

GNSS and Its Applications in the context of Bangladesh

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(SPARRSO)**

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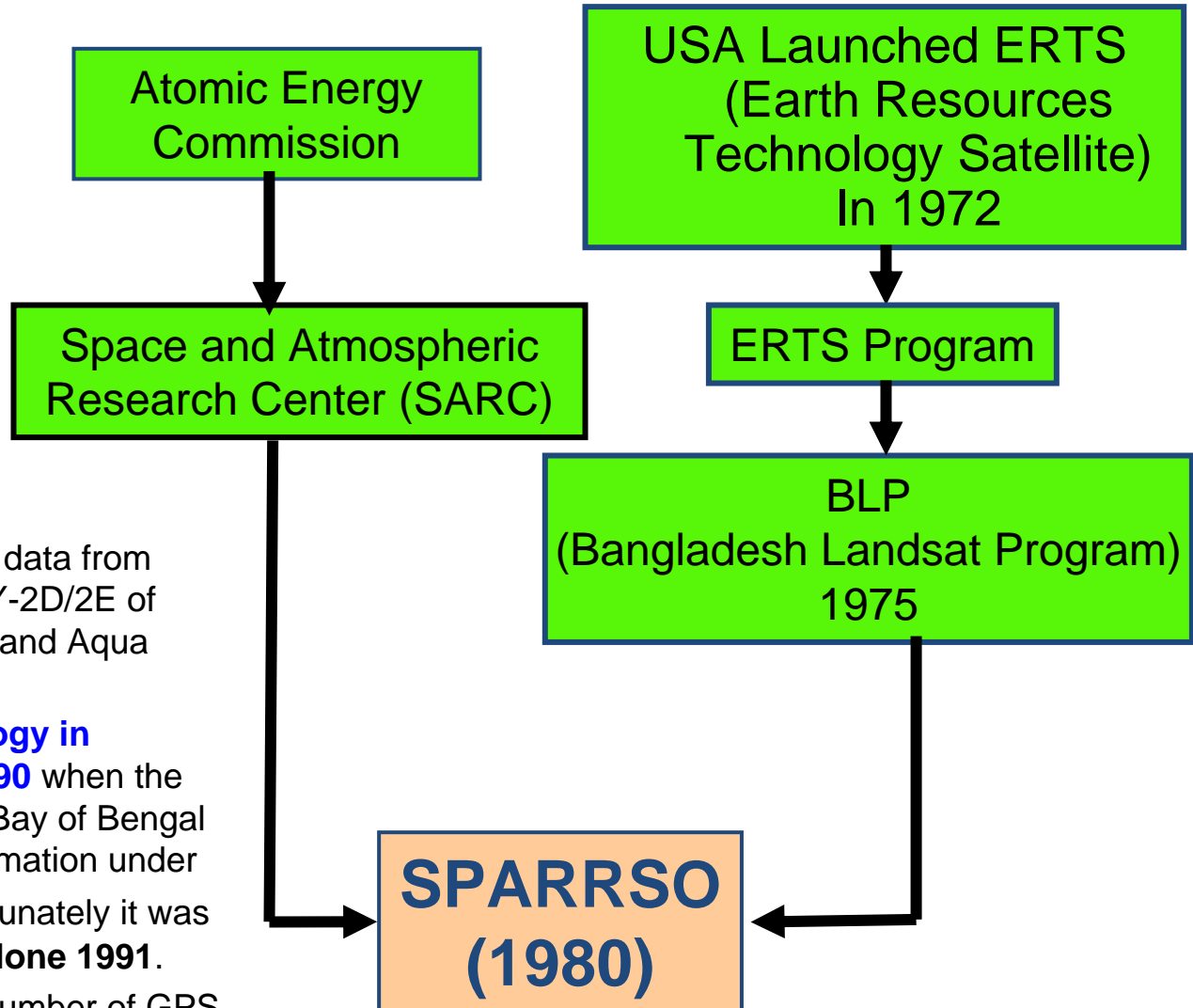
Overview

- Introduction to SPARRSO
- Applications of GNSS
 - Recently using
 - Needs
- Conclusion and Recommendations



A brief introduction to SPARRSO

- The history of RS technology in Bangladesh dates back to **1968** when the first Automatic Picture Transmission (APT) station was set up at SARC.
- With NASA's launch of the ERTS-1 satellite, the Bangladesh ERTS Program, one of **35** Principal Investigator Programs **worldwide**, that was initiated in 1972.
- At present SPARRSO receives data from NOAA-AVHRR and ATOVS, FY-2D/2E of China, MTSAT of Japan, Terra and Aqua MODIS of USA.
- **The history of GNSS technology in Bangladesh dates back to 1990** when the Buoy station was set up in the Bay of Bengal for collecting Atmospheric Information under **ACEMP** of USAID. But unfortunately it was missing during devastating **cyclone 1991**.
- At present SPARRSO have a number of GPS and a Differential GPS

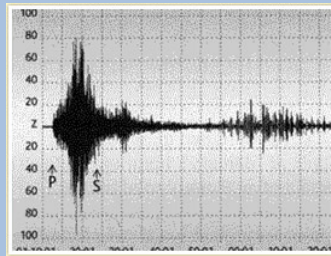


Specification of Differential GPS

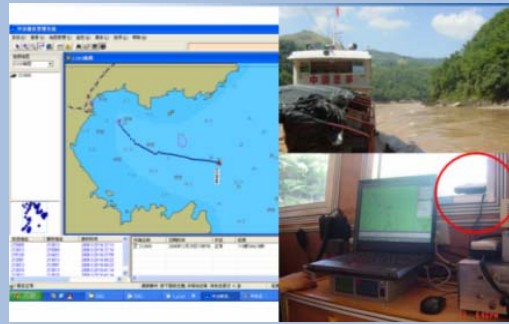
- **Brand and Model:** Magellan ProMark3 RTK
- **General Characteristics:**
 - 12 parallel channels; L1 C/A code and carrier;
 - SBAS tracking and use in RTK process;
 - Protocol: NMEA0183
- **Real Time Accuracy:**
 - RTK (horizontal accuracies)
 - Fixed: 1 cm + 1 ppm and Float: 20 cm + 1 ppm.
- **Post Processed Accuracy:**
 - Static Survey (rms)
 - Horizontal: 0.005 m + 1 ppm and Vertical: 0.01 m + 2 ppm
 - Kinematic Survey:
 - Horizontal: 0.012 m + 2.5 ppm & Vertical: 0.015 m + 2.5 ppm



Meteorological Applications



Earthquake Monitoring



Offshore & Inland Water Transport Control System



Marine Search & Rescue



Offshore Tide Data Transmission

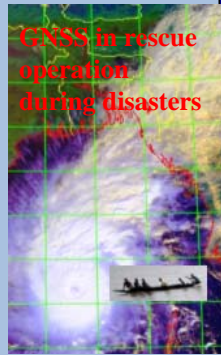


Land Survey Mapping

GNSS Applications



GNSS in optimizing crop cultivation



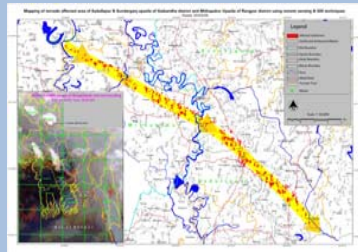
GNSS in rescue operation during disasters



