SAR for Sustainable Development

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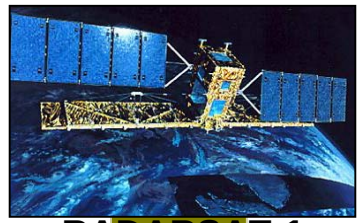
Outline

- RADARSAT-2 SAR sensor
- Applications of SAR data for sustainable development

SAR Continuity in Canada

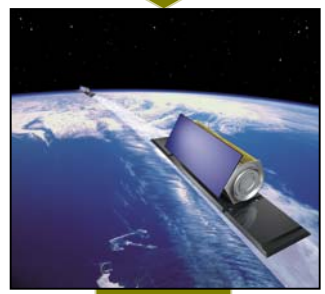
- Spaceborne SAR is Canada's long-term solution to environmental monitoring, resource management, and security
- $200M is committed for the first phase of a RADARSAT-2 follow-on SAR Constellation planned to commence operations in the 2010 time frame
- Canadian Govt has pledged $100M of funding for the Tandem Mission



RADARSAT-1

RADARSAT-2

Tandem Mission



SAR Constellation

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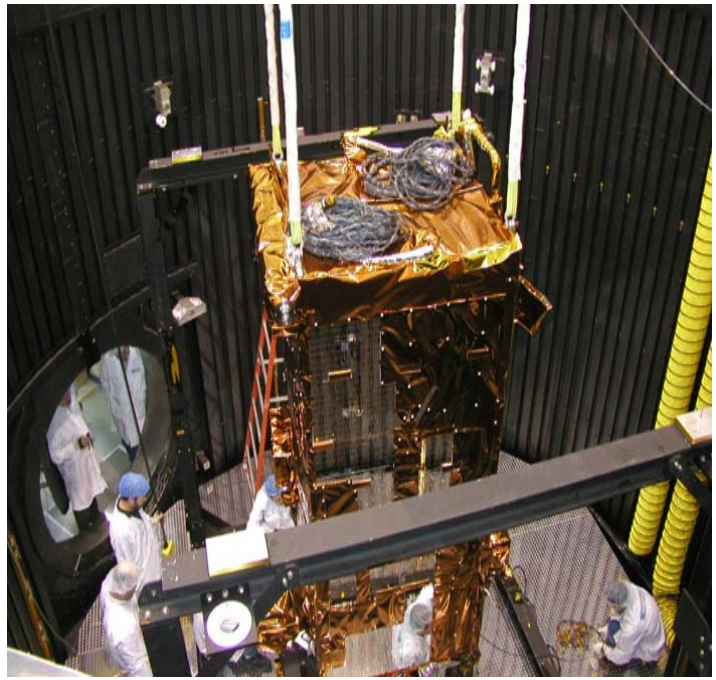
RADARSAT-2 Program

- Co-funded by Canadian Space Agency (CSA) and MacDonald Dettwiler (MDA)
  - public-private partnership
- RADARSAT-1 continuity
  - C-band SAR (5.6 cm wavelength)
  - imaging modes
- 7-year design life
  - RADARSAT-1 in 10th year of 5.25-year design life
- Planned launch in December 2006



RADARSAT-2 is currently undergoing pre-launch testing at the David Florida labs in Ottawa, Canada

