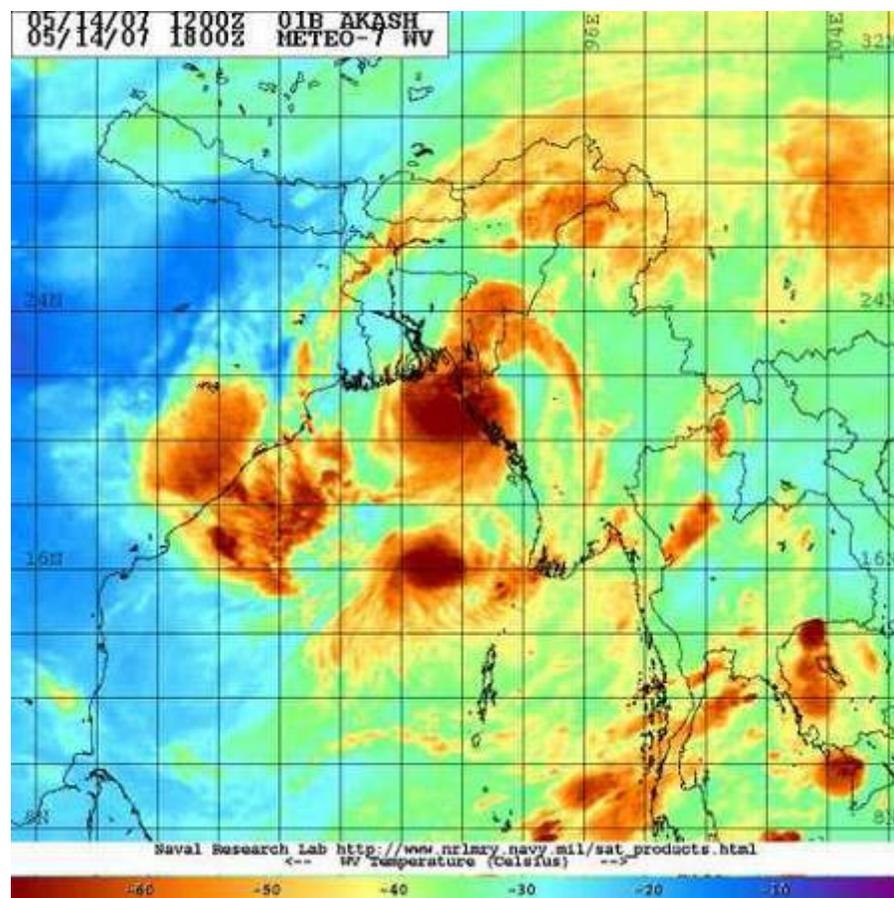
**Figure 5(c): METEOSAT7 WV
image at 0000 UTC of
14 May, 2007**



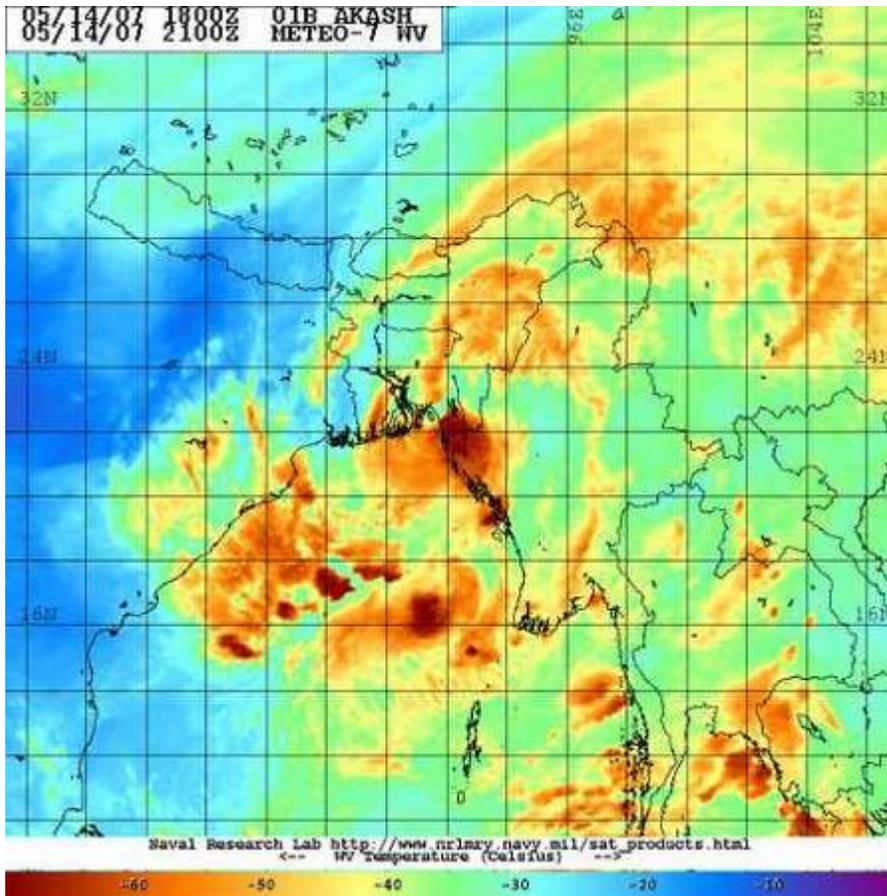
**Figure 5(d): METEOSAT7 WV
image at 0600 UTC of
14 May, 2007**