Transportation Application



Monitoring the vehicles to minimize the accidents during dense fog



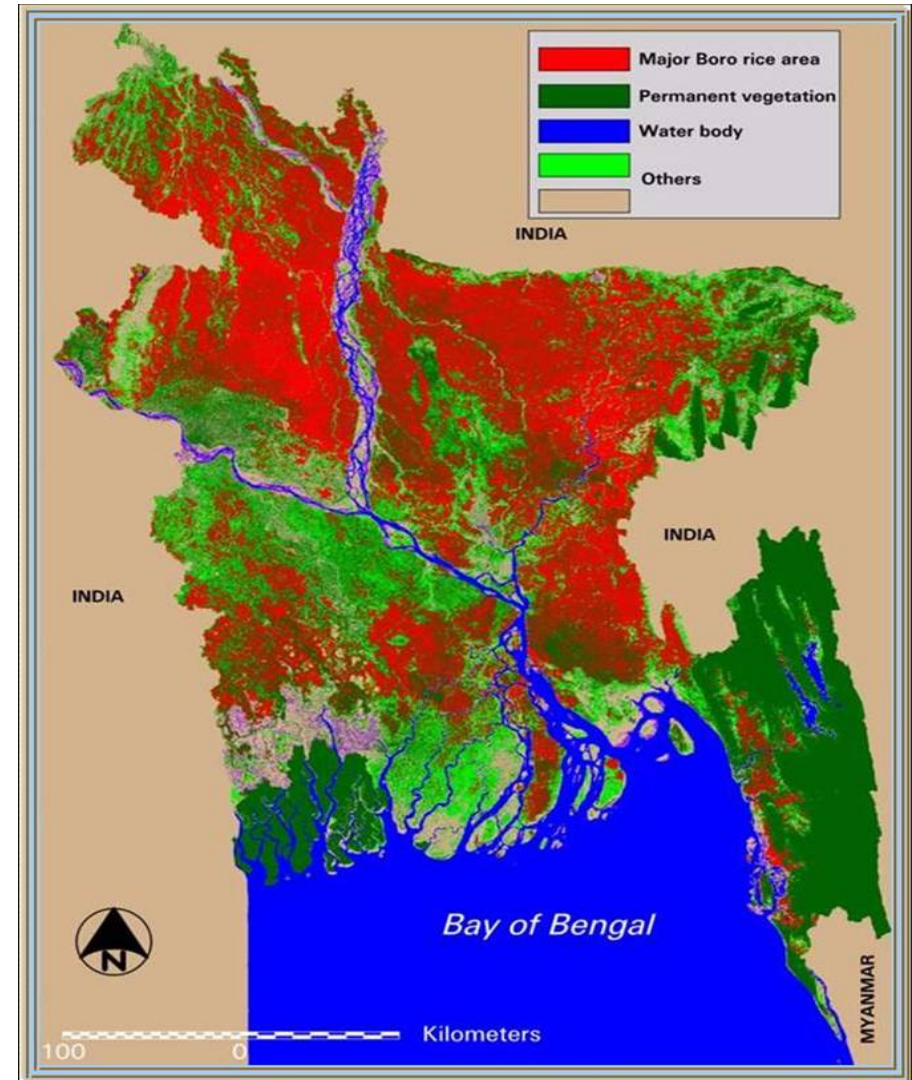
Car Navigation



Aircraft Positioning and Navigation

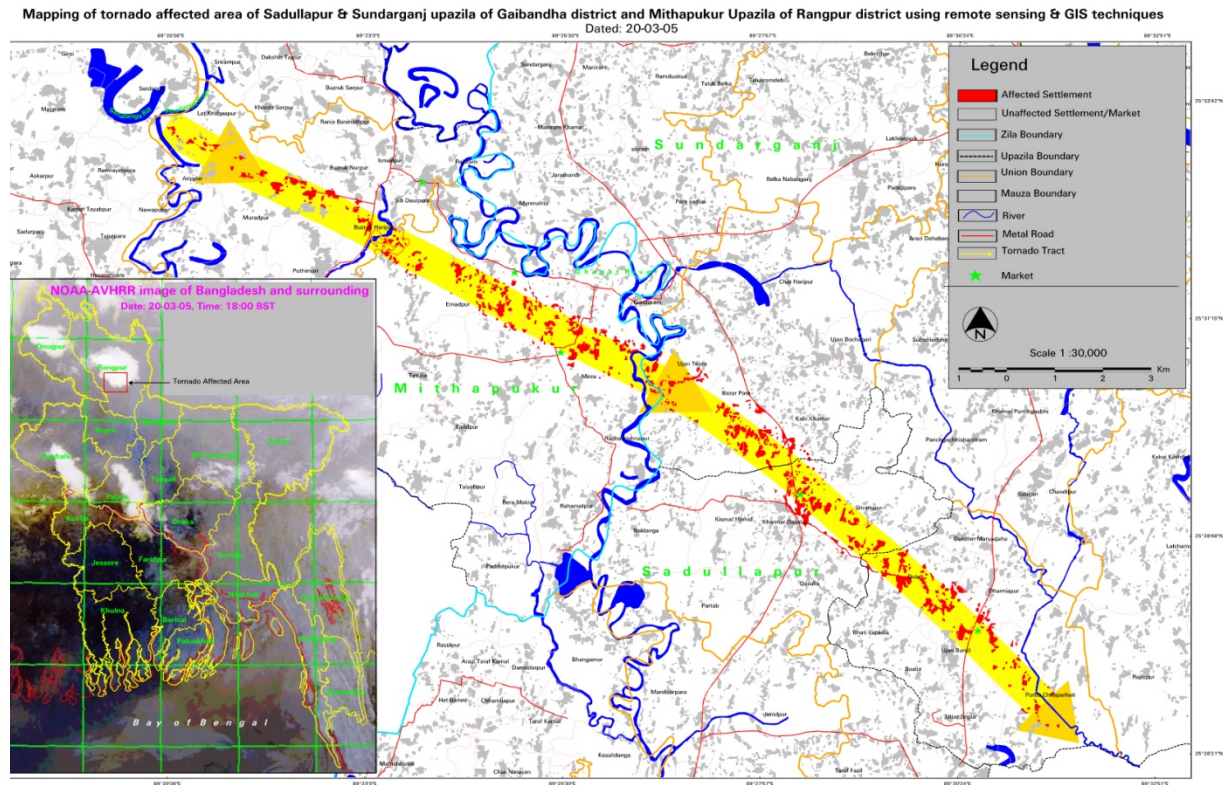
RS and GNSS in Precise Agriculture Monitoring

- Bangladesh economy is mainly based on **agriculture**.
- Almost **80%** of the total population depends on agriculture.
- For monitoring the **crops area estimation** we are using **GNSS** and **RS** technology since last two decades.
- It is helpful for policy making for **food security**.