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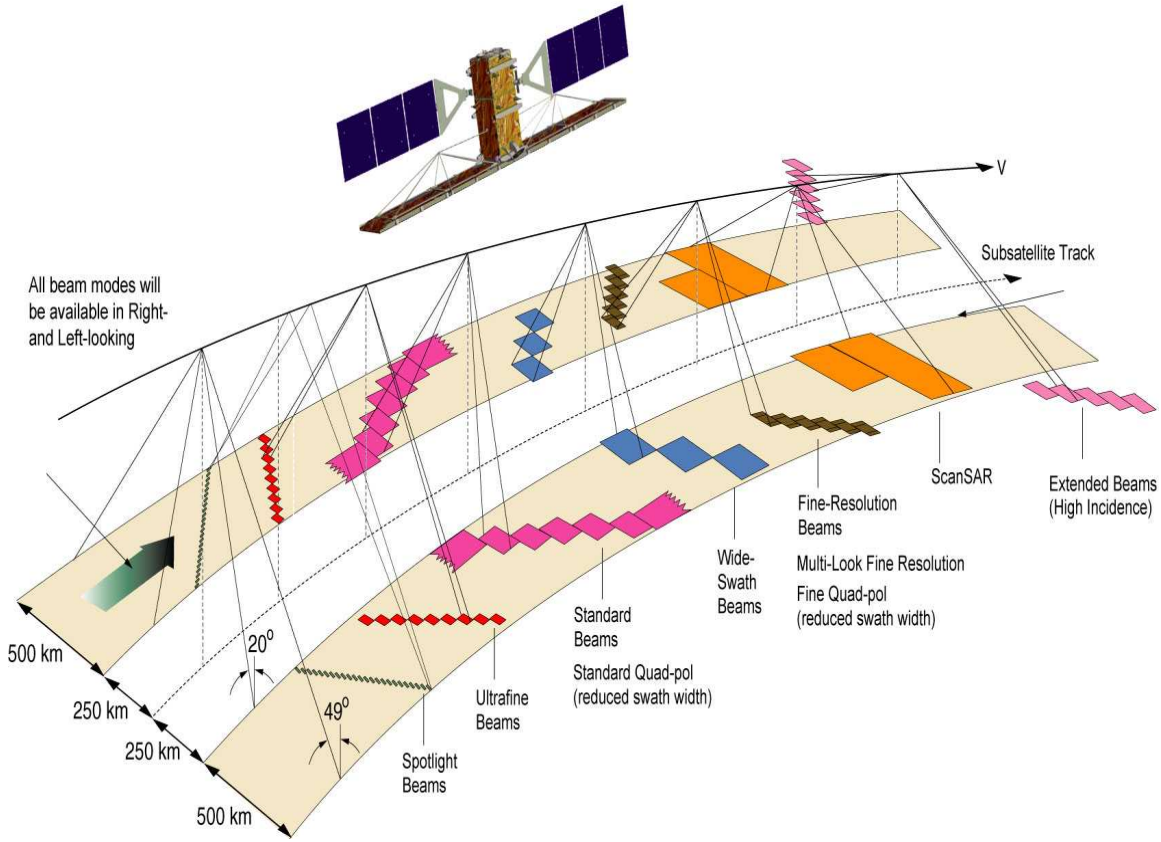
RADARSAT-2 Features

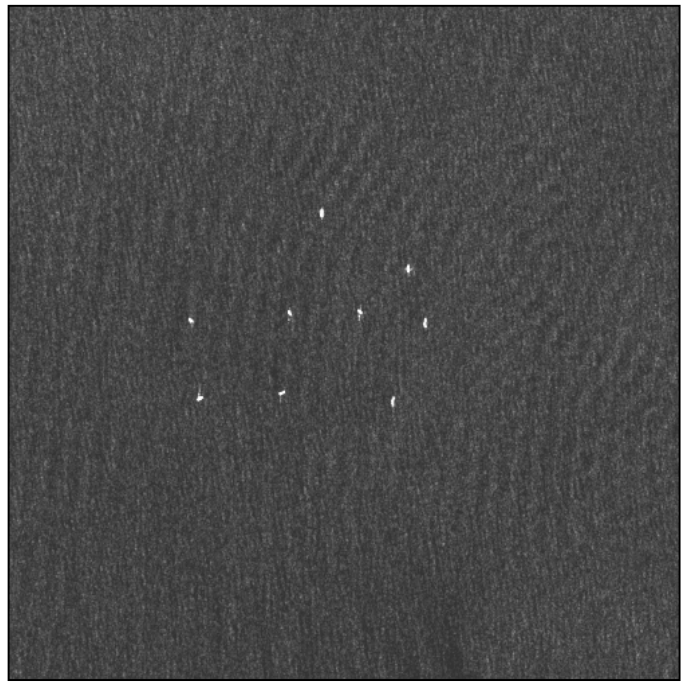
- High resolution
  - 3 m
  - 1m x 2.5m SpotLight
- Polarimetry
  - single/dual polarization
  - quad-pol
- Along-track inteferomety
- Right and left-looking capability
- Enhanced ground system providing:
  - efficient satellite tasking (12 - 24 hours routine)
  - faster data processing
  - data encryption for security



