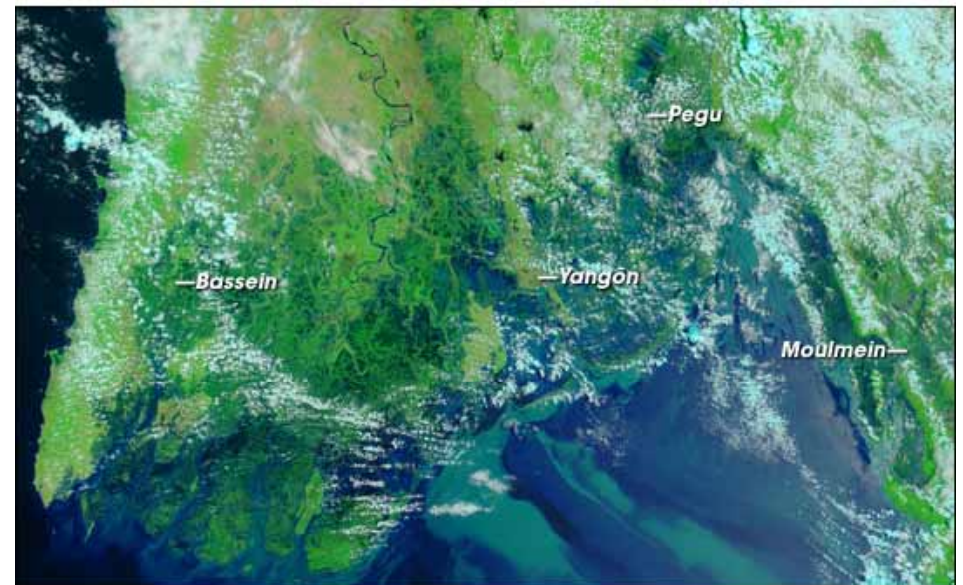


First Caribbean Waves, Pointe-a-Pitre, Guadeloupe, 10. Dec. 2008

Cyclone Nargis storm surge in Myanmar compared with Hurricane Katrina



April 15, 2008



May 5, 2008

Hermann Fritz¹, C. Blount¹, S. Thwin², M. Thu² and N. Chan²

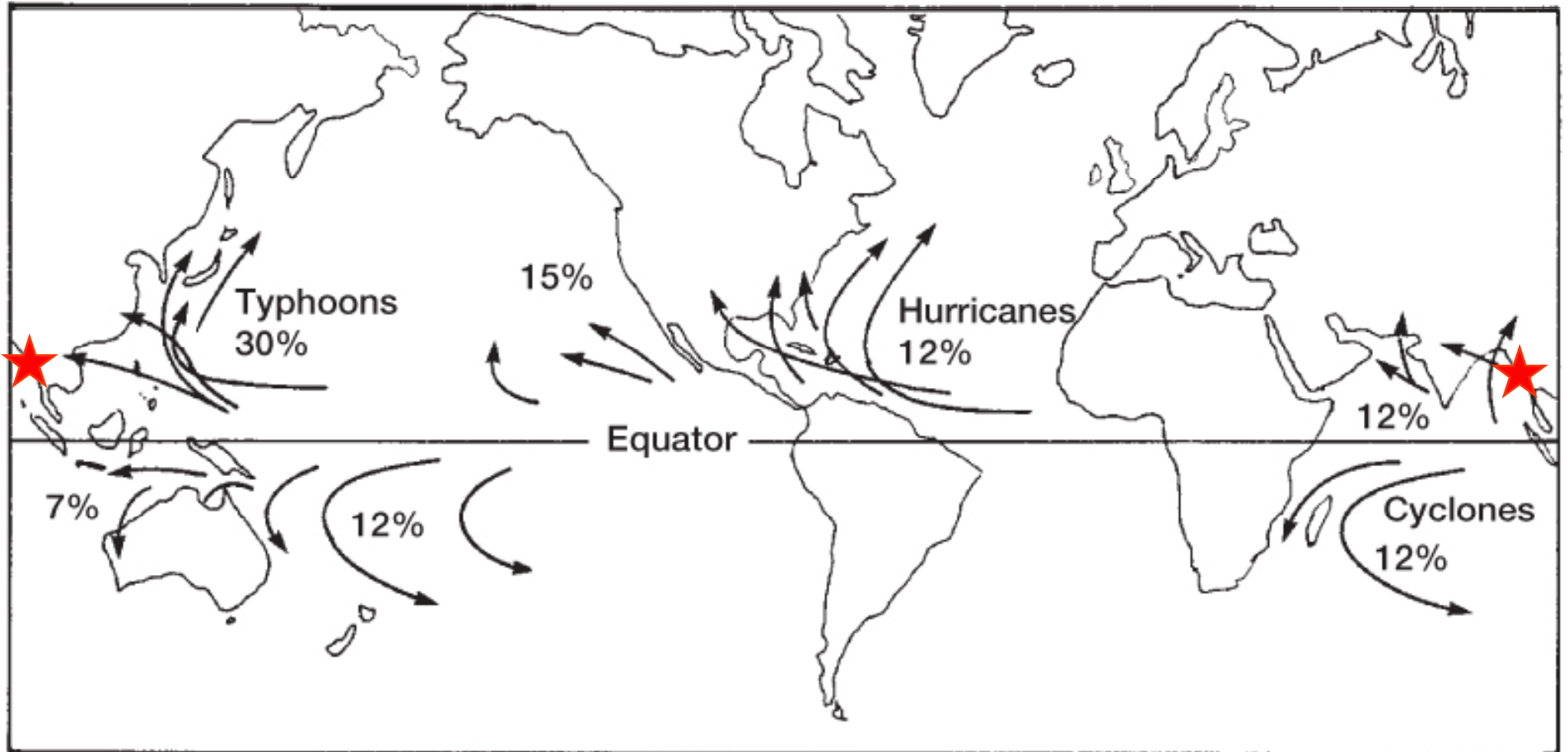
¹Georgia Institute of Technology, Savannah, GA, USA, fritz@gatech.edu