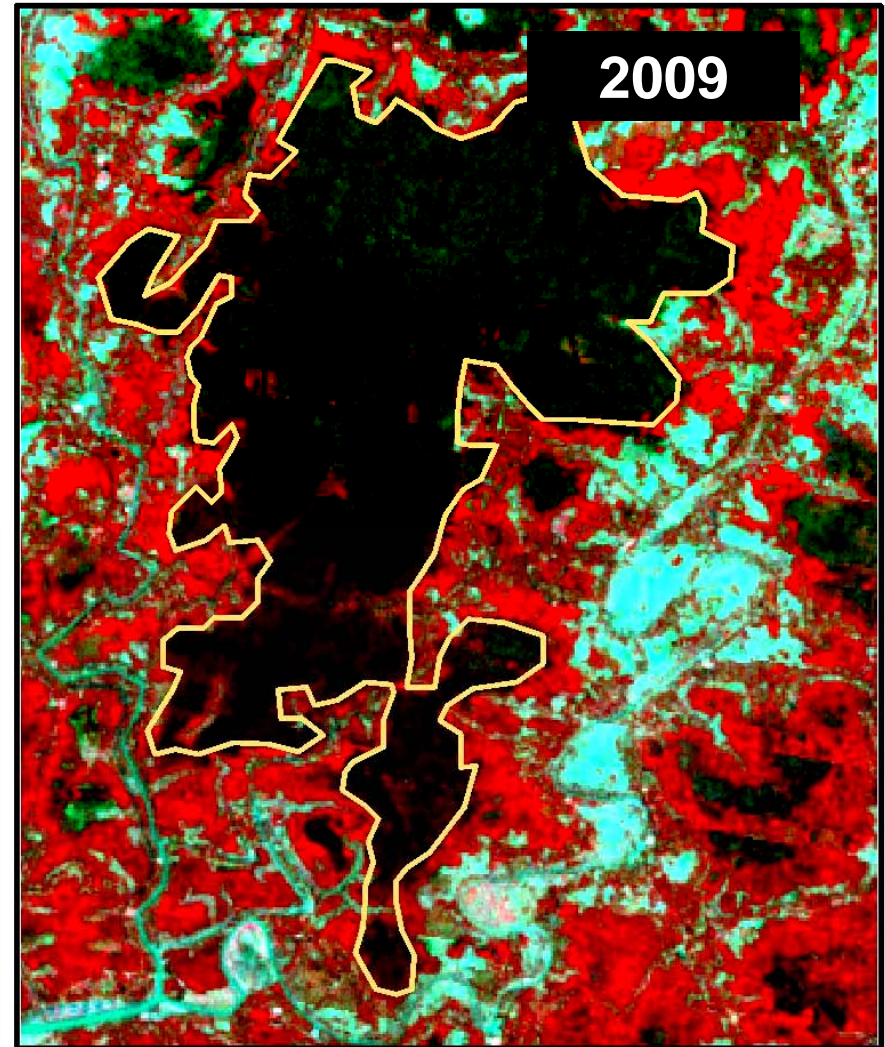
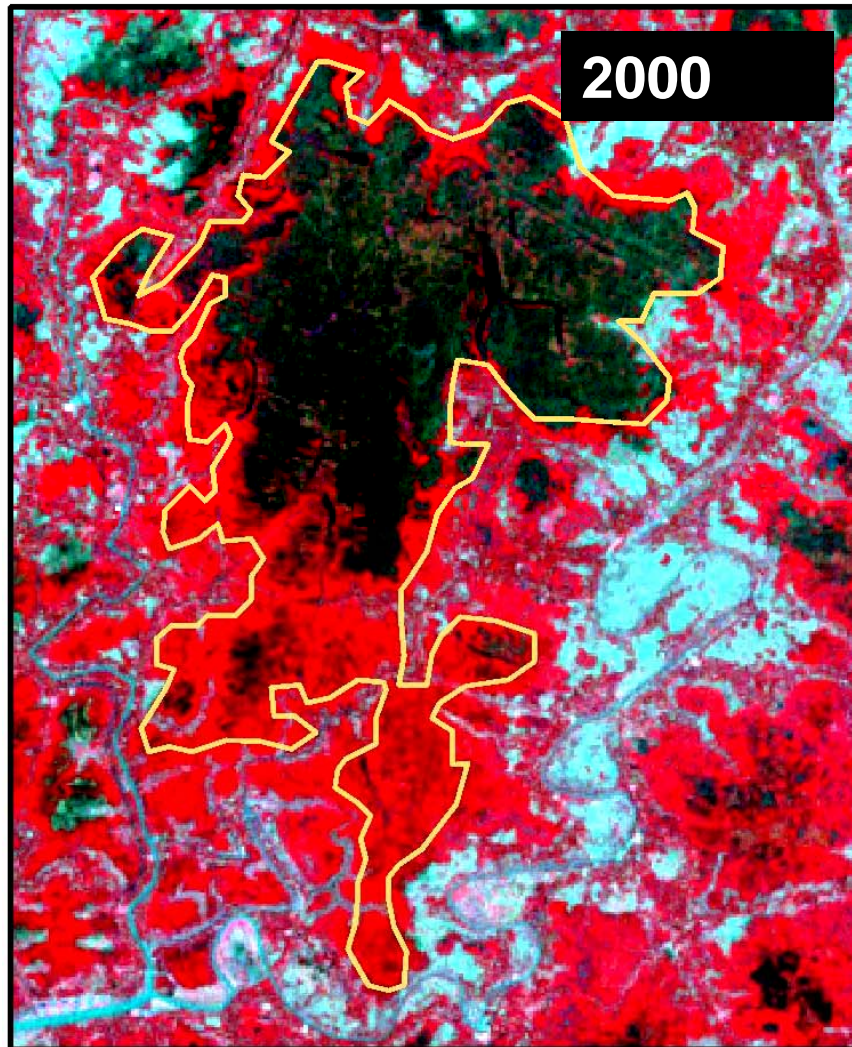


GPS in Tornado affected area Mapping

- Every year country is affected by **tornado** and many **lives and properties** are hampered.
- **GNSS technology** can help to mapping tornado affected areas **timely and accurately**.
- This would be helpful for **decision makers and planners** for **relief and rehabilitation** operations for safe and development of human life



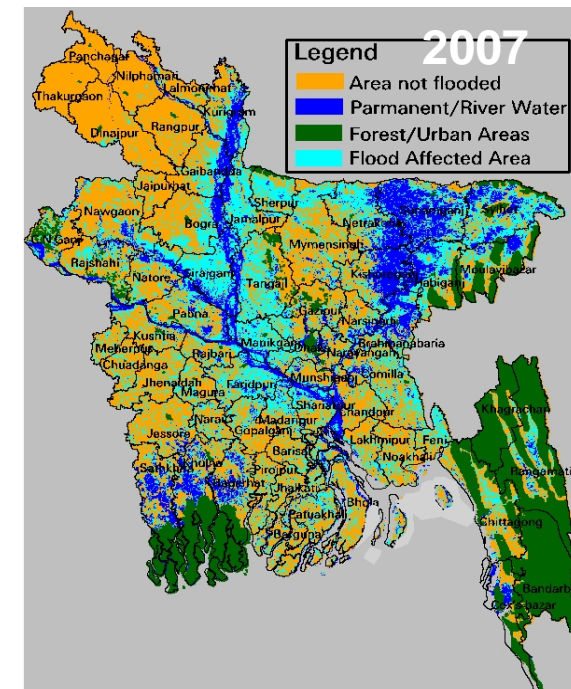
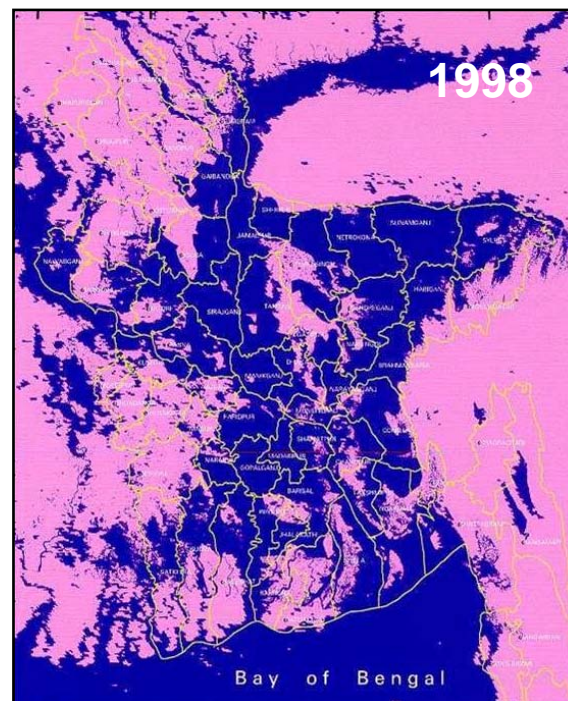
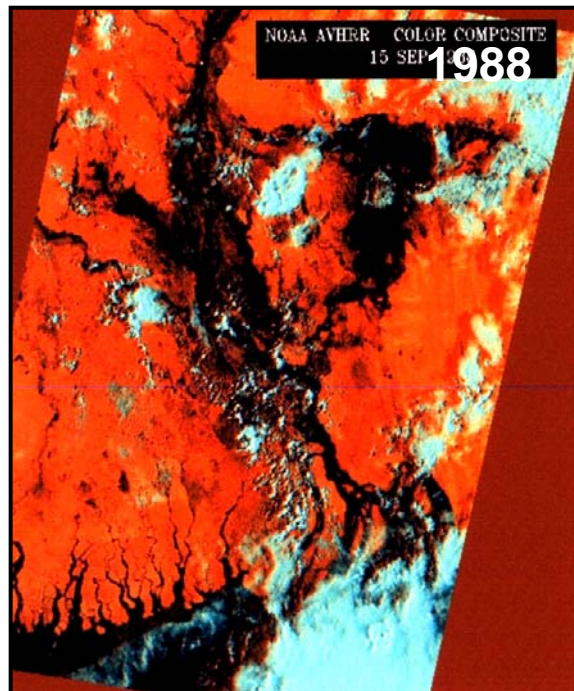
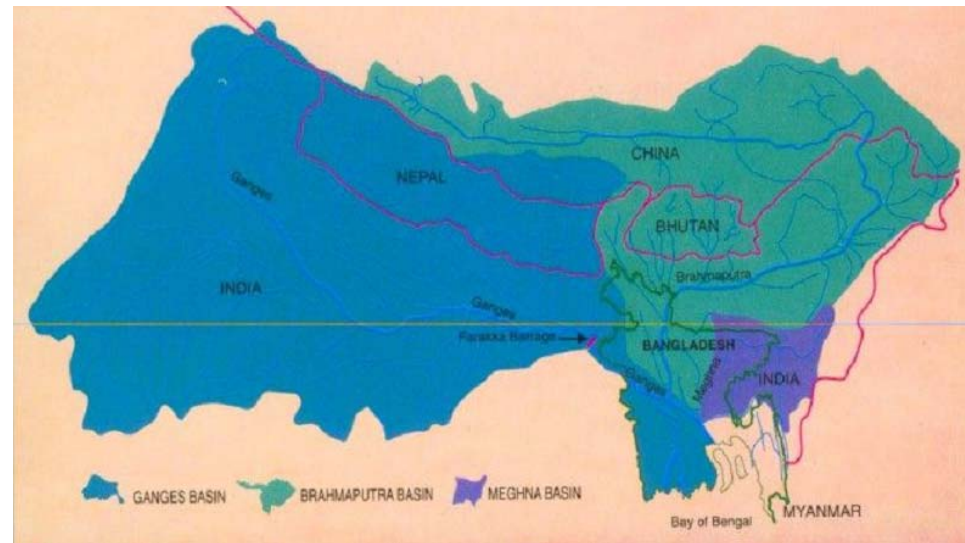
Monitoring of Water-Logging in Bhutiar Beel Region (Khulna) Using RS, GIS and GPS Technique