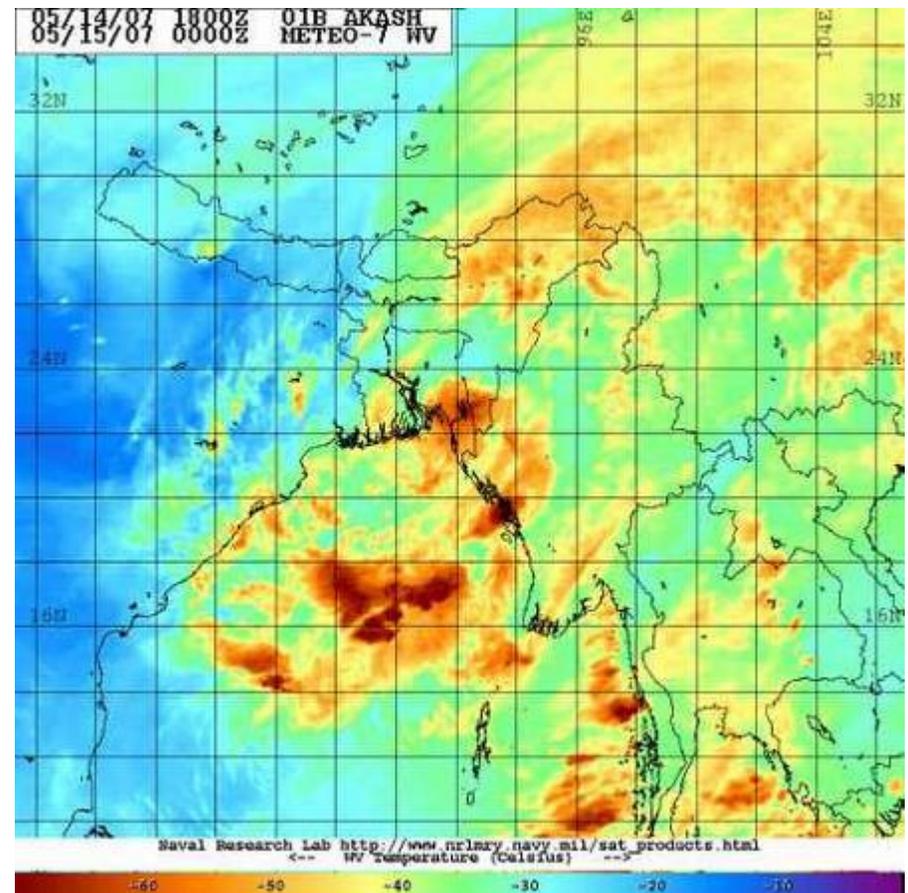
**Figure 5(e): METEOSAT7 WV
image at 1500 UTC of
14 May, 2007**



**Figure 5(f): METEOSAT7 WV
image at 1800 UTC of
14 May, 2007**



**Figure 5(g): METEOSAT7 WV
image at 2100 UTC of
14 May, 2007**



**Figure 5(h): METEOSAT7 WV
image at 0000 UTC of
15 May, 2007**

Conclusion-1

From this study the following conclusion can be drawn:

- **Microwave image, INSAT image, GMS IR image and METEOSAT-7 WV images were very much helpful tools for understanding the behaviour of cyclone “Akash” and forecasting about its life cycle.**

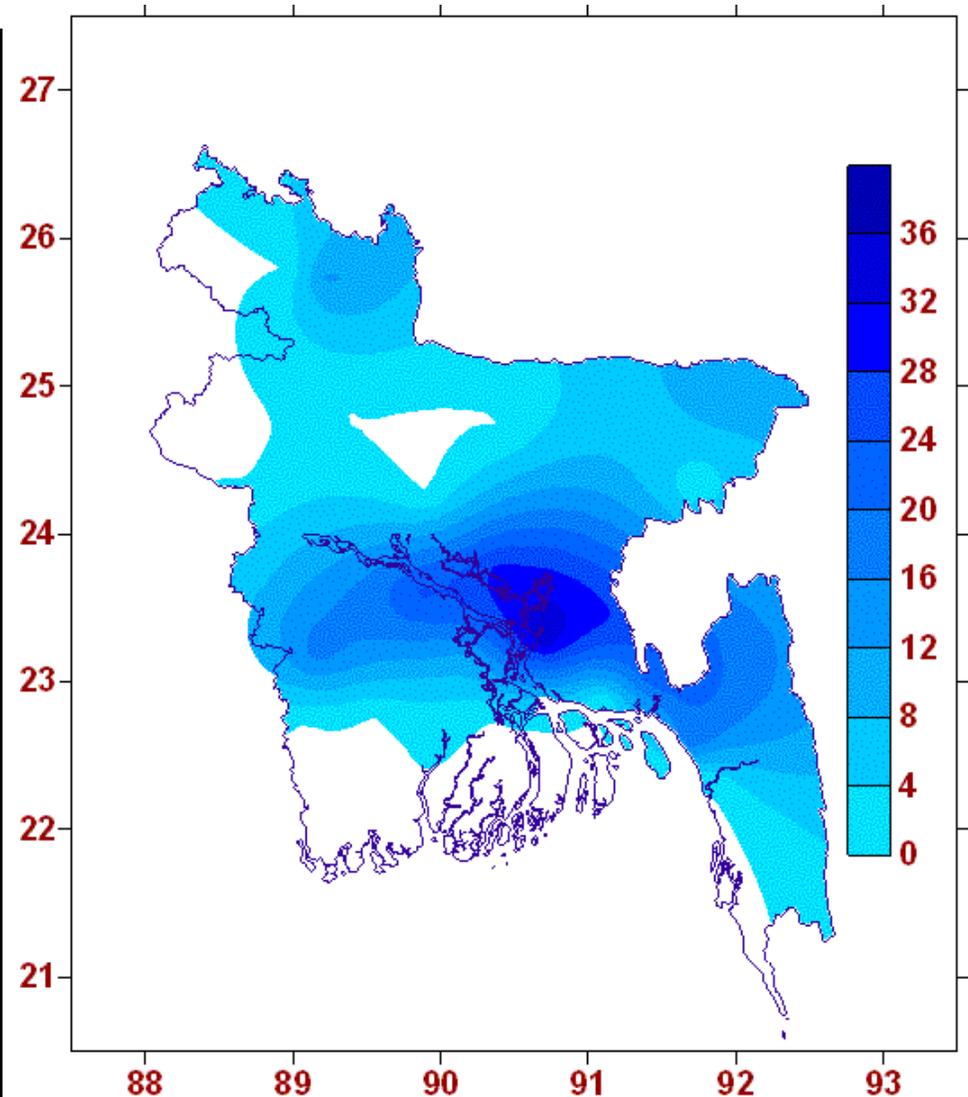
Nor'wester Forecasting in Bangladesh using Satellite products