RADARSAT-2 imaging modes provide variable resolution and swath width

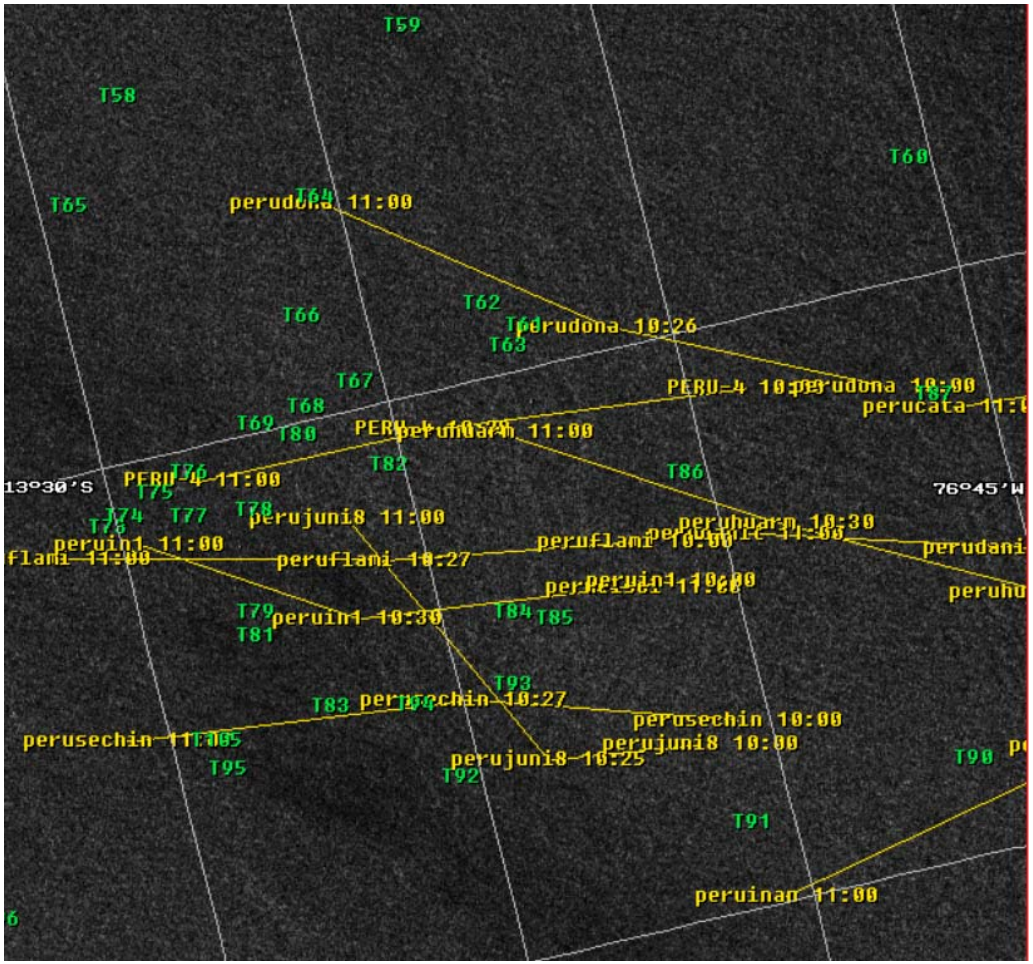
Fisheries Monitoring

- National & state fisheries agencies are responsible for the management of fisheries located within their Exclusive Economic Zone
- Vessel Management Systems (VMS) have been implemented to track fishing activities
- However, once VMS is implemented, one of the major concerns is detection of illegal fishing vessels, which is viable with radar satellites



Ship appear as bright targets against a dark (ocean) background

Peruvian Fisheries Monitoring Pilot Study



- Example of VMS tracked vessels (yellow) and radar detected (green)
- Correlation between radar detected and VMS tracked, but other targets that were detected suggest illegal fishing activity

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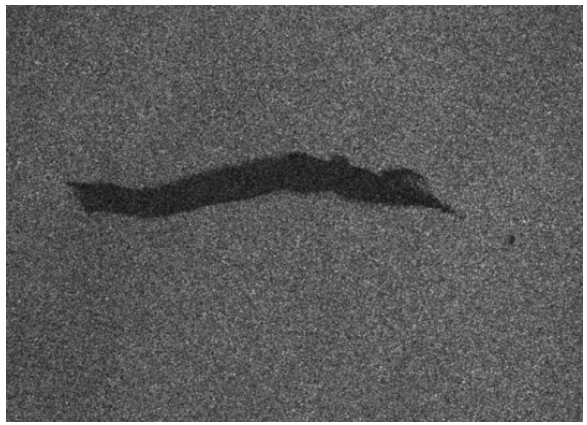
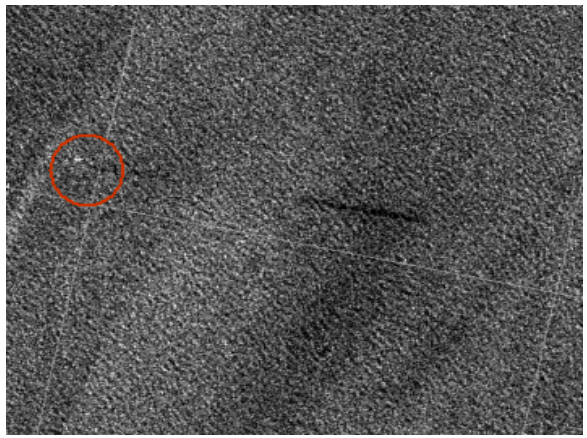
Integrated Satellite Tracking of Polluters (I-STOP)