➤ Geo-referenced of both the data were verified using GPS based field survey

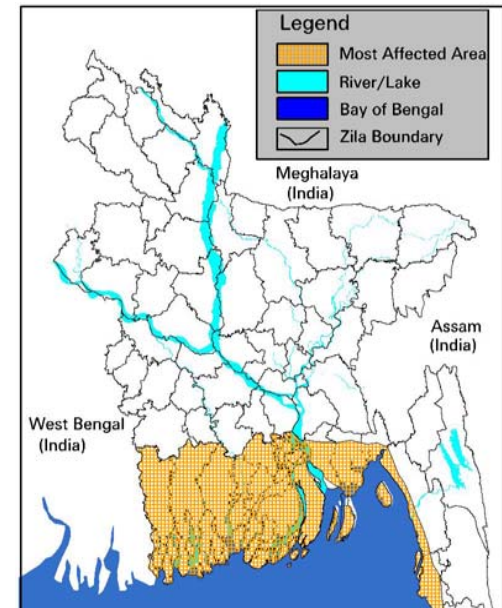
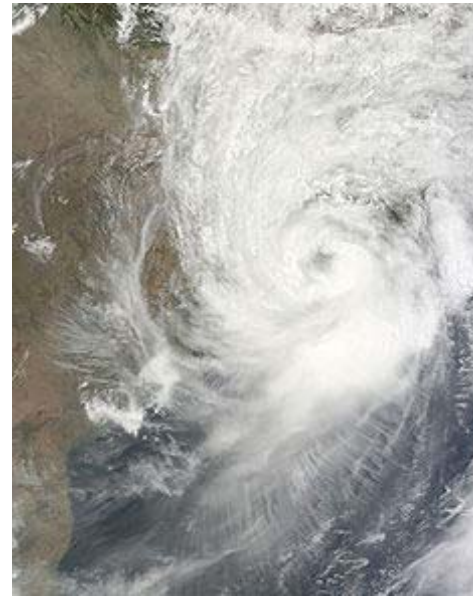
RS and GPS in Flood Affected Areas Mapping

- Almost every year Bangladesh is affected by **flood** and **loses live and properties**.
- Combination of **GNSS** and **RS** technology can help in mapping **flood extend**.
- This would help in **relief and rehabilitation** work precisely.

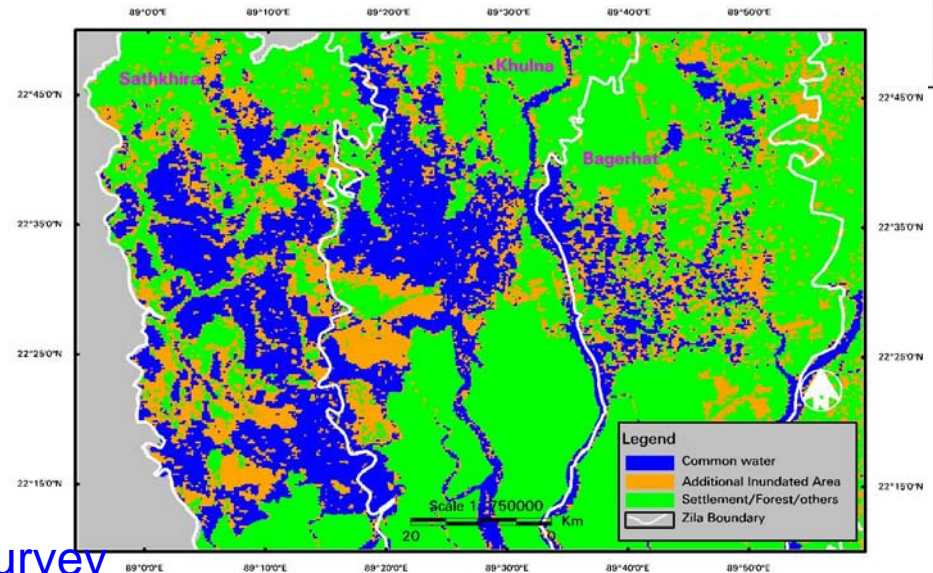


RS and GPS for Storm Surge affected area delineation

- A storm surge occurs when powerful storm winds push water up onto the shoreline.
- This most frequently occurs when a Cyclone makes landfall.
- Cyclones are especially effective at producing a storm surge for these reasons
- Example: Cyclone Aila



- **Formed:** 22 May 2009
- **Dissipated:** 26 May 2009
- **Highest winds:**
 - 110 kmh (3-minute sustained)
 - 120 kmh(1-minute sustained)
- **Storm Surge Height: 8-10 feet**
- **Fatalities:** 172 total,
Damage: \$40.7 million ([USD](#))
- **Most Area affected:** 15 district



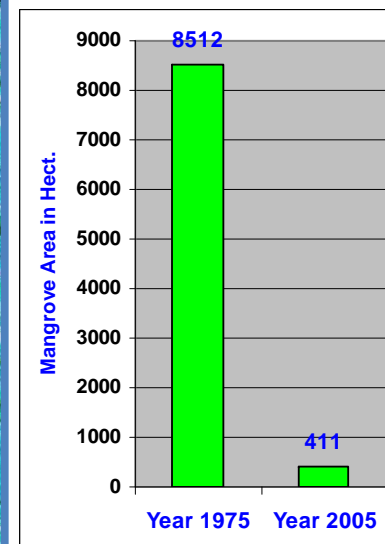
- Field verified using GPS based field survey

RS and GPS in Fishery Resource Monitoring

- Remote sensing and GPS technology are used for surveying, monitoring and analysis of the fisheries resources of the country.
- Huge number of aerial photographs has been geo-referenced using ortho software coupled with ground control point **collected by GPS**