History of the event

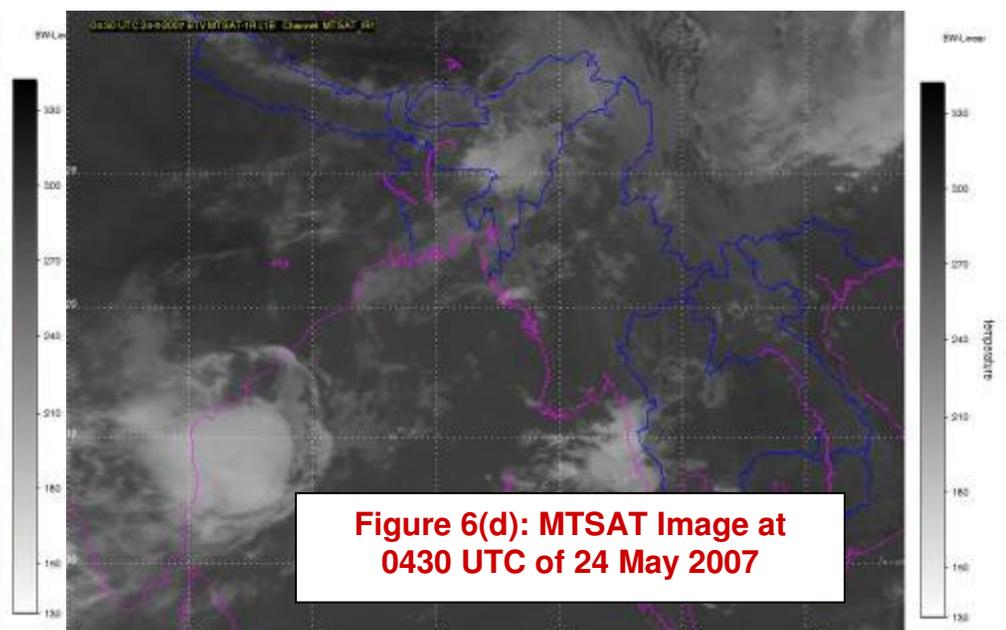
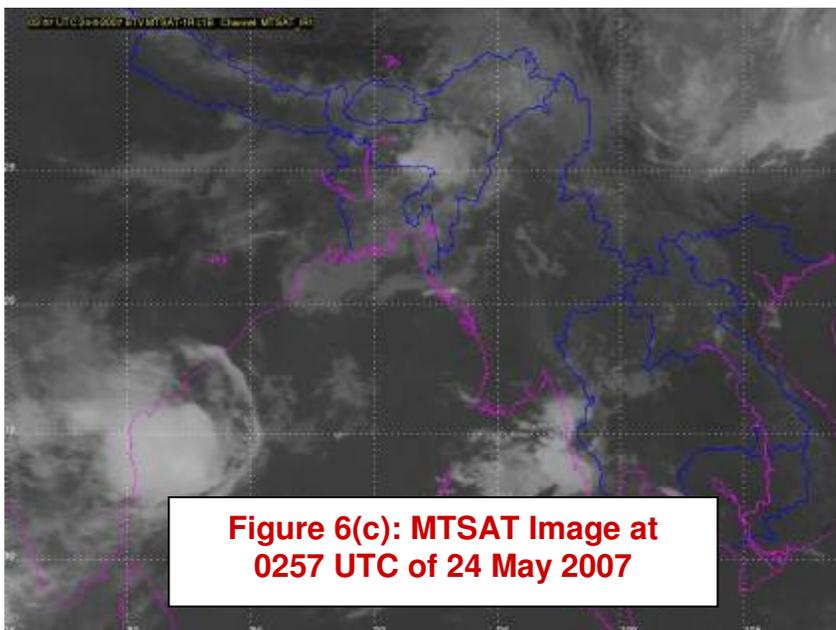
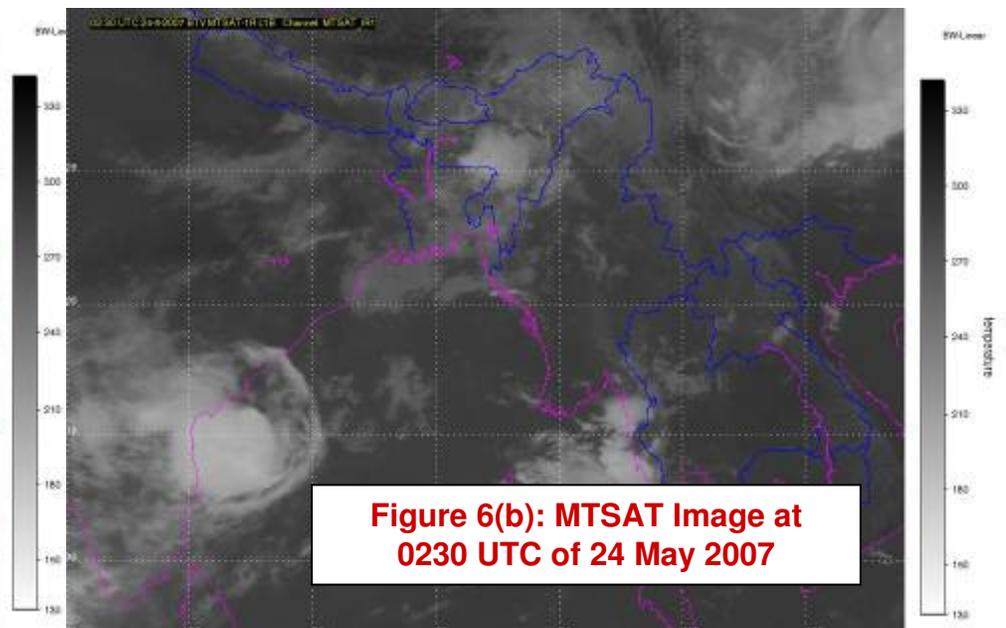
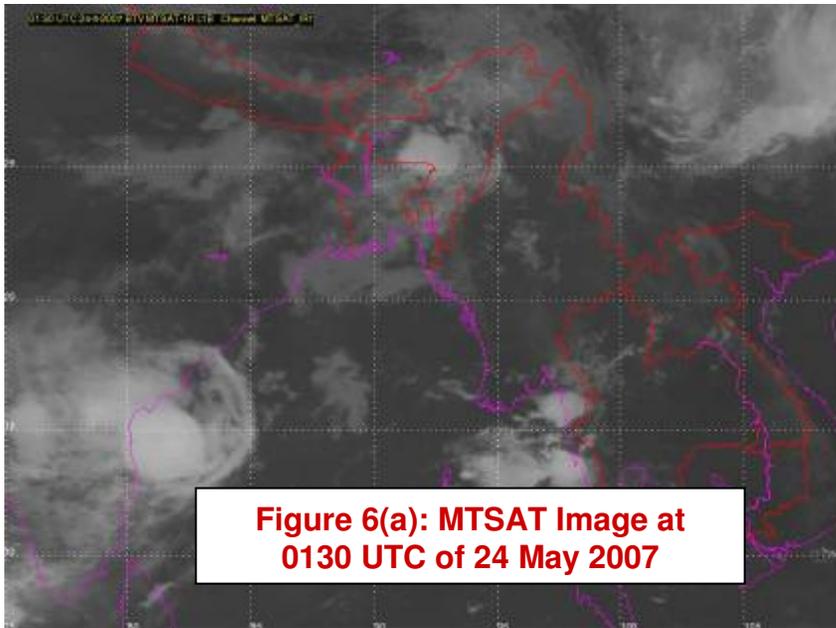
On 24 May 2007 there was Severe Nor'wester over Dhaka and adjoining area at about 1203 UTC