²Mingalar Myanmar, Yangon, Union of Myanmar

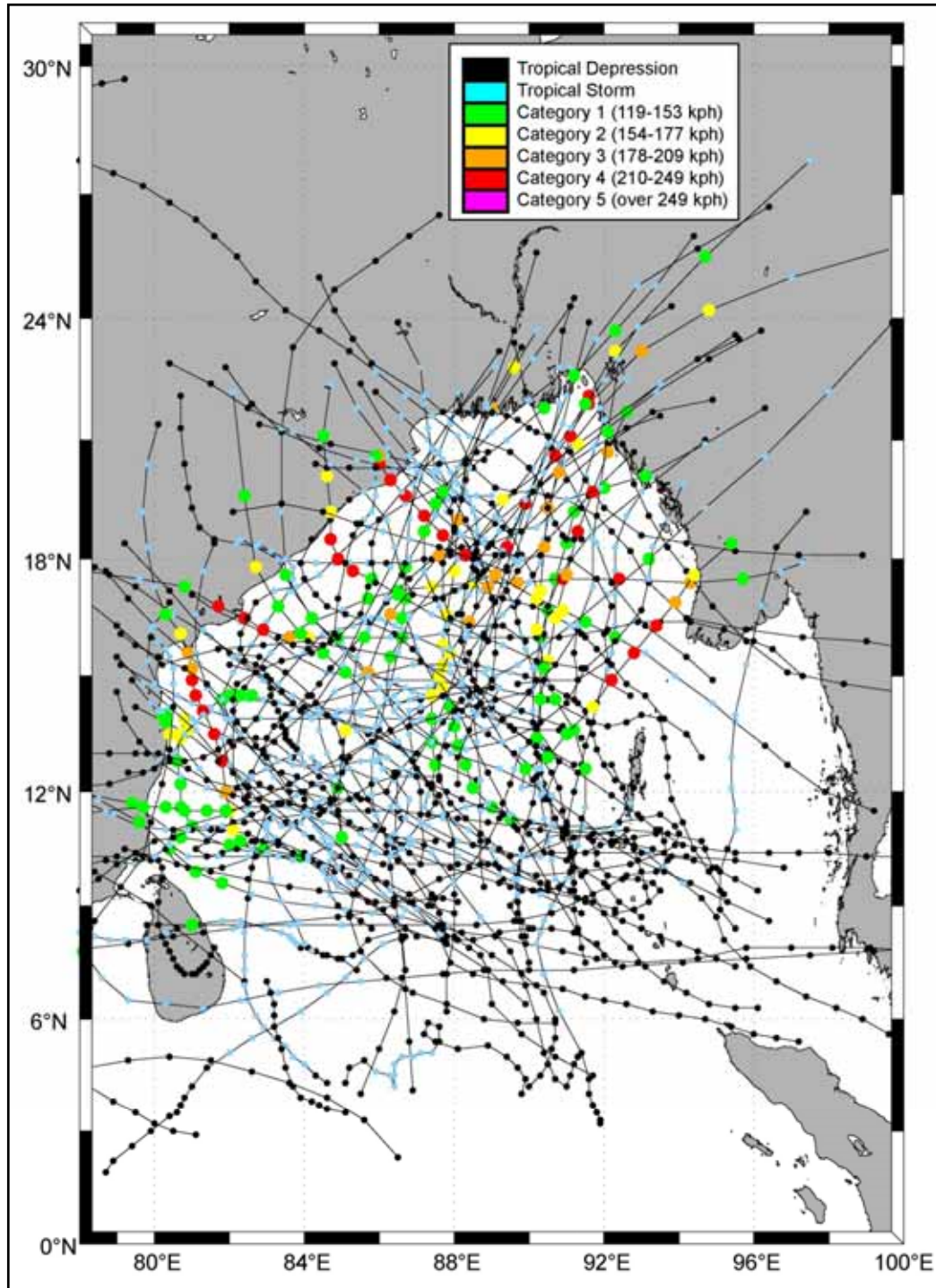
**Georgia
Tech**



Tropical Cyclone occurrence

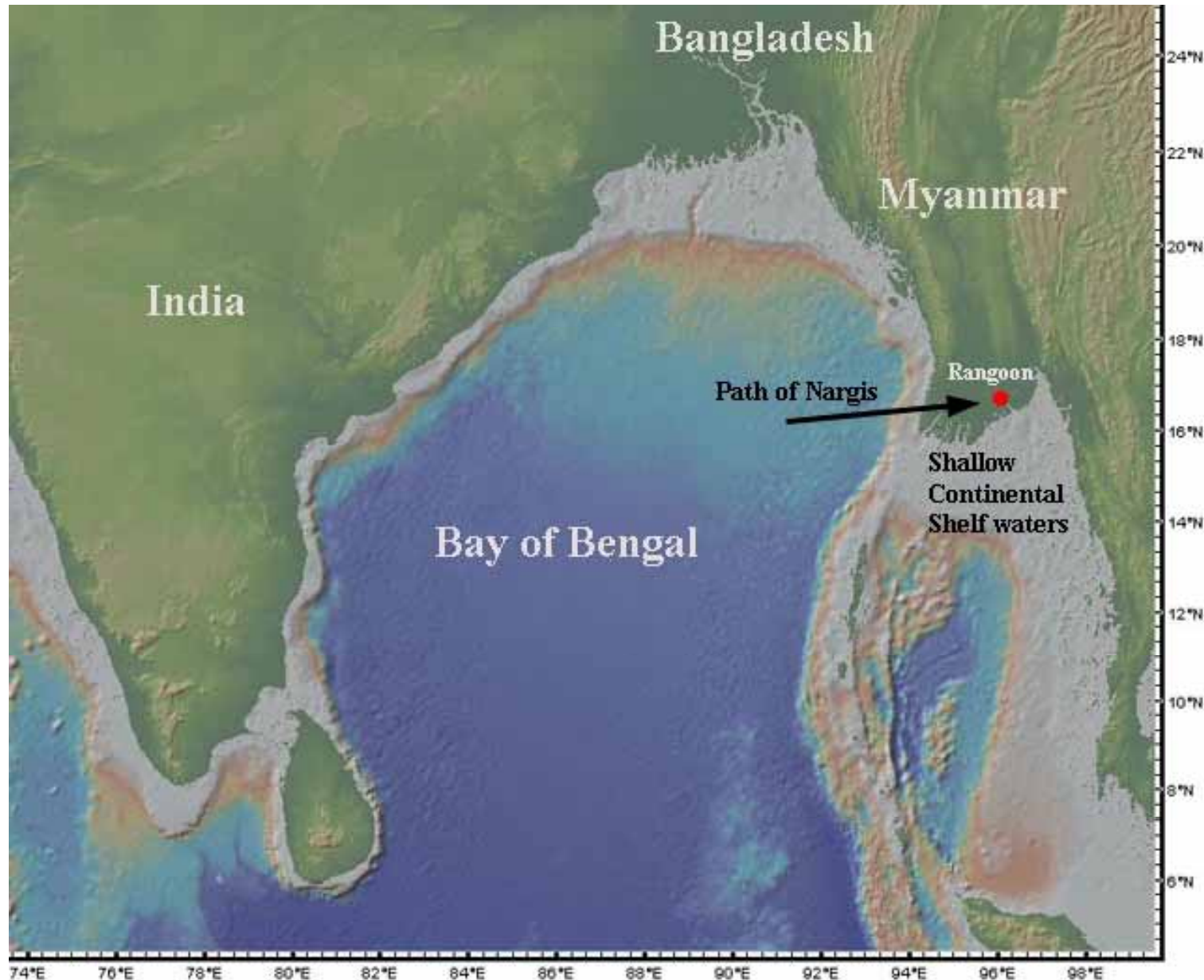


North Indian Ocean Tropical Cyclones split 1:4 between Arabian Sea and Bay of Bengal