- Environment Canada - Canadian Wildlife Service involved in two initiatives:
  - Birds Oiled At Sea
  - Prevention of Oiled Wildlife
- These initiatives are based on studies suggesting that 300,000 birds off the east of Canada are killed yearly due to oil dumping
- I-STOP instituted in an effort to help prevent ship-source and chronic oil pollution

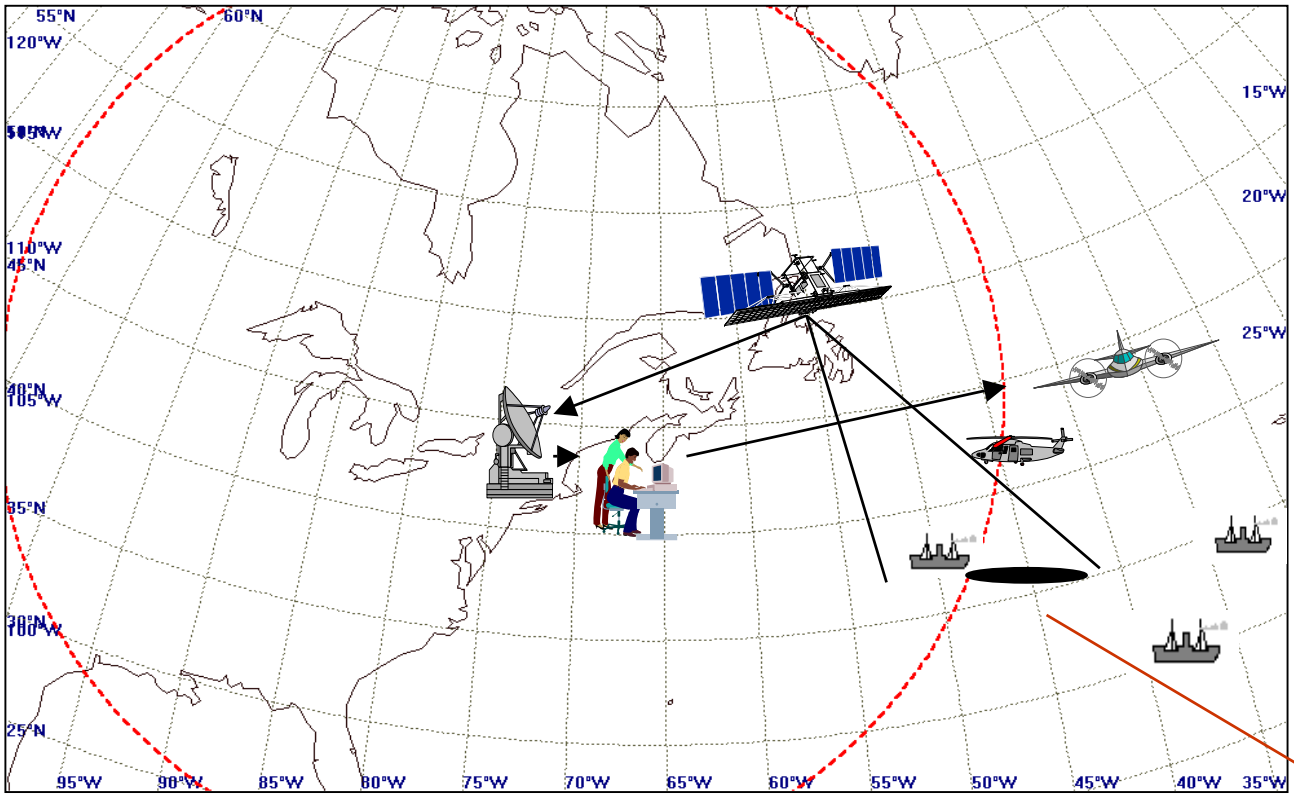


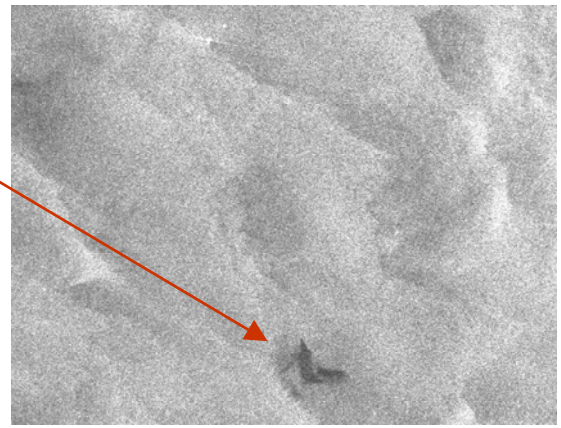
Oil slick



Oil slick and source vessel

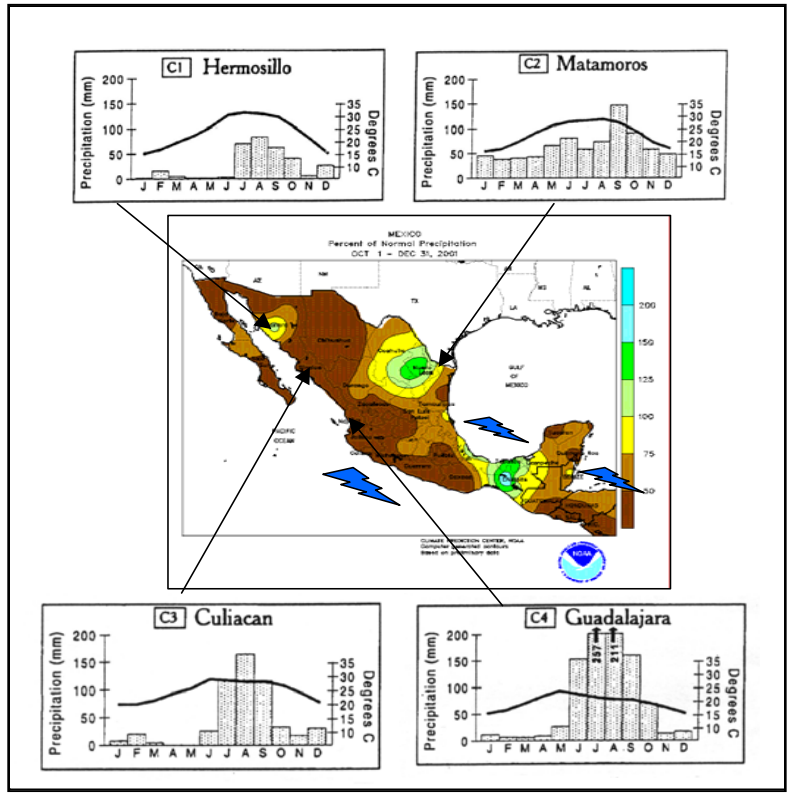
I-STOP Concept of Operations





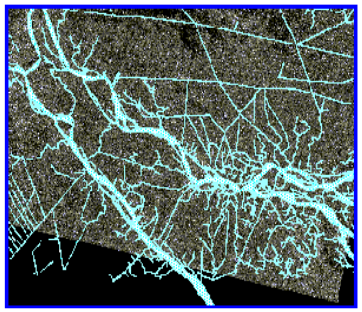
Satellite-Based Weather-Event Validation

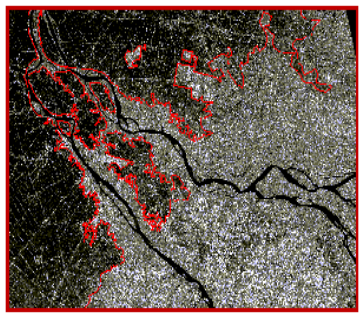
- World Bank project to evaluate implementation of crop insurance based on weather-events.
- Verification methods typically based on *biased* field measurements. Satellite-based verification system allow the insurance companies to validate the claims, thus reducing risk and keeping insurance costs compatible with local economies.
- SAR and VIR data were used to validate:
  - cumulative rainfall (for inferring drought);
  - flooding;
  - vegetation density