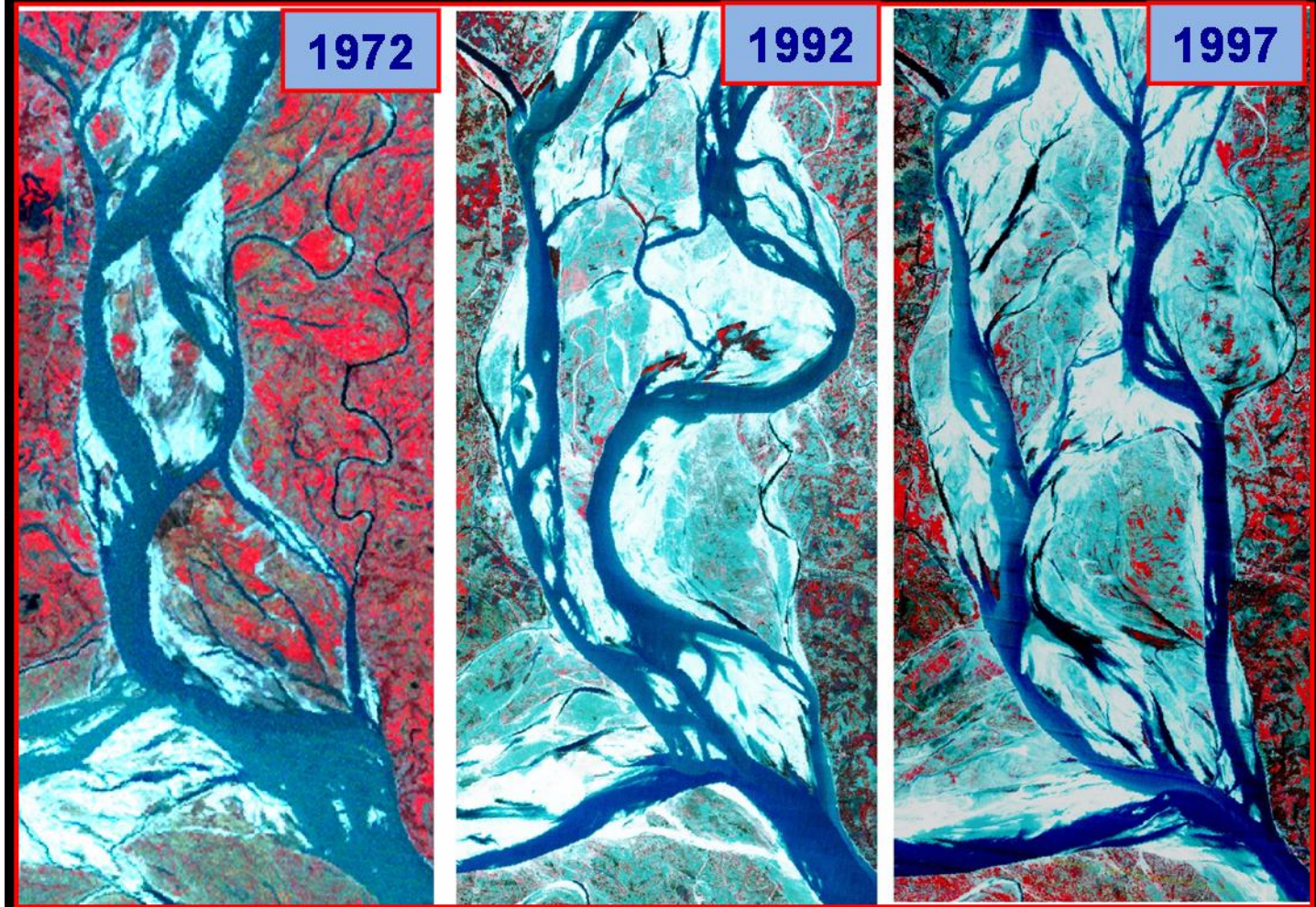
Deforestation and Expansion of Shrimp Farming (Chokoria Sunderbans)



➤ Geo-referenced of both the data were verified using GPS based field survey

River course monitoring of Bangladesh

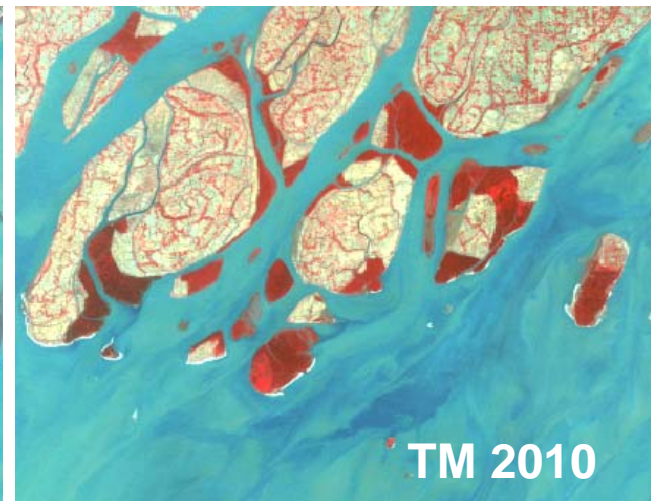
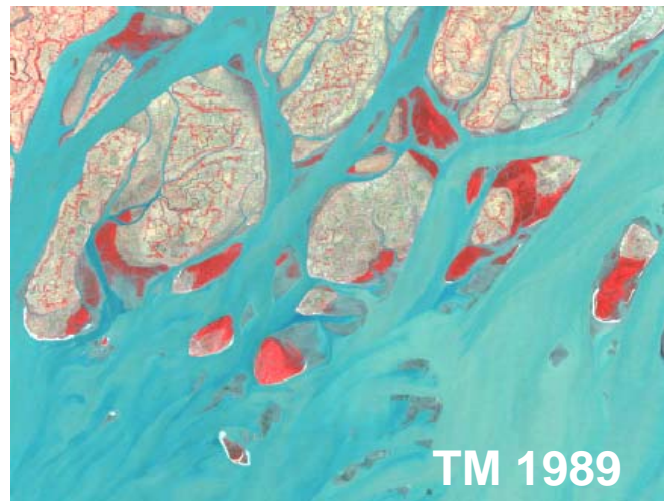
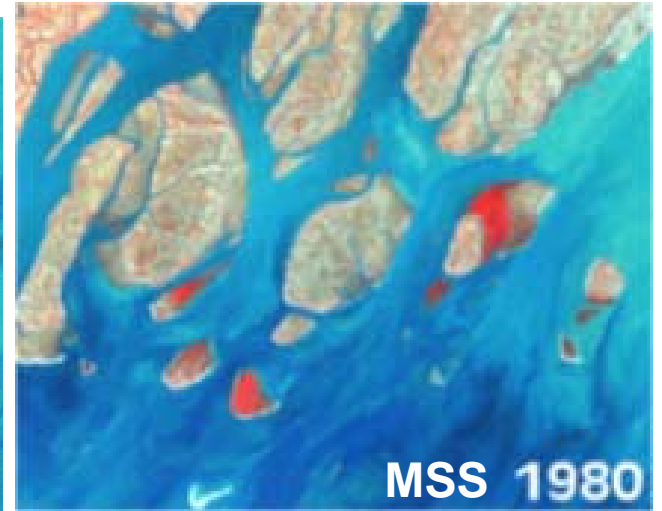
- A number of studies have been carried out to reveal the geomorphological changes occurred in coastal areas based on remote sensing data.
- Maps were prepared showing the erosion and accretion
- Geo-referenced of both the data were verified using GPS based field survey