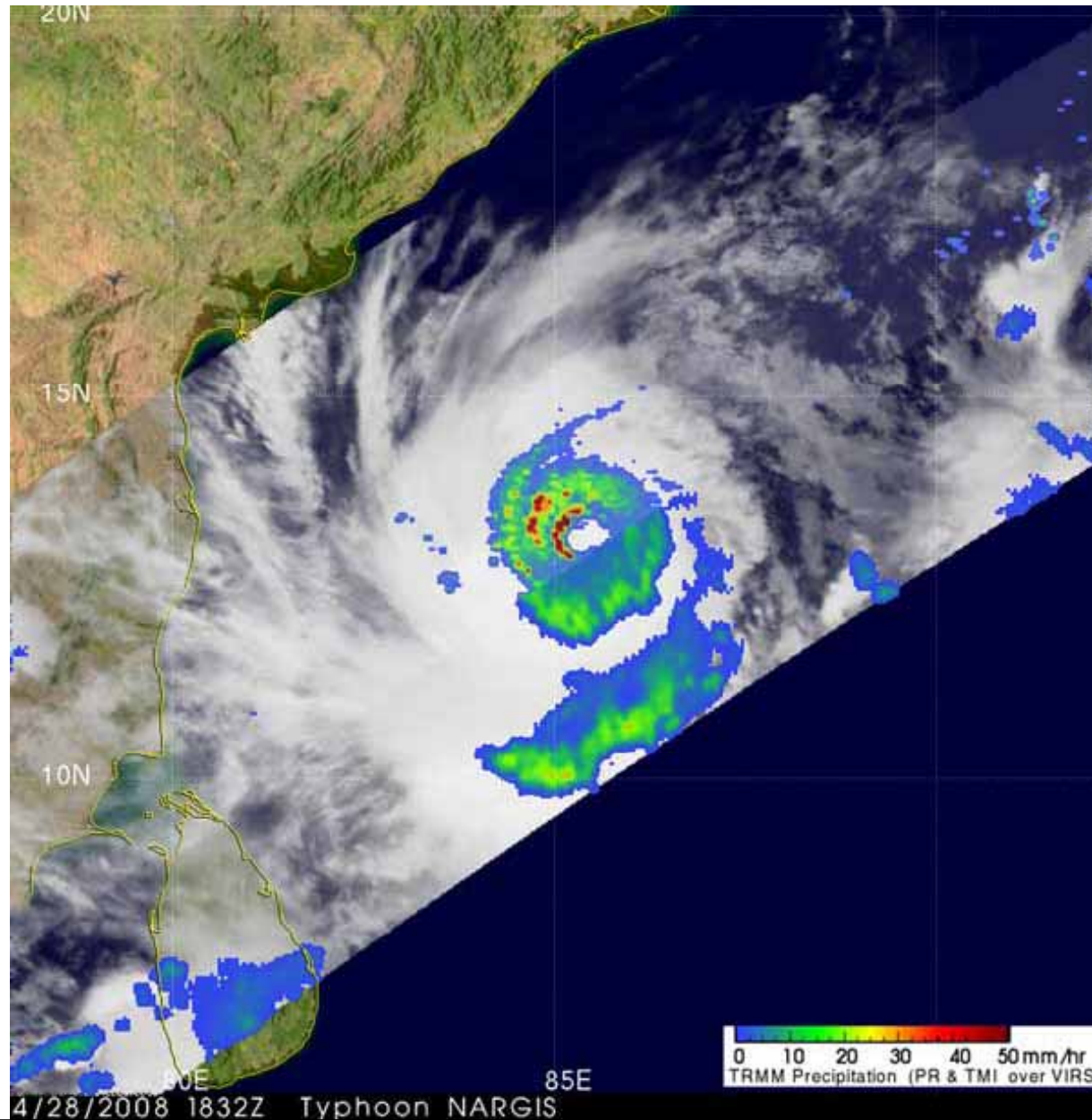


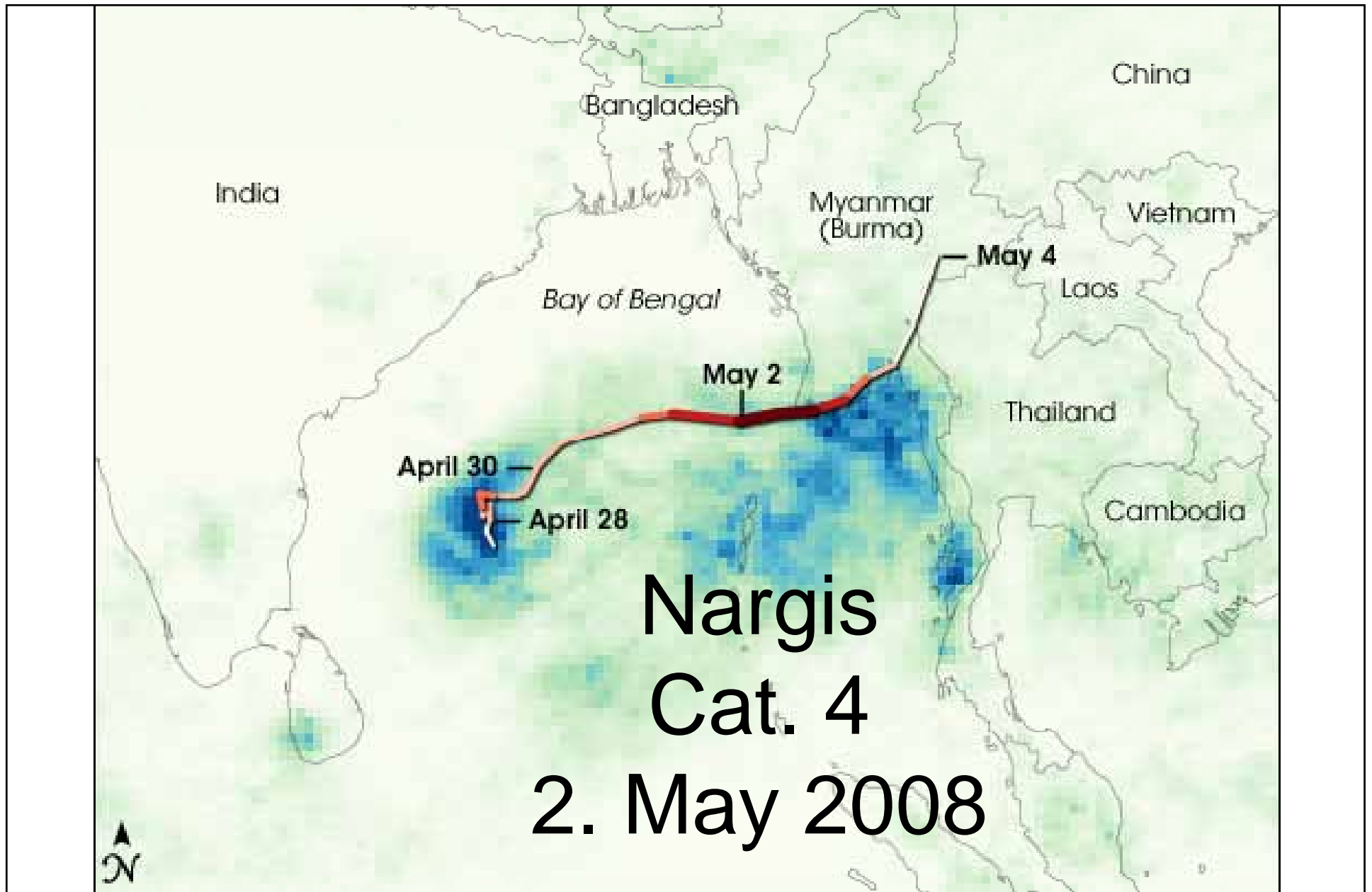
Historical Tropical Cyclone Tracks Bay of Bengal prior to Nargis starting 1972

Coastal Cyclone Vulnerability



Cyclone Nargis, Cat. 1 (28 April 2008)





April 27 - May 4, 2008

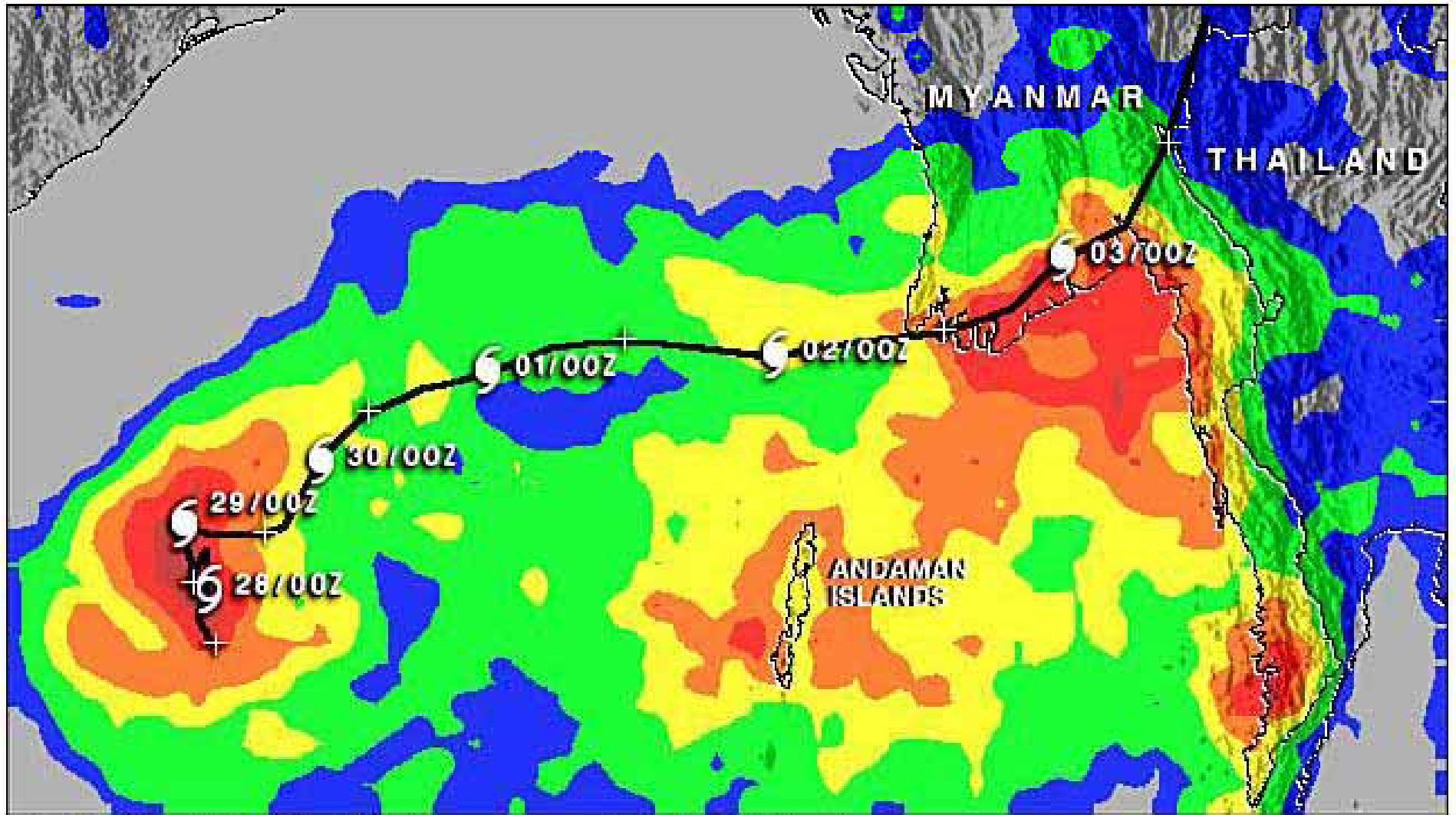
Total Rainfall (mm)



Storm Intensity (Category)