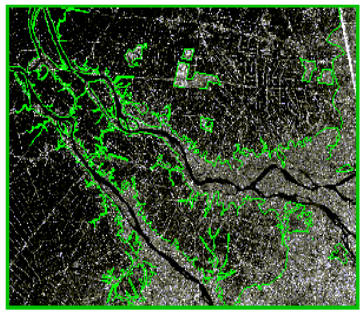


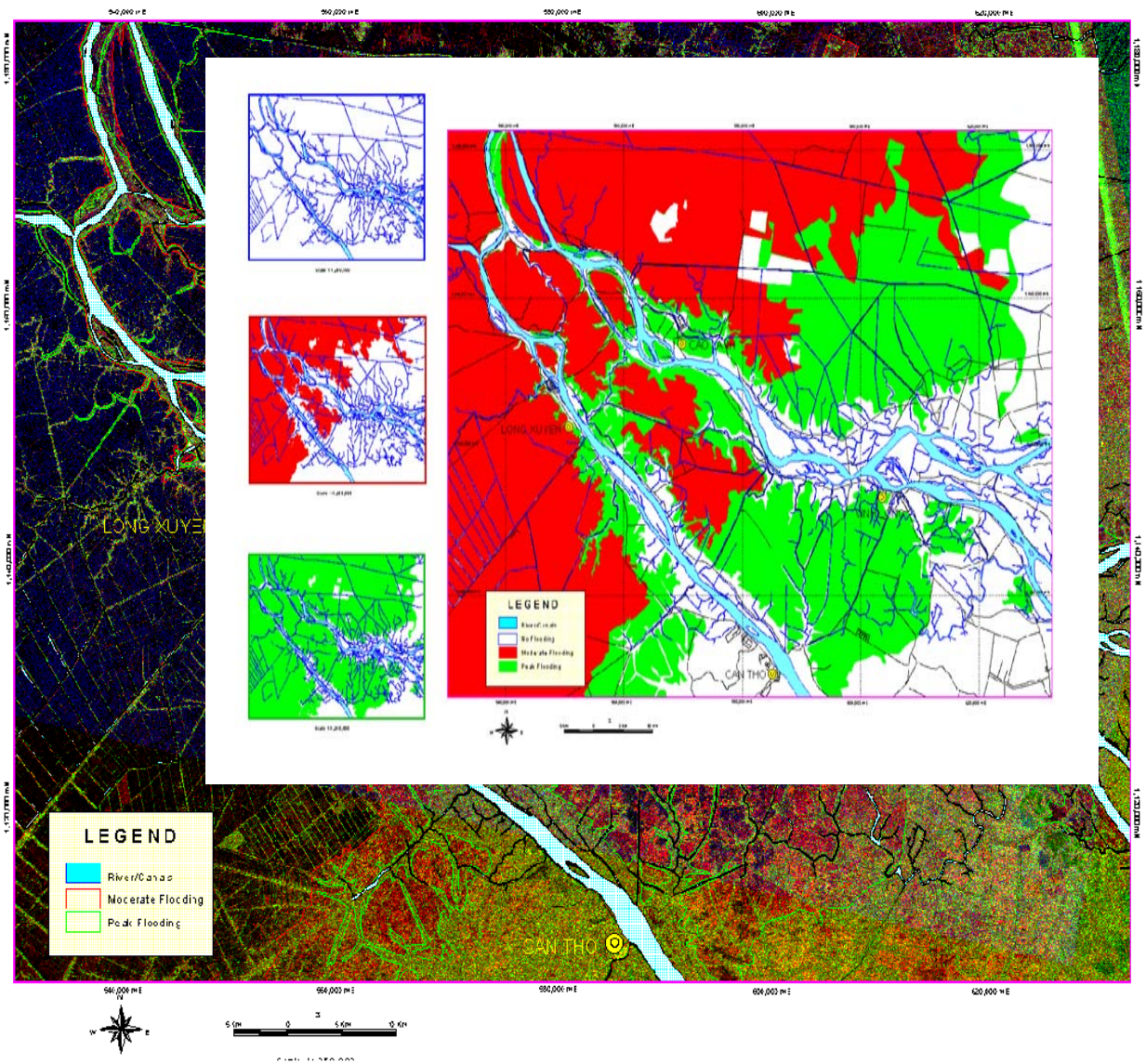
Study sites in Mexico. Morocco, Tunisia, Ethiopia, and Nicaragua were also partners in the project.