Use of GPS in coastal zone Management

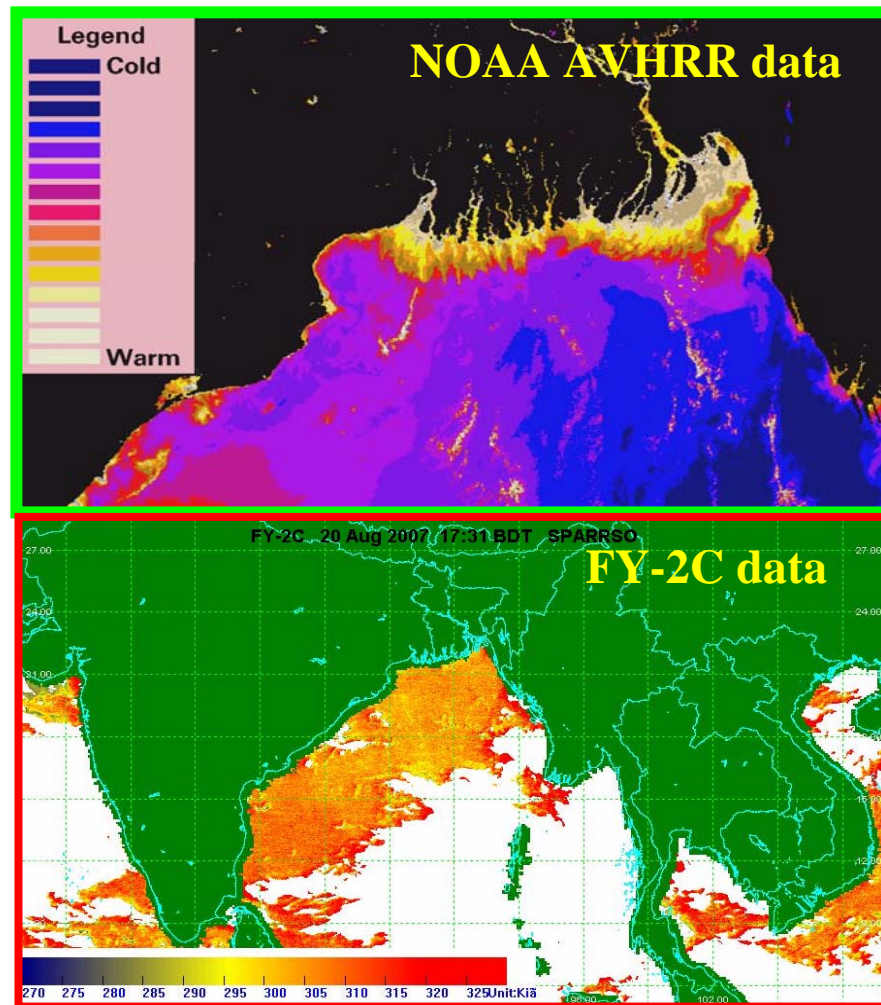
(Expansion of Afforestation Area)

GPS extensively used under **Mangrove afforestation** project (BGD 85-031, 1990) of SPARRSO for reclaim land by sedimentation, creation of a protection base against the **tropical cyclone** and **storm surges**.



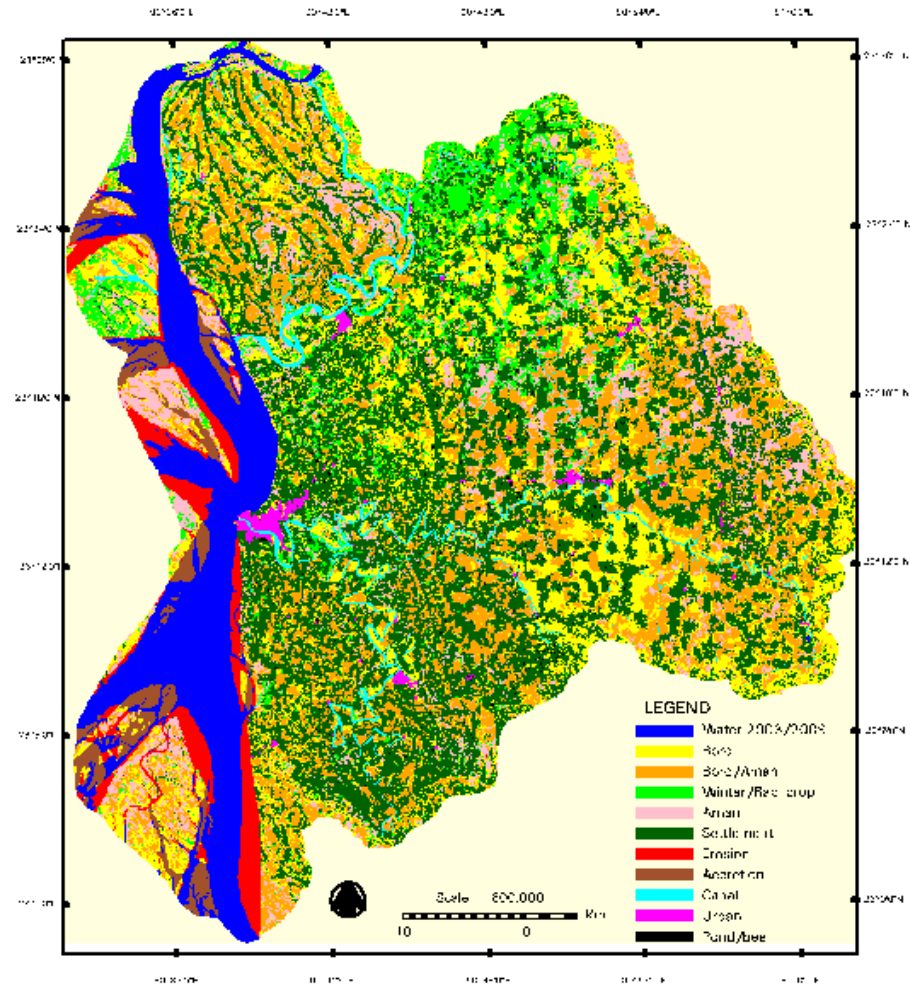
Estimation of sea surface temperature in the Bay

- Analysis the probability of cyclone formation in the ocean
- Estimation of chlorophyll concentration
- Determination of water movement in the sea and coastal zone
- Result verified using GPS based field survey.



RS and GPS used in Landuse Zoning

- SPARRSO carried out a project on Coastal Land Zoning under the Ministry of Land for land use classification for whole coastal area (21 Districts)
- LISS-III 2009 and Landsat TM 2003, 2004 & 2007 data have been used
- **Geo-referenced and classification of thematic layers were verified using GPS based field survey**



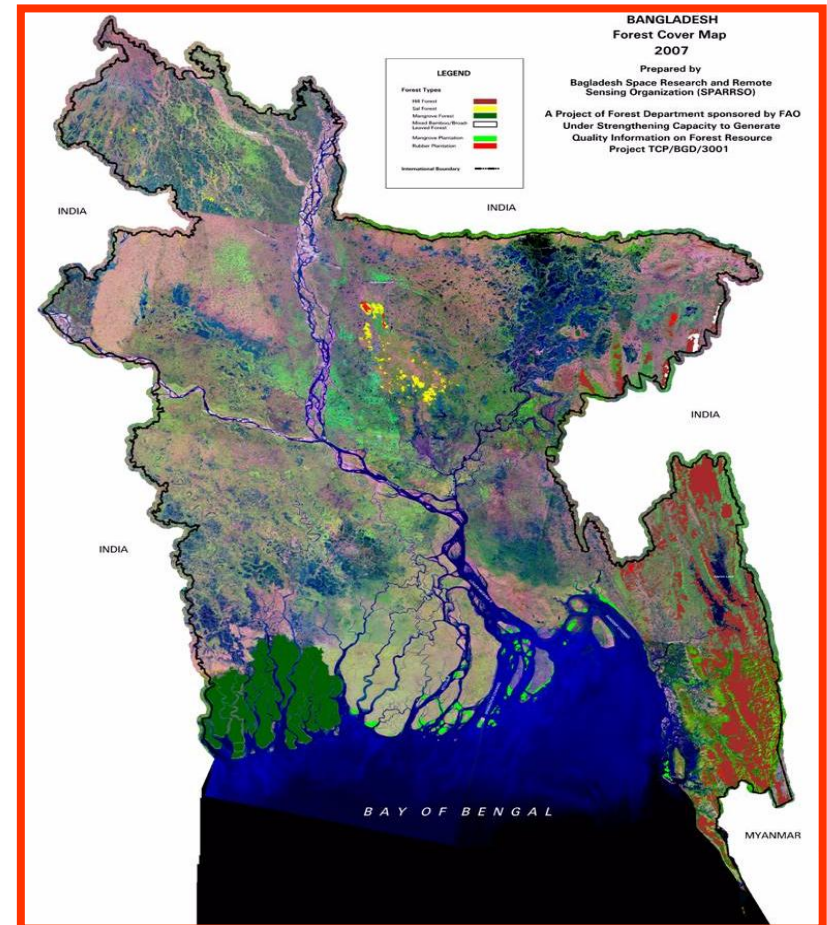
GNSS in Cadastral Mapping

- Preparation of a digital land use (Cadastral) map is one of the agenda of our Government.
- Combination of GNSS and remote sensing (RS) technology, we would be able to make an accurate Cadastral map of Bangladesh