Cyclone Nargis Rainfall

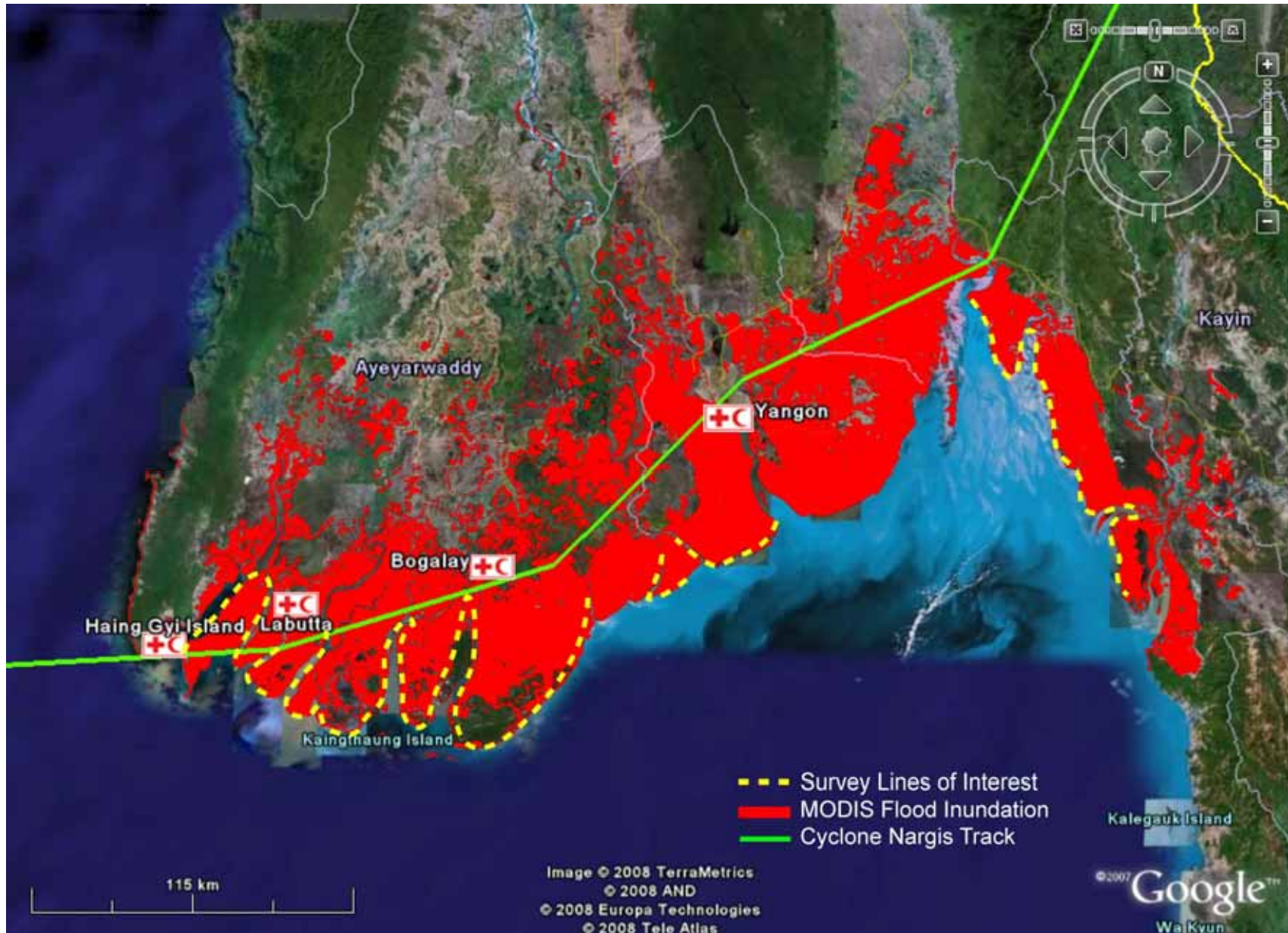


April 27 – May 4, 2008

Rainfall Totals (mm)