Flood Mapping for Rice Crop Sustainability

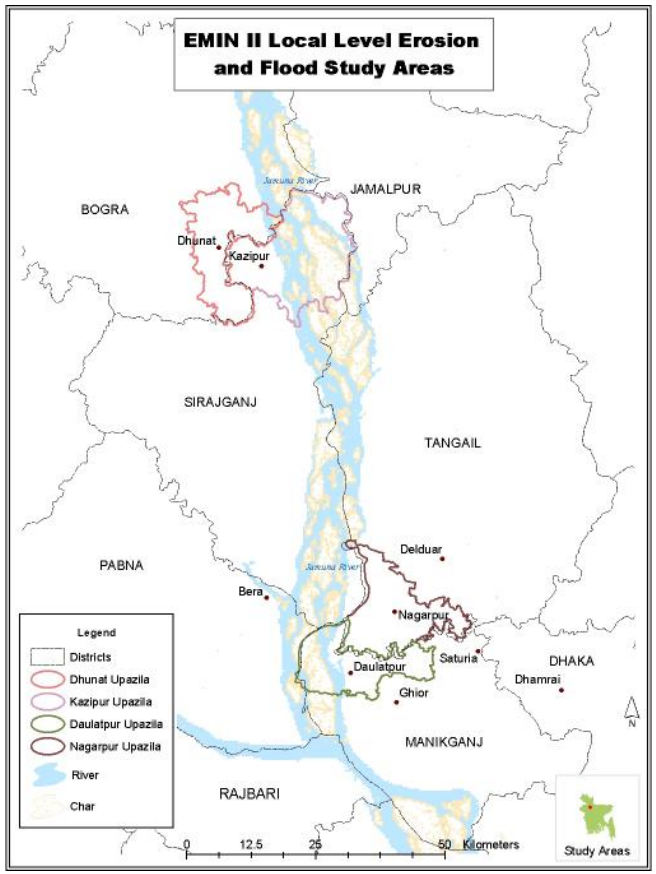








EMIN
ENVIRONMENTAL MONITORING INFORMATION NETWORK



Goal:
Strengthen the capacity of Bangladesh to manage its own development process by improving water resource management

Purpose:
Implement an information network to deliver information products to facilitate planning and management of water and land resources as it relates to flood and erosion monitoring

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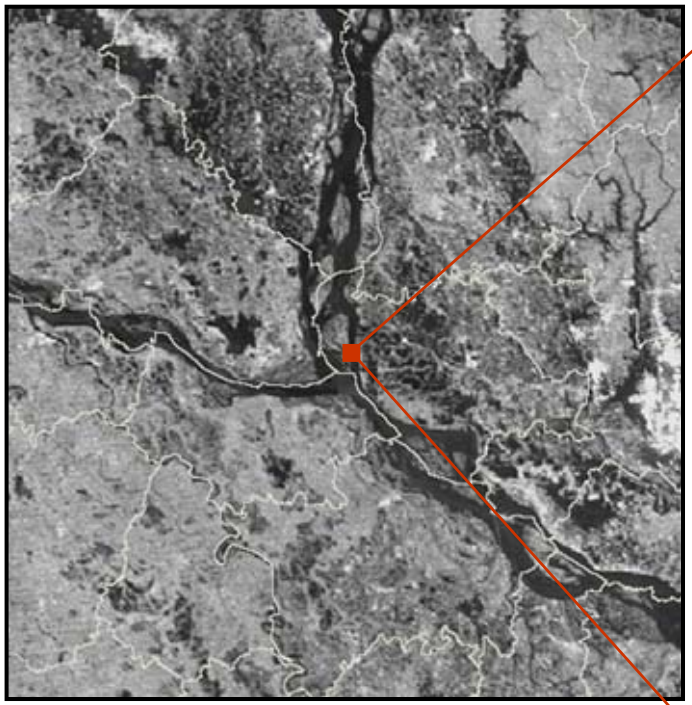
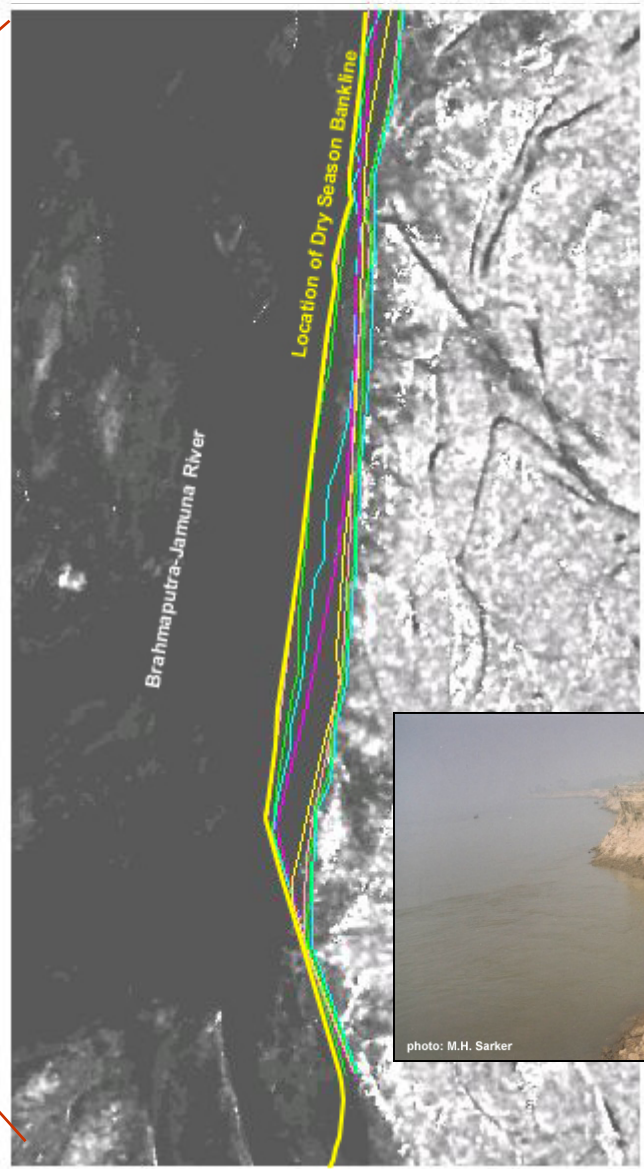
EMIN Erosion Information Product