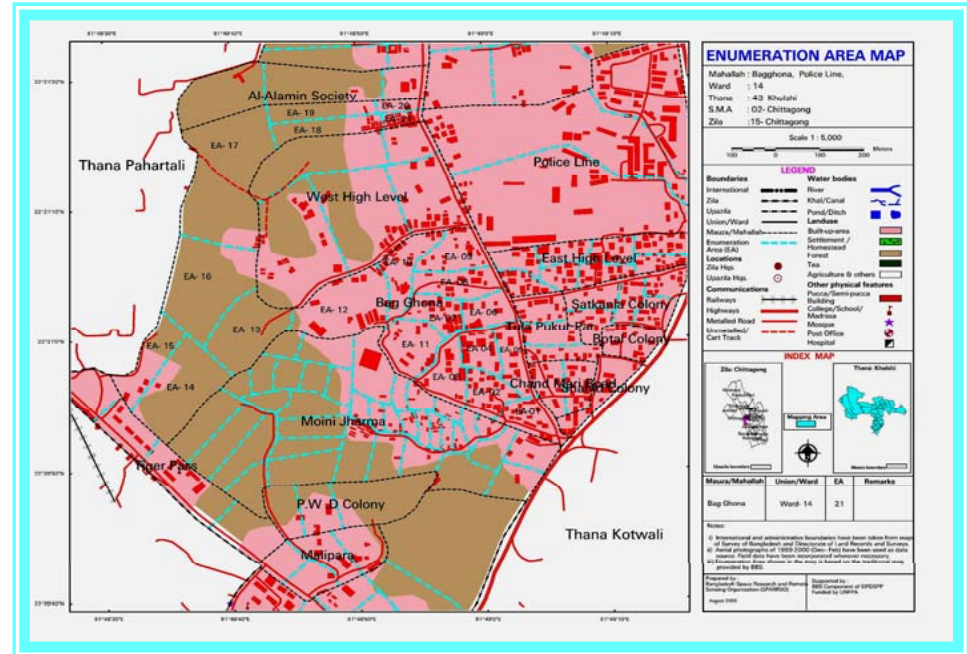
Forest Area Mapping using RS and GPS

- Recently SPARRSO completed Country-level Forest Cover Mapping using Landsat TM Satellite Image of 2005-2006.
- The project was jointly supported by Bangladesh Forest Department (BFD) and FAO
- **Field verification has been done using GPS.**



Enumeration Area (EA) mapping using Air-borne data

- SPARRSO has successfully completed the project “Preparation of Digital Enumeration area maps using aerial photographs”, funded by UNFPA for Bangladesh Bureau of Statistics (BBS).
- Huge number of aerial photographs has been geo-referenced using ortho software coupled with ground control point **collected by GPS**



Methodology for flood affected area delineation using RS and GNSS technology

Remote Sensing Data

GPS based ground Control Point

Pre-Processing of RS data

Land/Water Classification

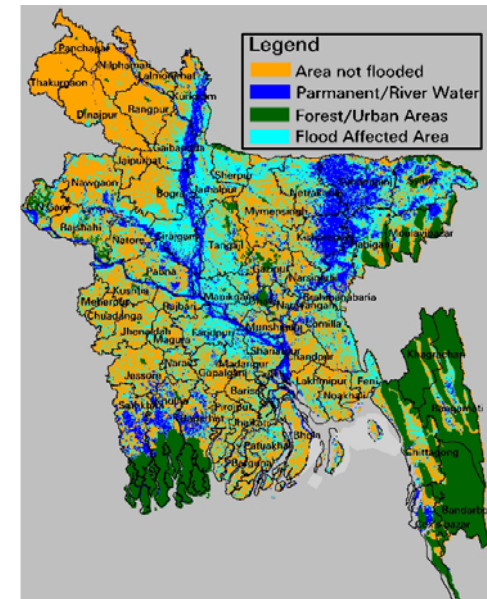
Post-classification

Masking of Permanent Water

GPS based ground Verification /Area Delineation

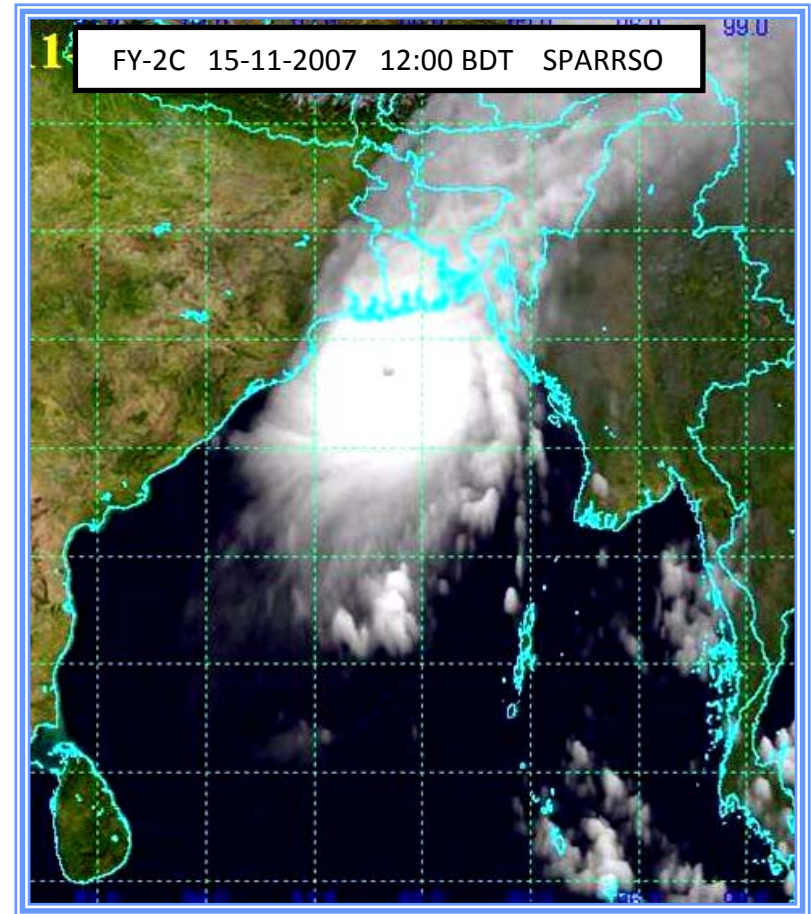
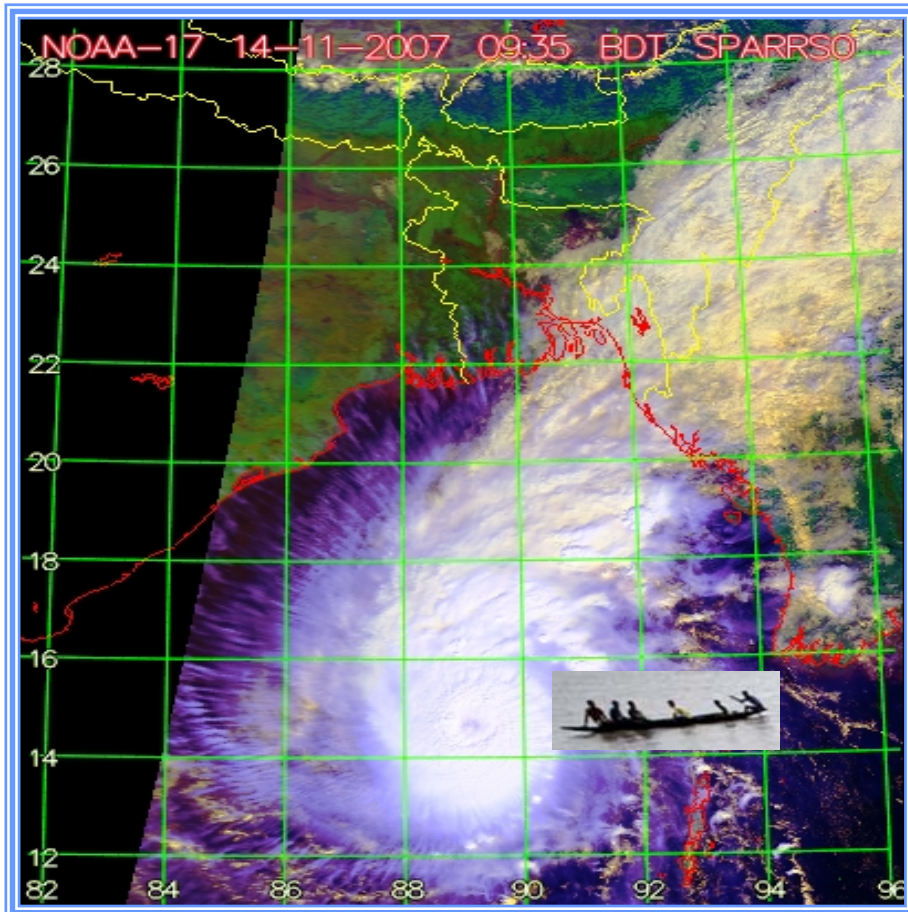
Analysis