Cyclone Nargis MODIS flood areas



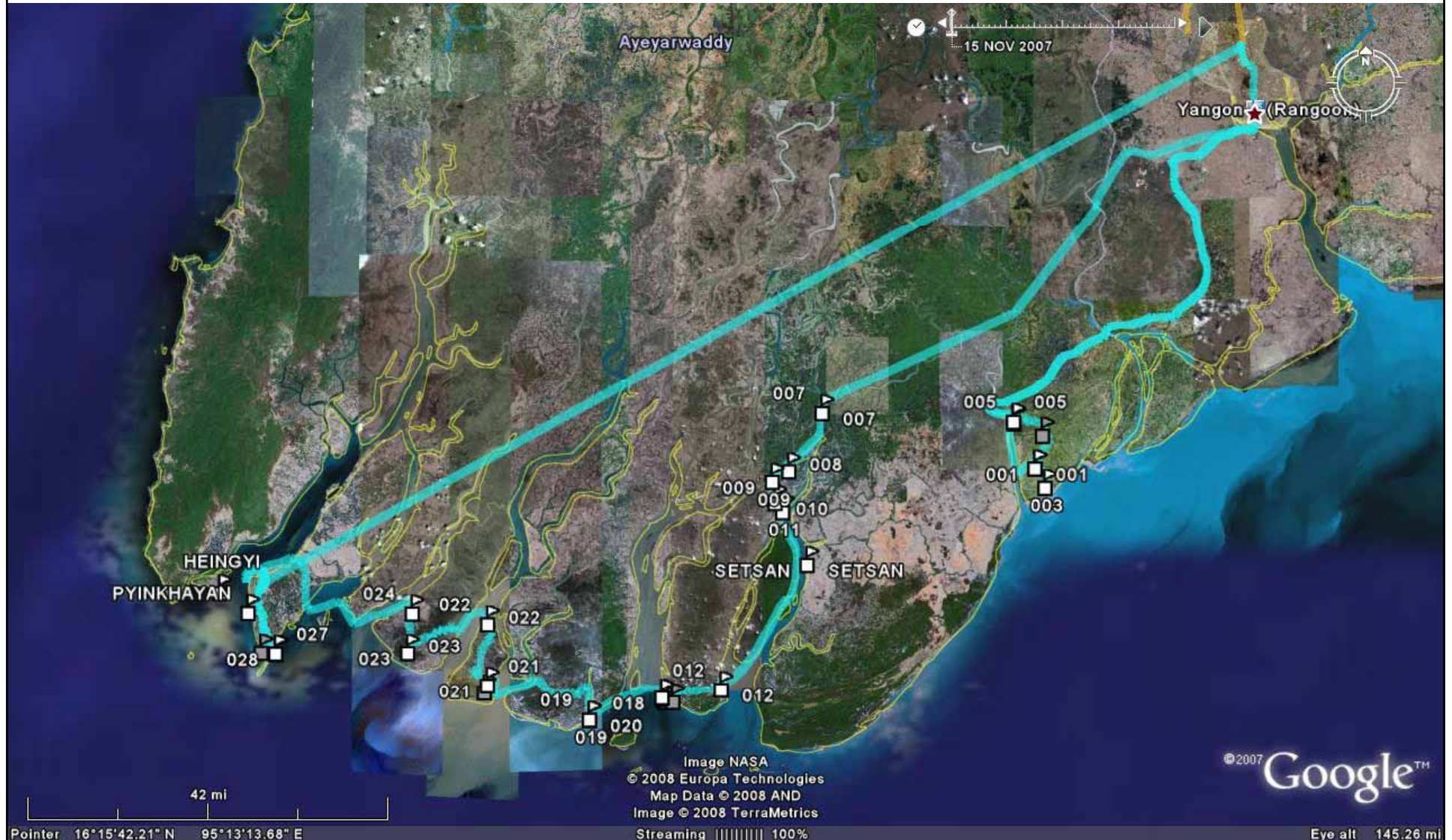
Cyclone Nargis Fatalities >138k





Cyclone Nargis storm surge survey

August 2008



Yangon River Embankments



Cyclone Nargis storm surge survey

August 2008



Aya – 150 m land loss



Aya – water wells scoured



Aung Hlaing – 1m erosion



Pyinsalu – Govt. Reconstruction



Local Reconstruction / Vulnerability



Pyinsalu – Volunteers







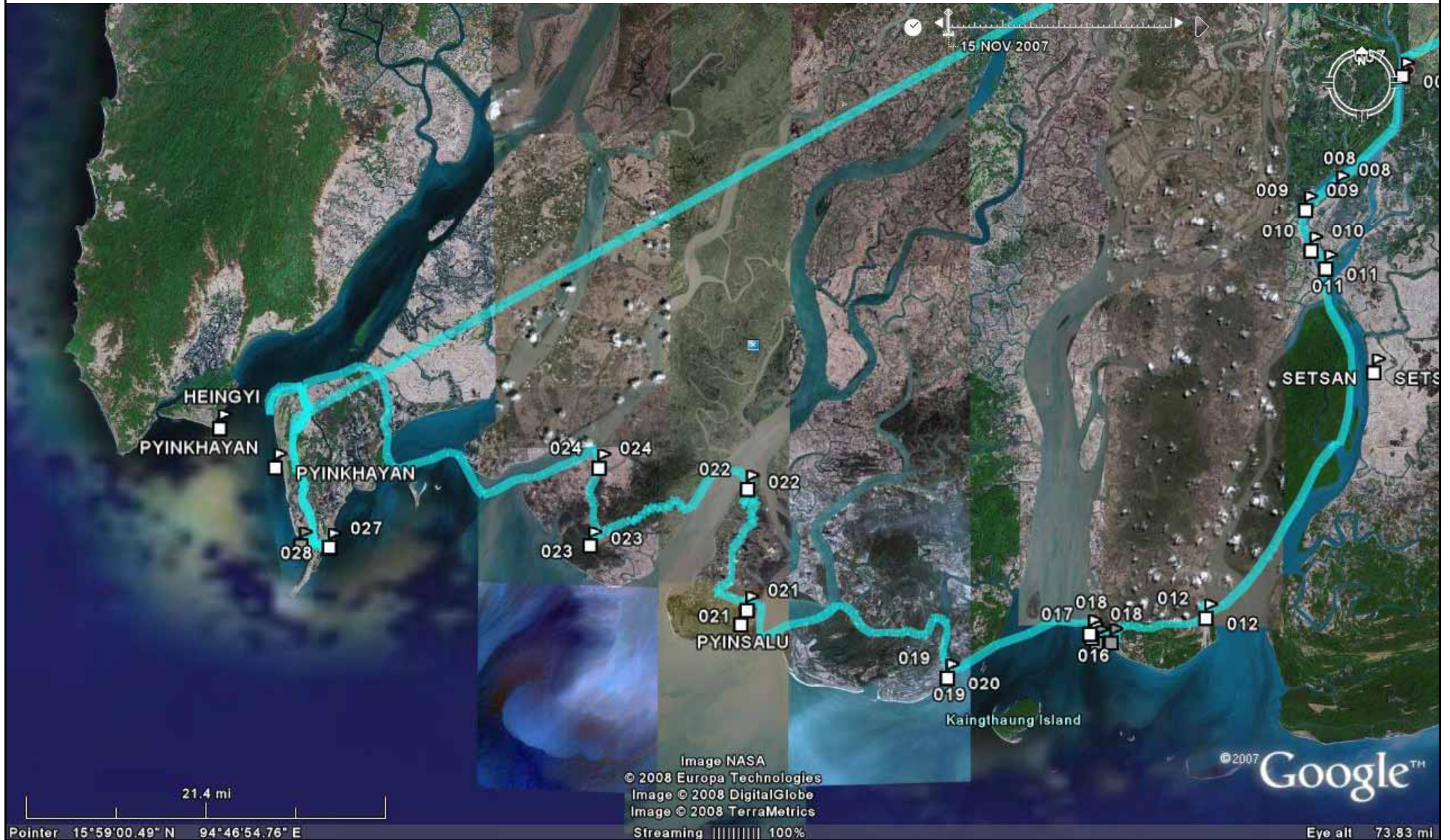


Pyinsalu – 5m storm surge



Cyclone Nargis storm surge survey

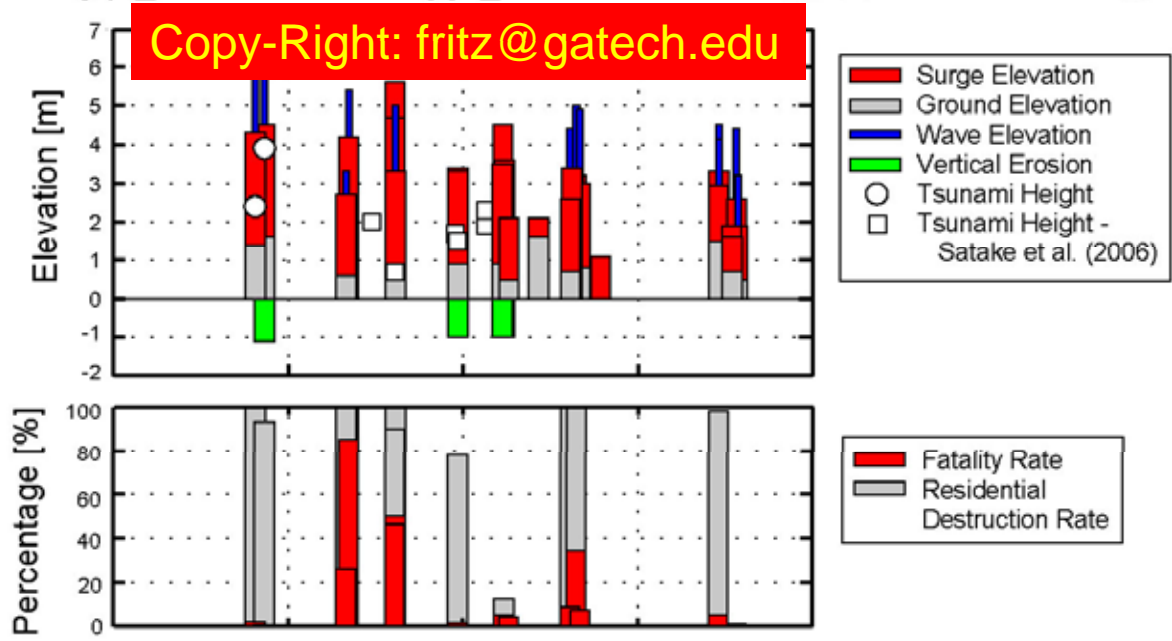
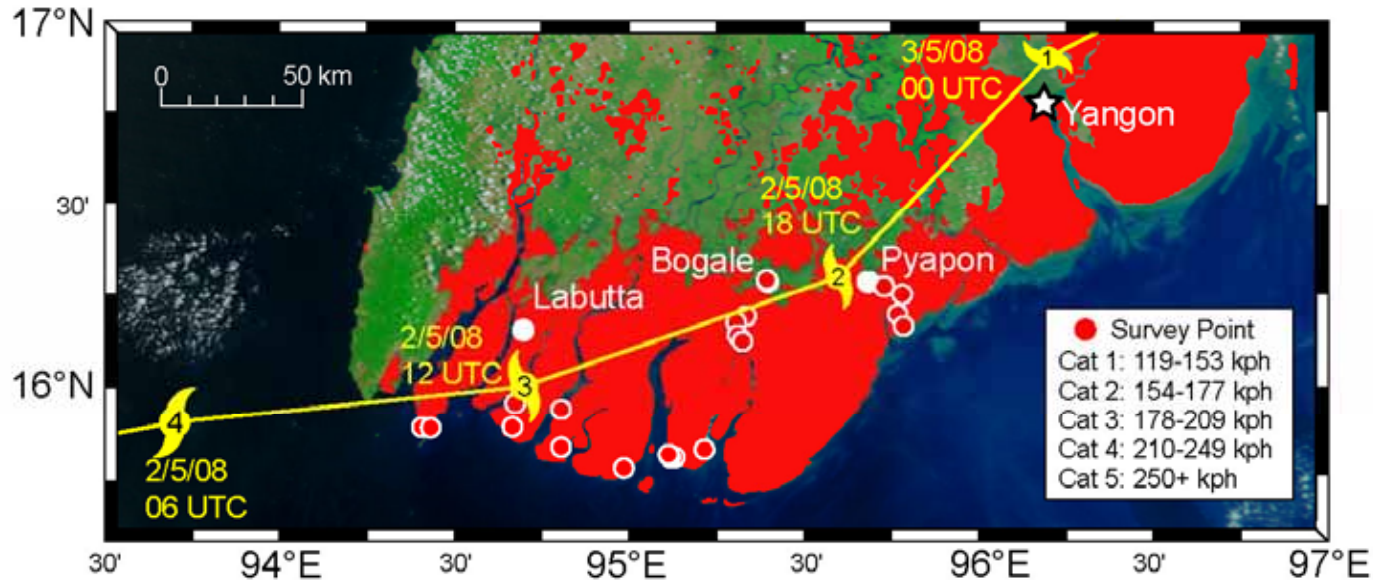
August 2008