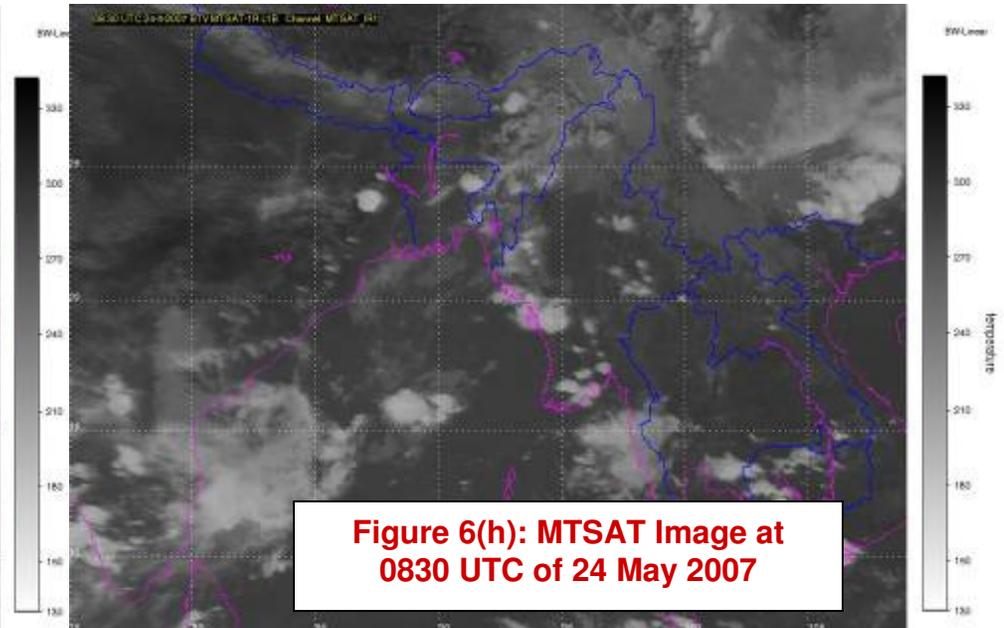
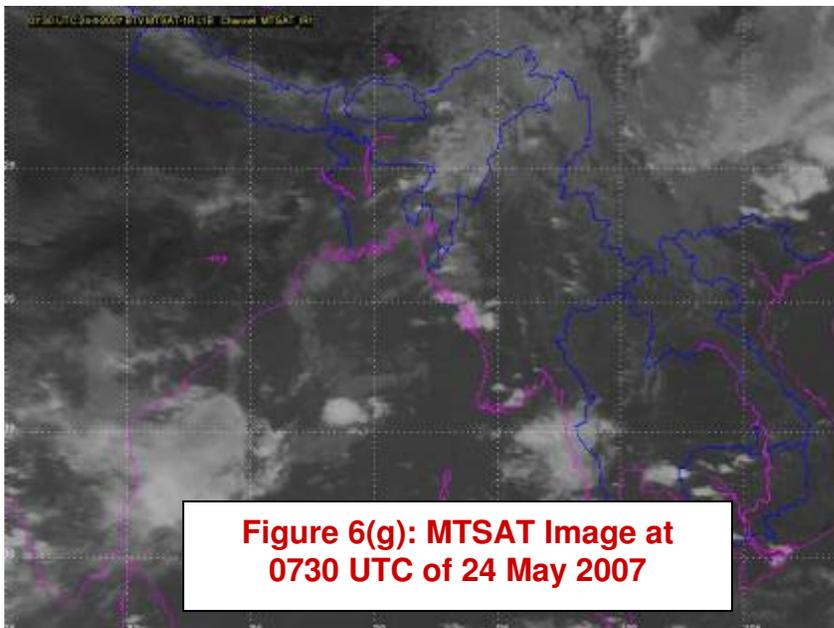
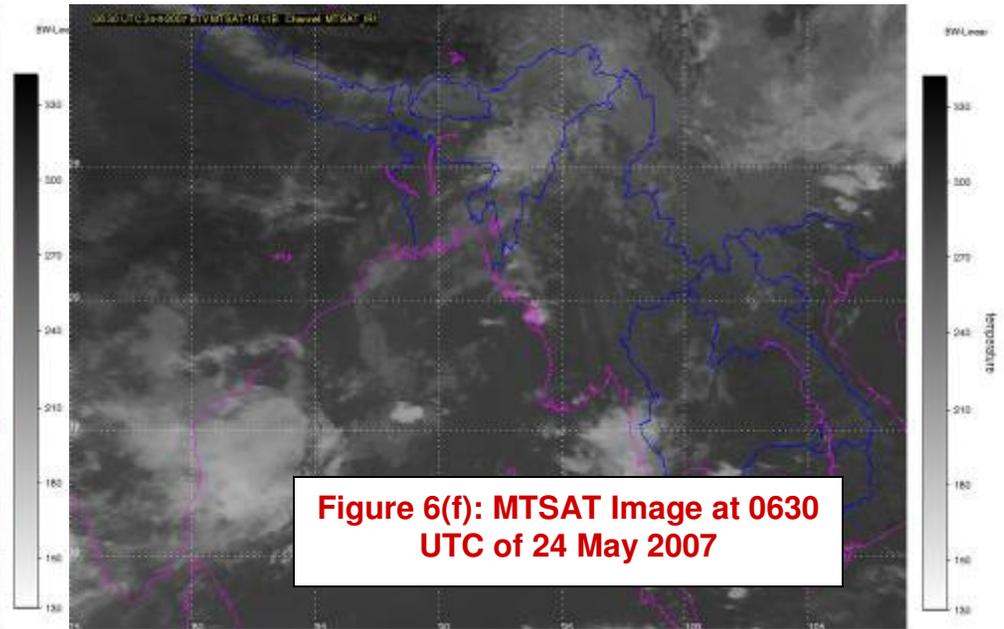
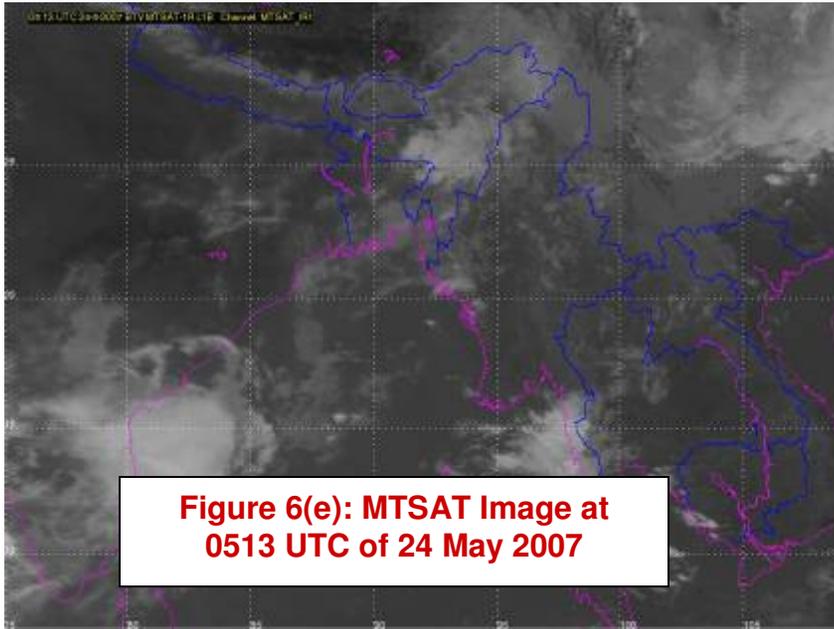
1. Max. wind speed recorded at Dhaka was about 83 KPH
2. Some structural damages were occurred.
3. 29 mm rainfall was recorded at Dhaka city.