Output



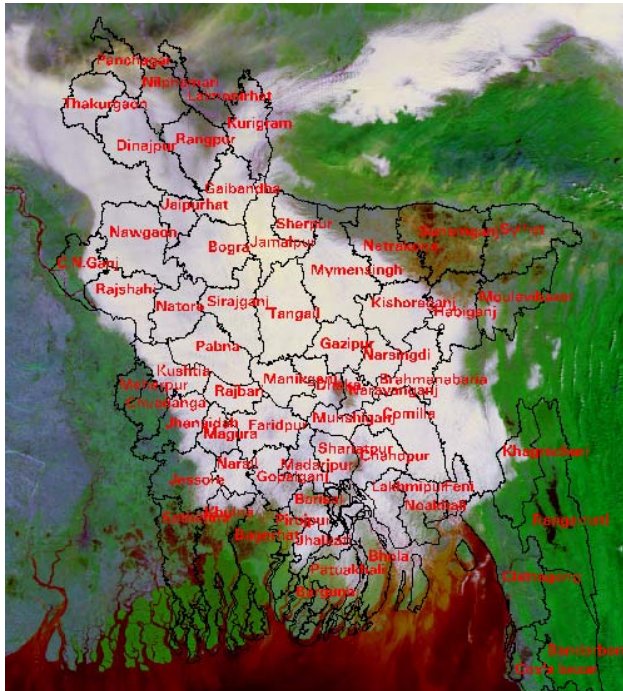
GNSS in Fishing Vessel/Boat Monitoring

- Bangladesh is a **disaster prone** country in the world.
- Almost every year Bangladesh is visited by **cyclone** and many **fishing boats** have been **missing**.
- **GNSS technology** could be used for search and rescue (SAR) operations and thus save life and property.



GPS in Transportation Monitoring

- **Road accidents** are quite a common occurrence in Bangladesh and at least 4,000 deaths per year.
- **Dense fog** in winter season causes noticeable road and river accidents.
- GNSS technology can help to monitor the vehicles and minimize the accidents.



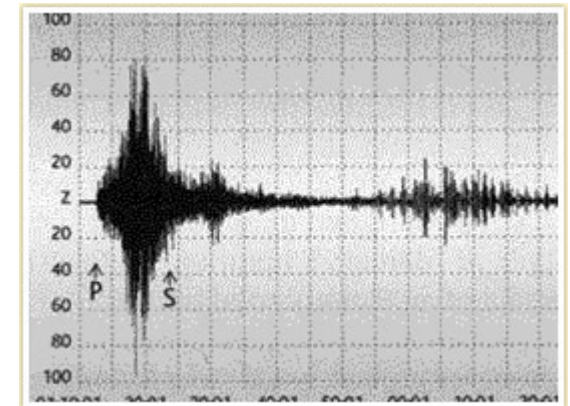
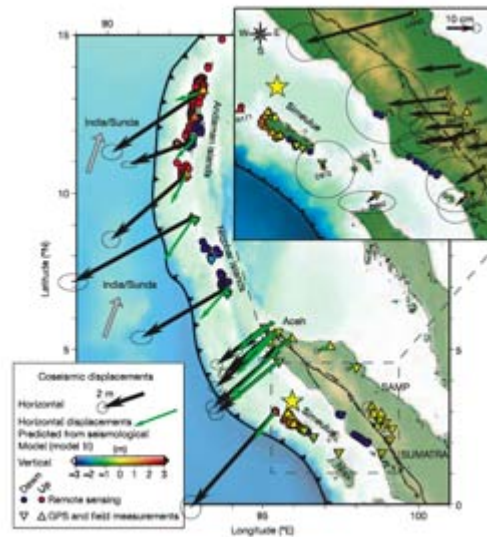
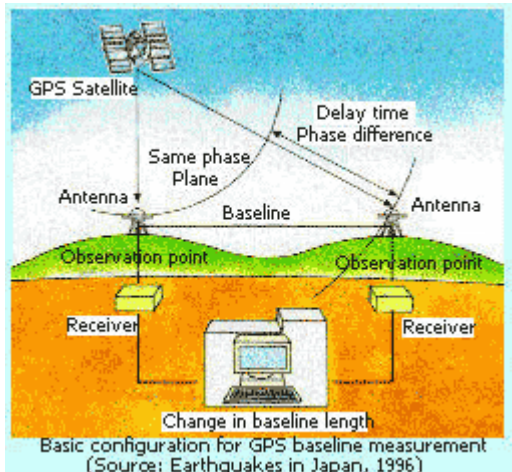
GPS in Meteorology

- Using GPS to sense the Earth's atmosphere and measure the temperature and water vapor content for monitor the climate.



GPS In Earthquake Monitoring

- GPS can be used to monitor the crustal movement. It can also be used for the earthquake prediction.



Organizations using GNSS Technology

- **The Survey of Bangladesh (SOB)** deals with survey and mapping under the Ministry of Defense. It is the leading organization of aerial photographs.
- **Local Government Engineering Department (LGED)** deals with technical support to local government bodies for planning and implementation of development program of Rural area using RS and GPS
- **Directorate of Land Records and Surveys (DLRS)** is entrusted with the mandate to carryout periodical cadastral survey and settlement operations for preparing, updating and publishing land records of the country.
- **Bangladesh Water Development Board (BWDB)** uses GPS in flood monitoring, especially in determining location of flood and its extension.
- **Civil Aviation Authority, Bangladesh** extensively used GNSS for flight navigation
- **Mobile Companies**
- **Some NGO's**
- **Academic Institutions**



Conclusions and Recommendations

- GNSS is not **so well-known** technology in Bangladesh. Normally we have been using for (i) geo-referencing RS data for collecting ground control point from field and (ii) results verification.
- It is therefore essential to create **awareness** of the usefulness of the technology among **potential users**.
- Such awareness can be created through the arrangement of **workshops/seminars** on the applications of GNSS as well as conduct collaboration **projects/data shearing in various fields**.
- In Bangladesh, as an economically developing country, users should be given an opportunity to access the GNSS technology at an **affordable price**. Therefore, the **cost of the GNSS receiving** systems should be **reduced**.
- Almost every year Bangladesh is visited by cyclone and many **fishing boat** have been missing.
- In this context we are seeking GNSS technology/project for navigating the **missing fishing boat** and **rescue operation** during cyclone as well as for management of seaport.
- **Road accidents** are quite a common occurrence in Bangladesh. **GNSS technology** can be used to monitor and **reduce such incidents**. We also seeking such type of GNSS technology.



Thanks for your Patience