Kyauk Ka Latt – 4.5m storm surge



Nargis Storm Surge Measurements

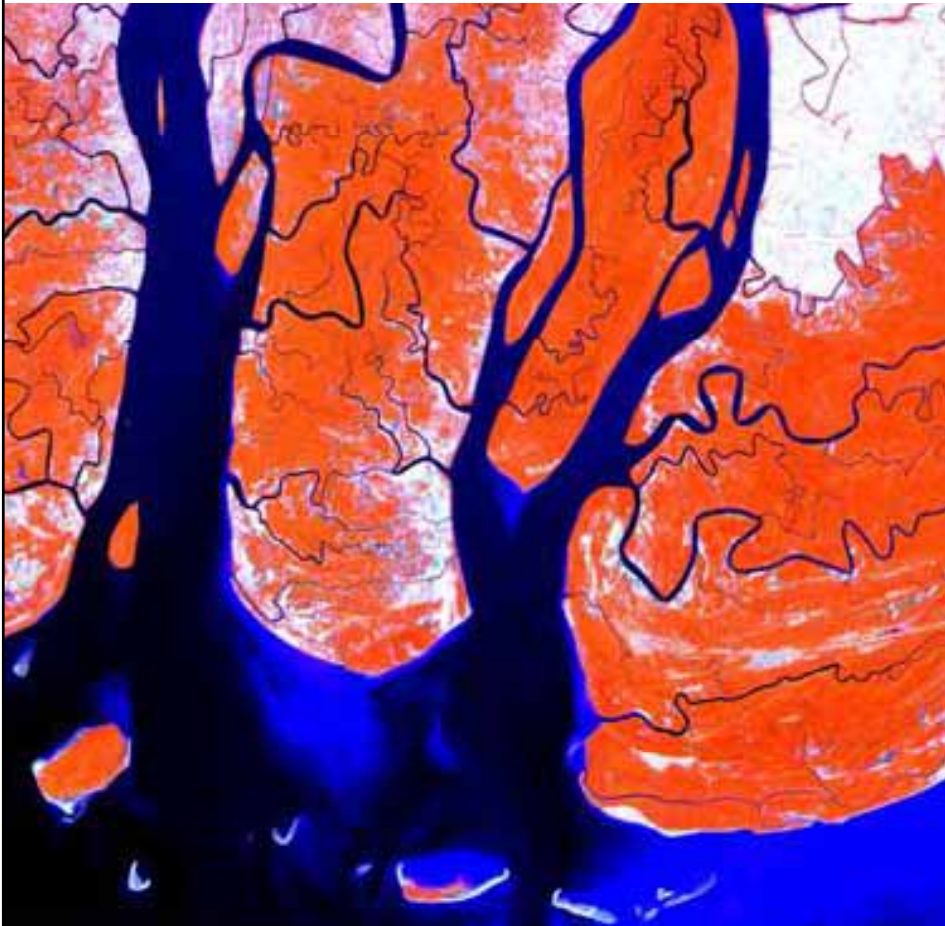




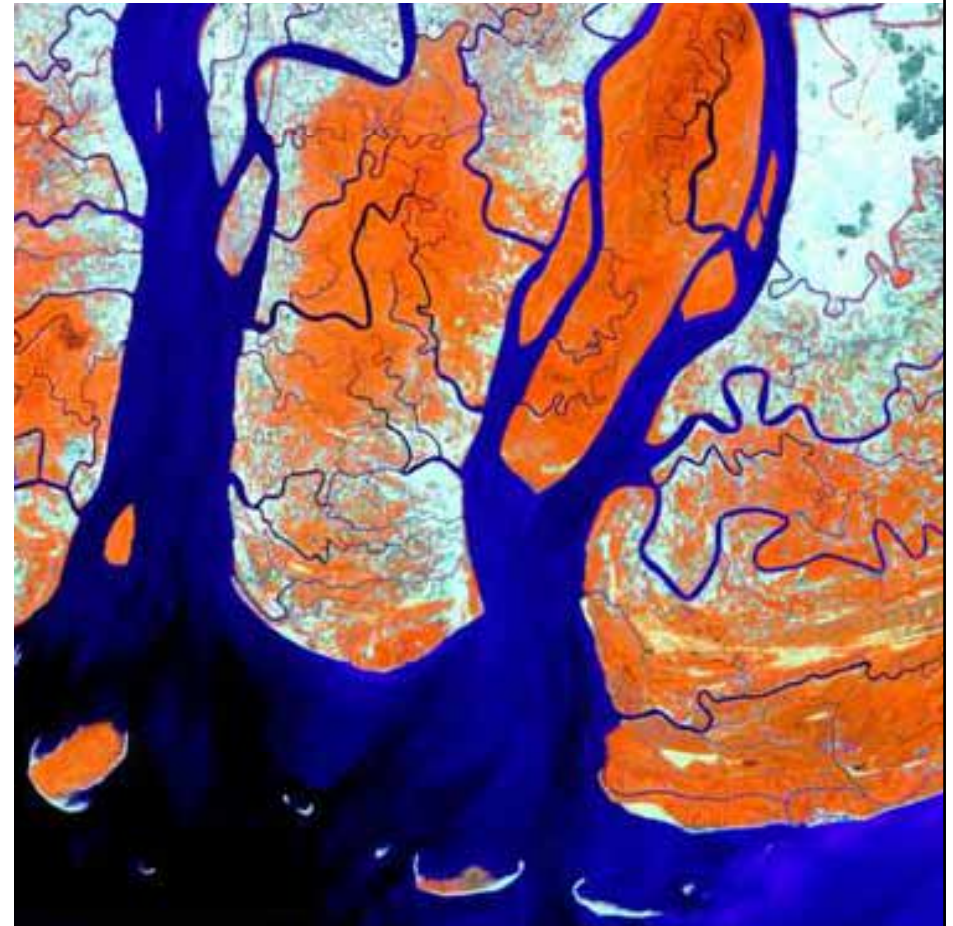
Mangrove Coverage and Land Use



Mangrove Coverage and Land Use



1995



2000



**Mangrove
Coverage
and Land Use**

Mangrove Coverage and Land Use



Mangrove Coverage and Land Use



Mangrove Reforestation – Khao Lak

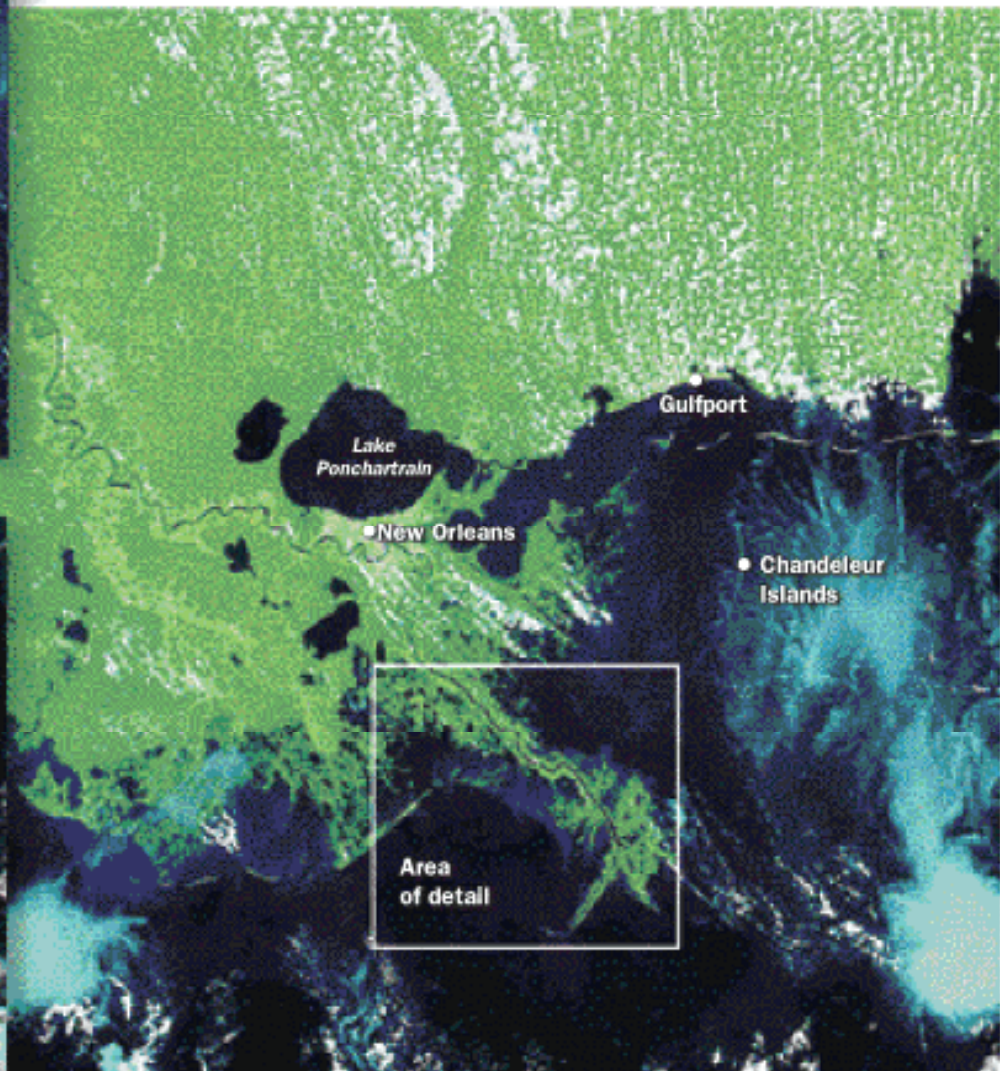


Mississippi Delta Land Loss

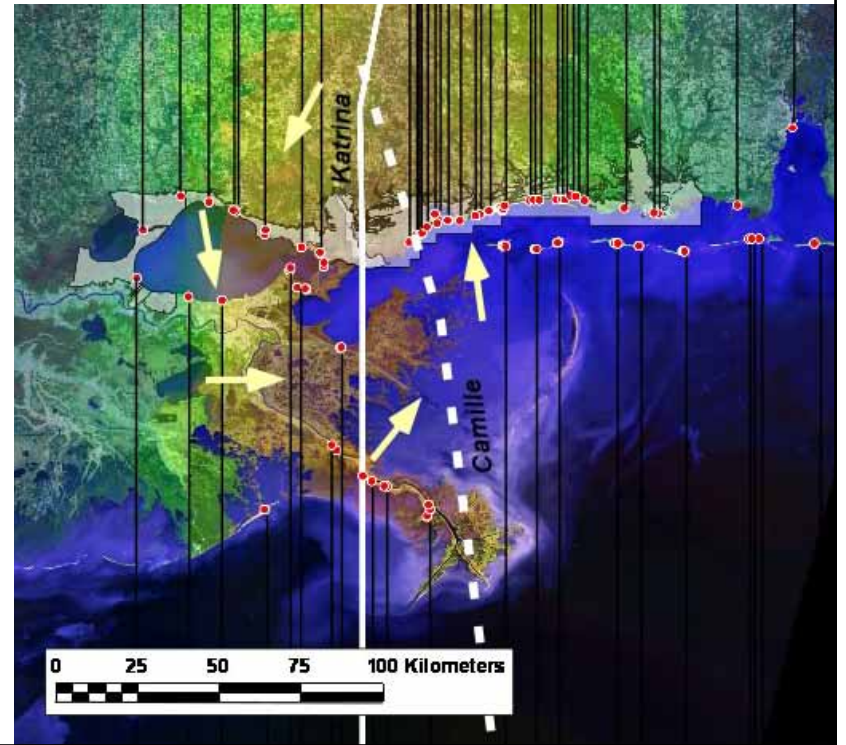
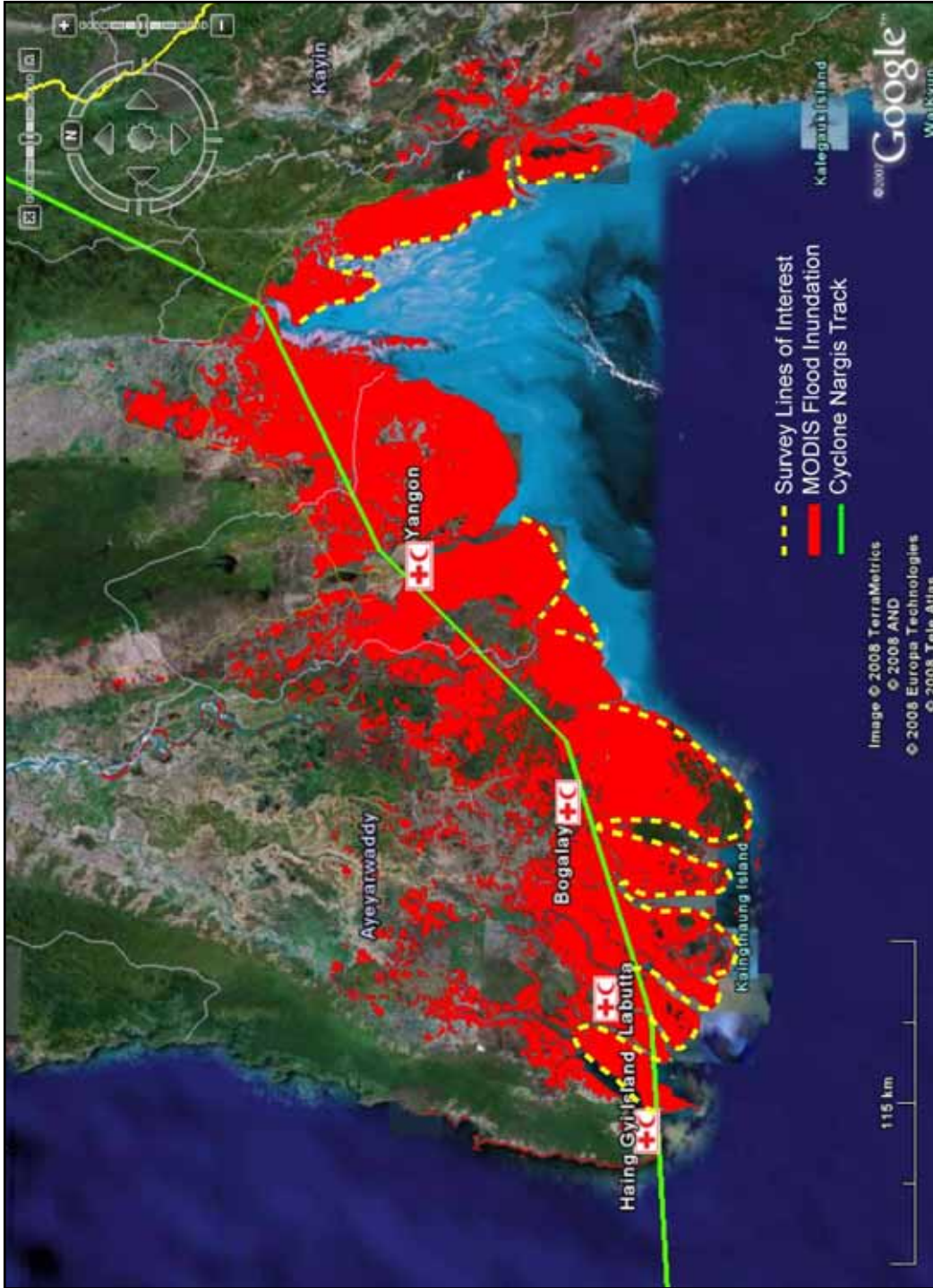