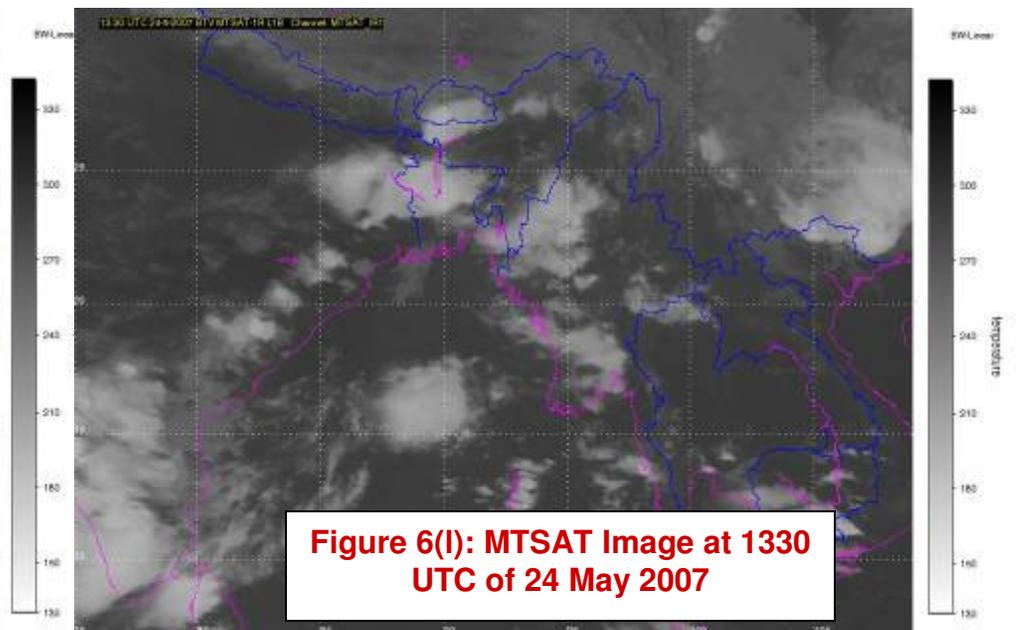
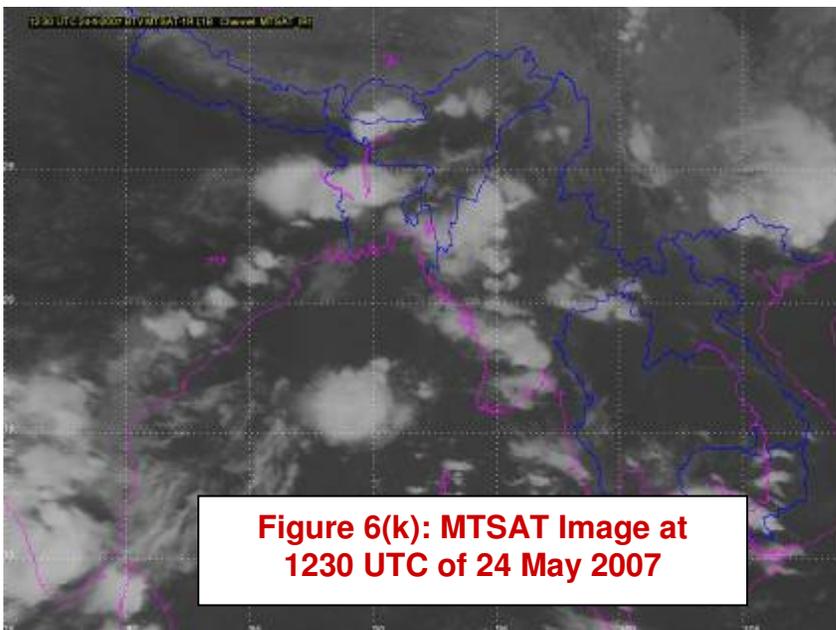
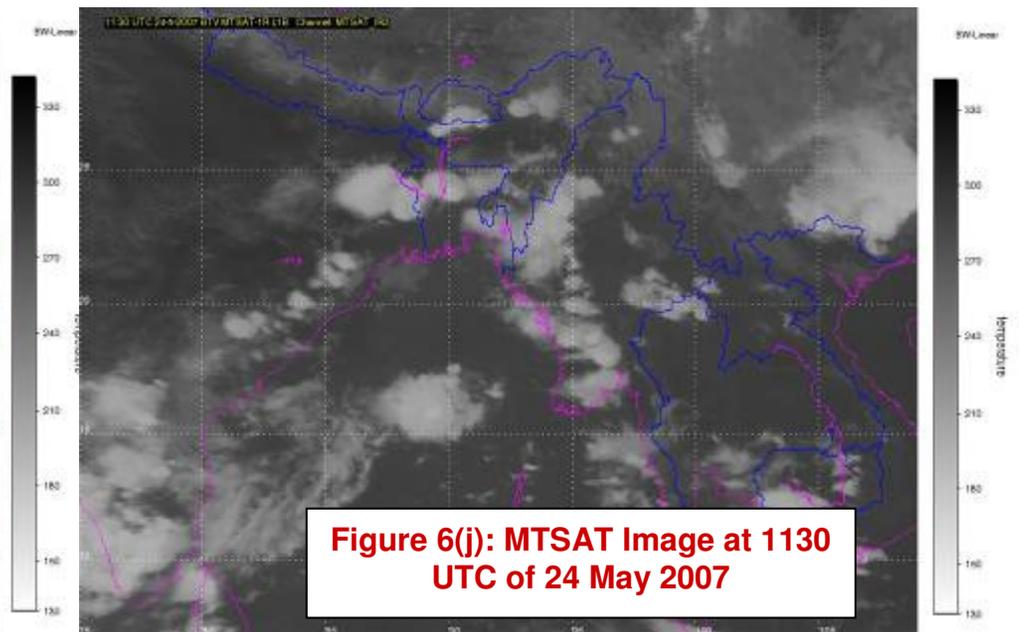
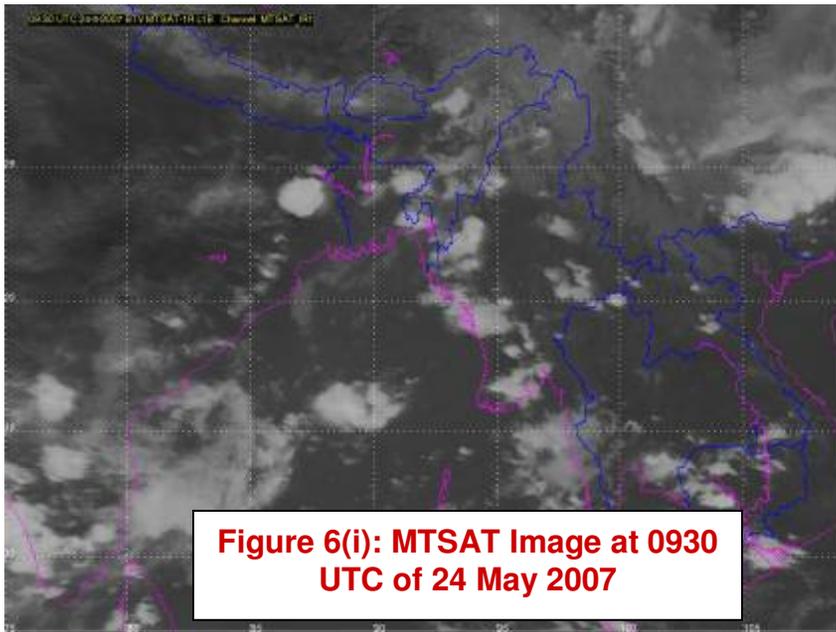