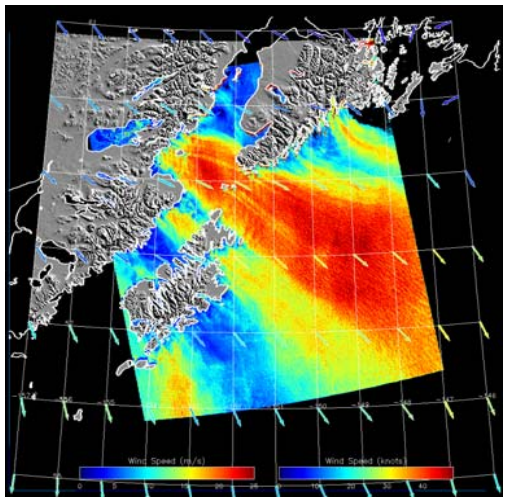


Sustainable Energy Sources

- Offshore wind turbines can provide energy from renewable sources

- Optimal site location is required, and SAR data can provide relevant information in the form of:
  - wind
  - waves
  - bathymetry

Offshore wind turbines



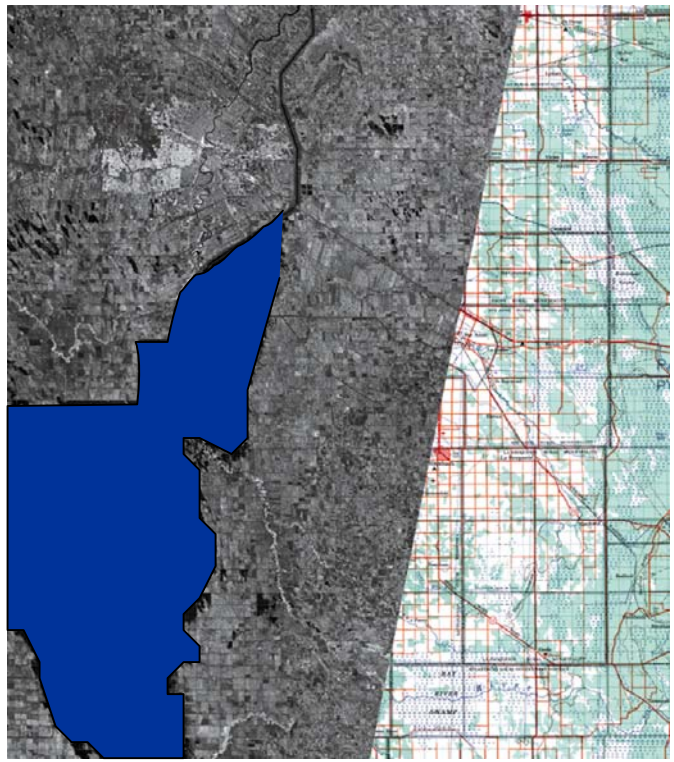
Winds derived from SAR data

Towards Sustainable Use of SAR

- Costs can be reduced by sharing data under the assumption that multiple users can use one image.

- Developing countries (and SAR users in general) require information products versus data. These products should be:
  - interpretable
  - interoperable
  - timely

- Future SAR satellites:
  - maturing in design, thus reducing development costs
  - smaller, thus reducing launch costs
  - increased automation of ground systems to reduce operating costs



Flood extent (blue) derived from SAR data and merged with topographic map

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