Washed Away

Flooding has eroded marshlands that protect and reinforce the busy shipping channel at the bottom of the Mississippi River (land is green on satellite map). Here, views from before and after the hurricane.



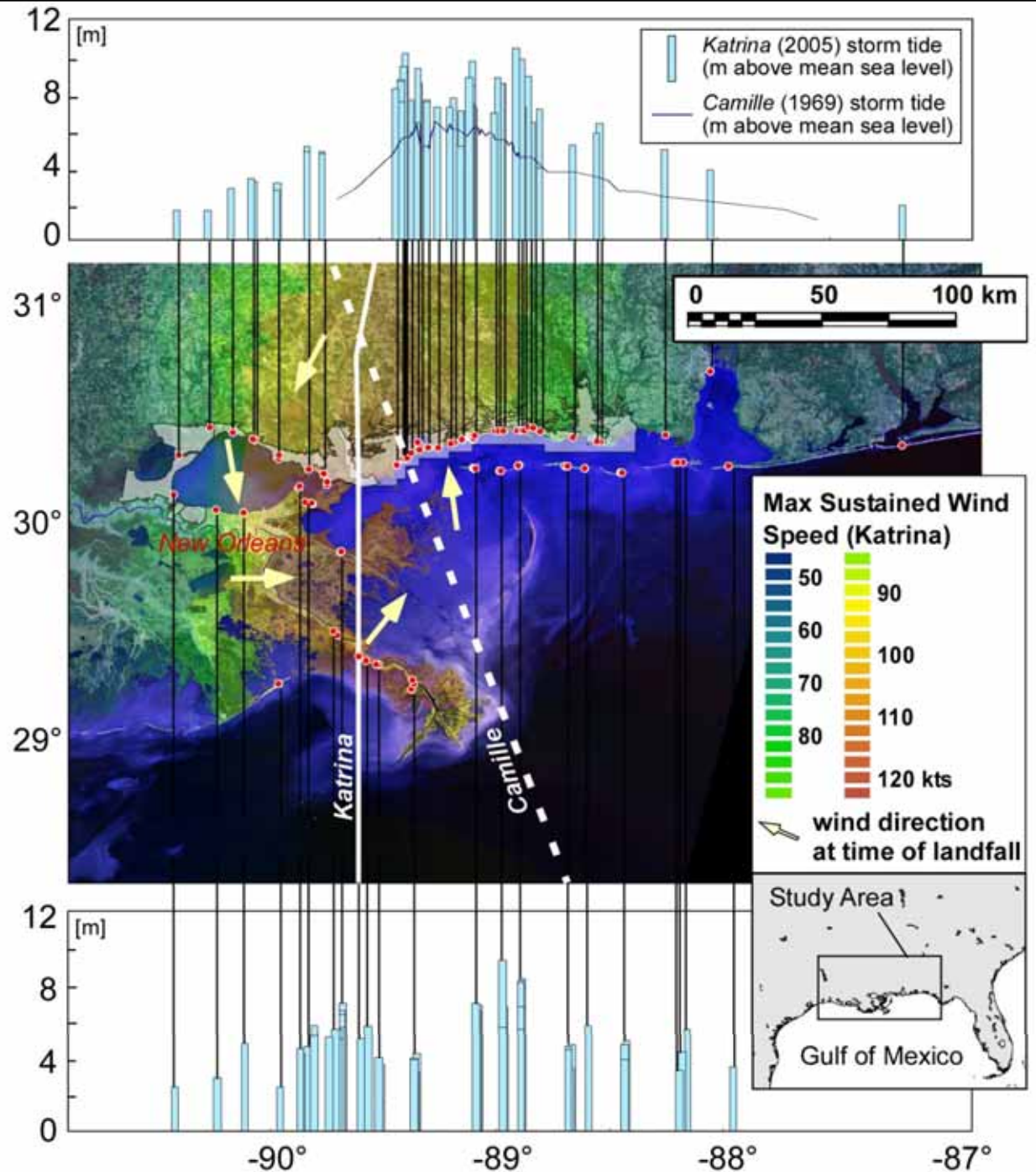
Ayeyarwady & Mississippi Delta Scale Comparison