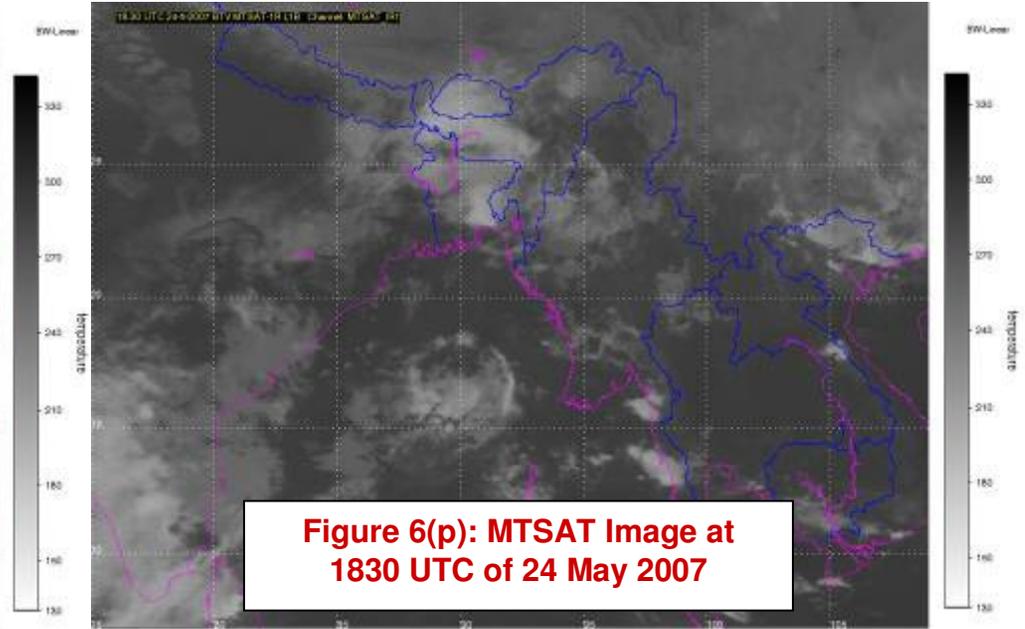
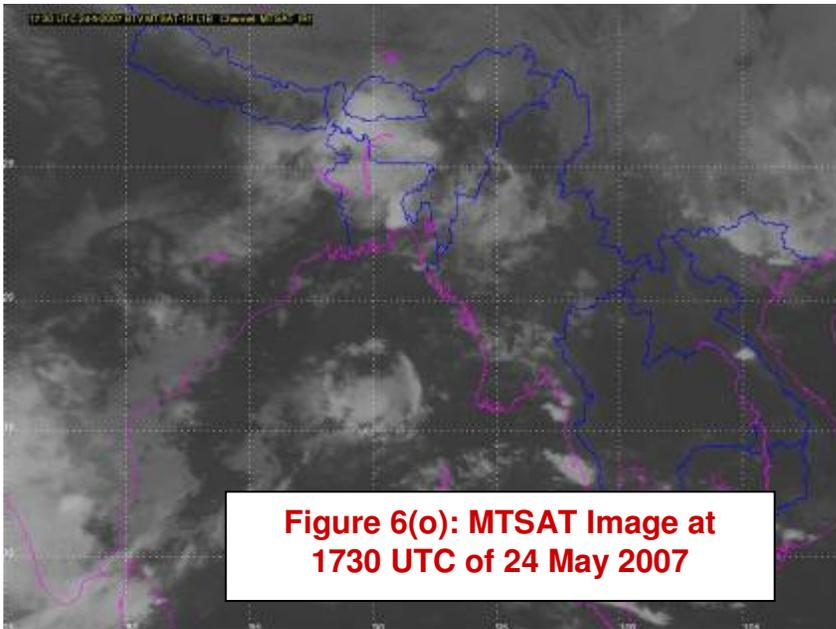
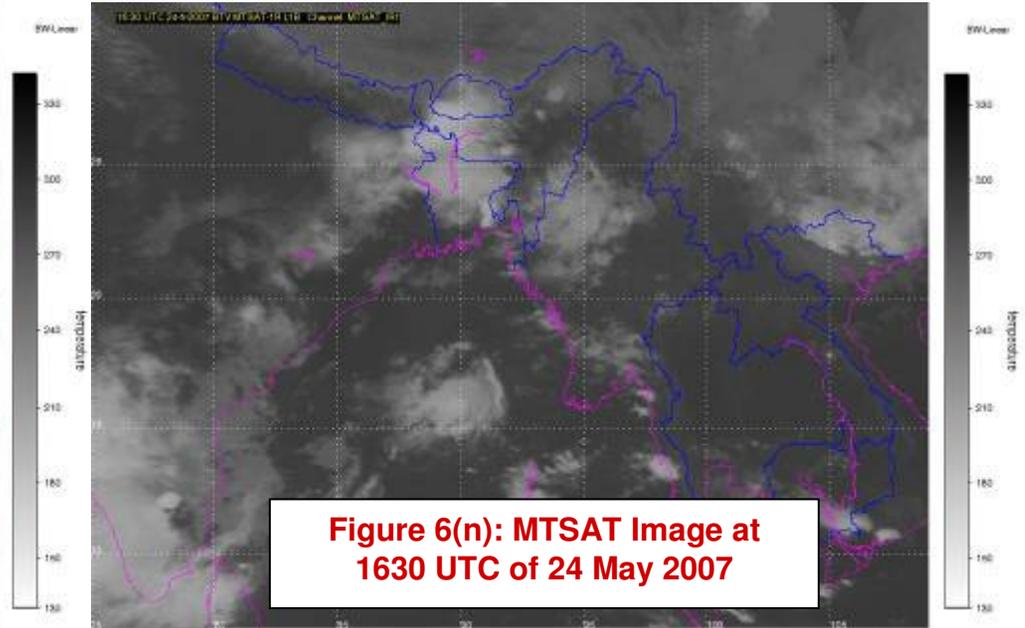
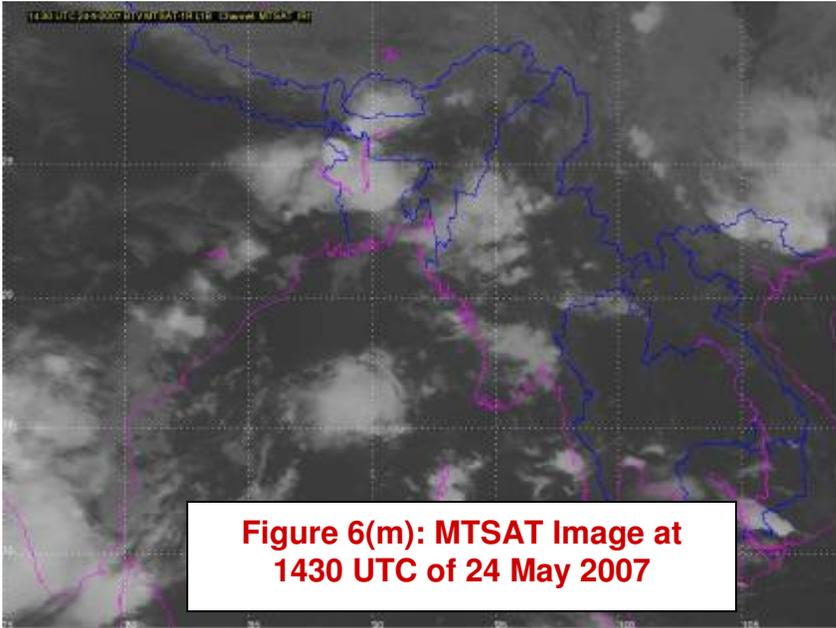
BMD recorded rainfall during 24, 0000 UTC to 25, 0000 UTC in Bangladesh

MTSAT Image analysis









Conclusion-2

- **Using these satellite images BMD issued forecast and warning timely for the river ports to safe the river going vessels and peoples, fisherman and it was fully effective.**
- **No causalities ware observed during this disaster.**

Conclusion

- **Satellite products are being used for monitoring synoptic weather systems so as to issue accurate forecast .**
- **Dynamic nature of weather systems are able to capture through the time series of satellite observations satellite**
- **Zones of cloudiness are identified from the imagery and it helps for identifying the possible areas of rainfall.**
- **In order to issue accurate and timely forecast for severe weather and cyclone tracking Satellite imagery provides powerful signals for sustainable development.**

Thank You for your kind attention