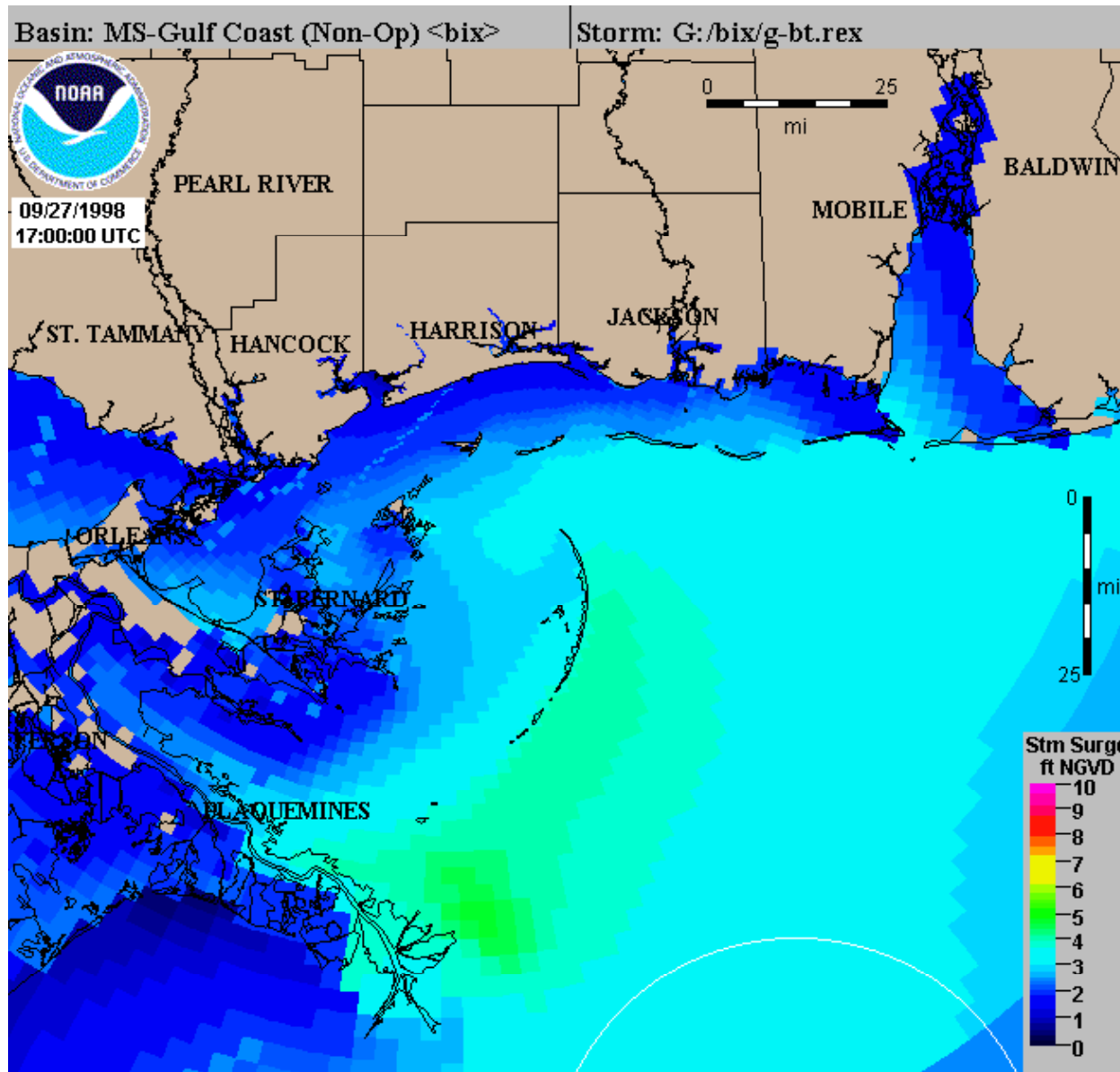
Hurricane Katrina

Storm Surge Survey

Fritz et al., 2008
ASCE, JGGE
Fritz et al., 2007
Elsevier, ECSS



Storm Surge Modeling – SLOSH (NOAA)

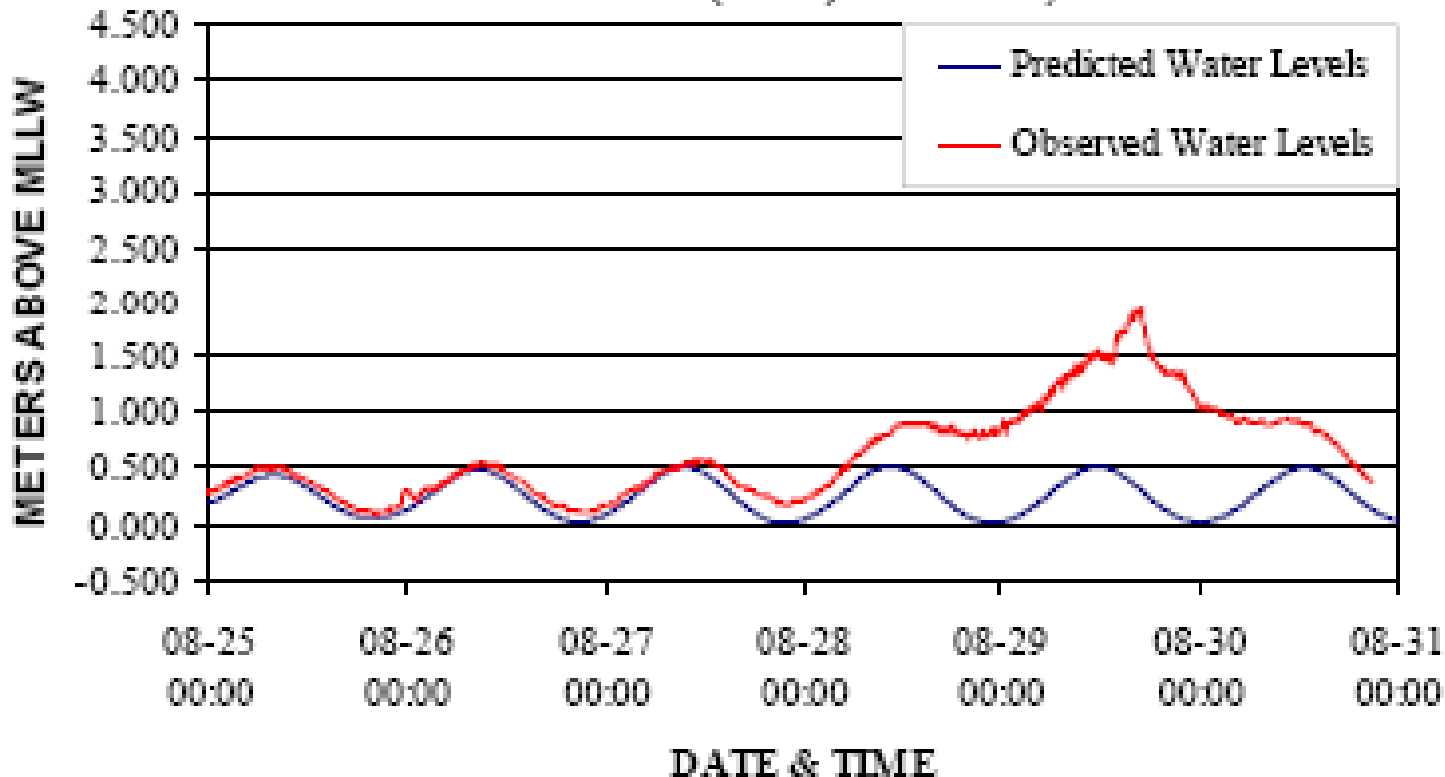


Duration of Storm Surge >> Tsunami Wave Period

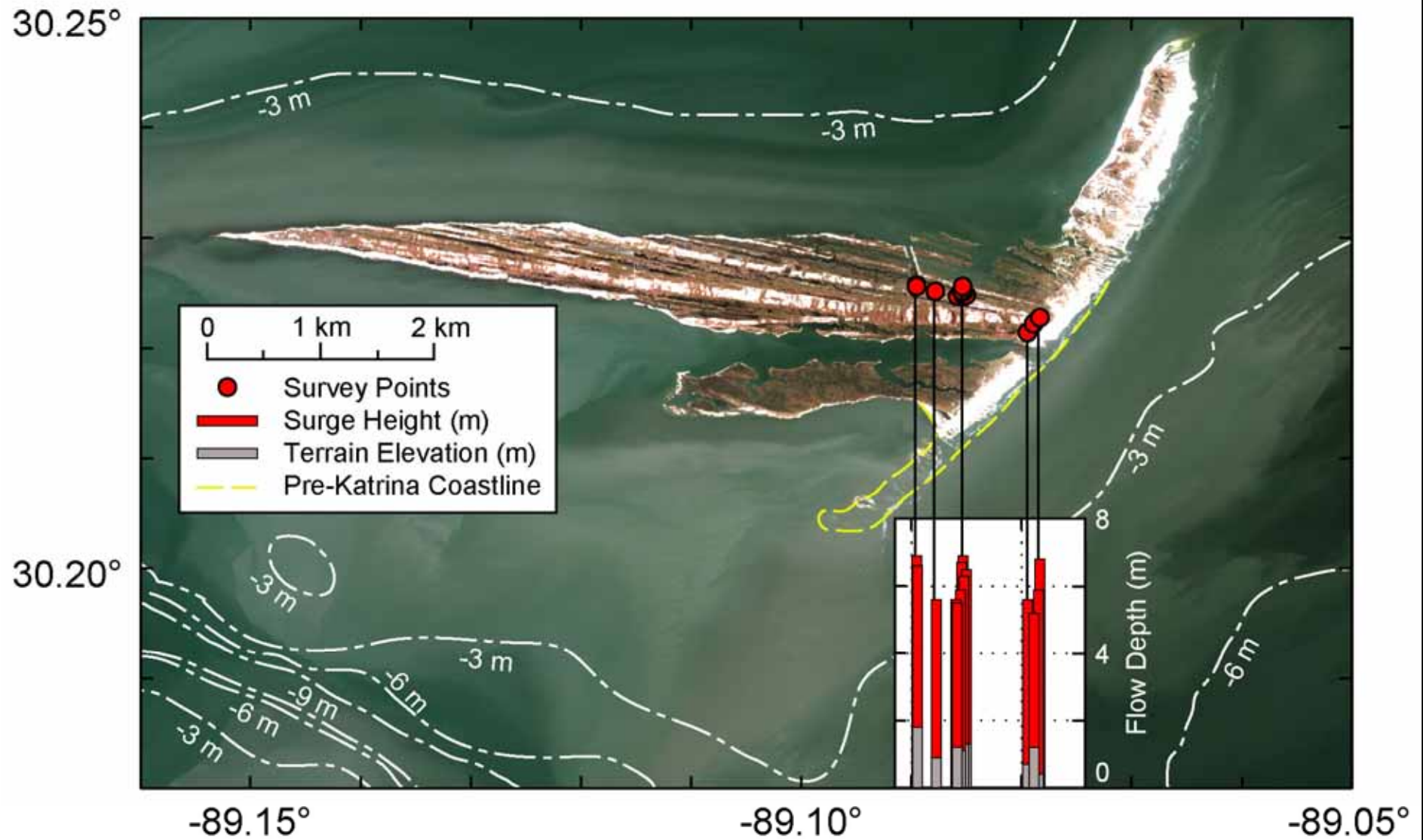


NOAA NOS Center for Operational Oceanographic Products & Services
8735180 DAUPHIN ISLAND, AL

OBSERVED VS PREDICTED WATER LEVELS
STORM TIDE 1.942 m (6.37 ft) 17:00 GMT, 08-29-05

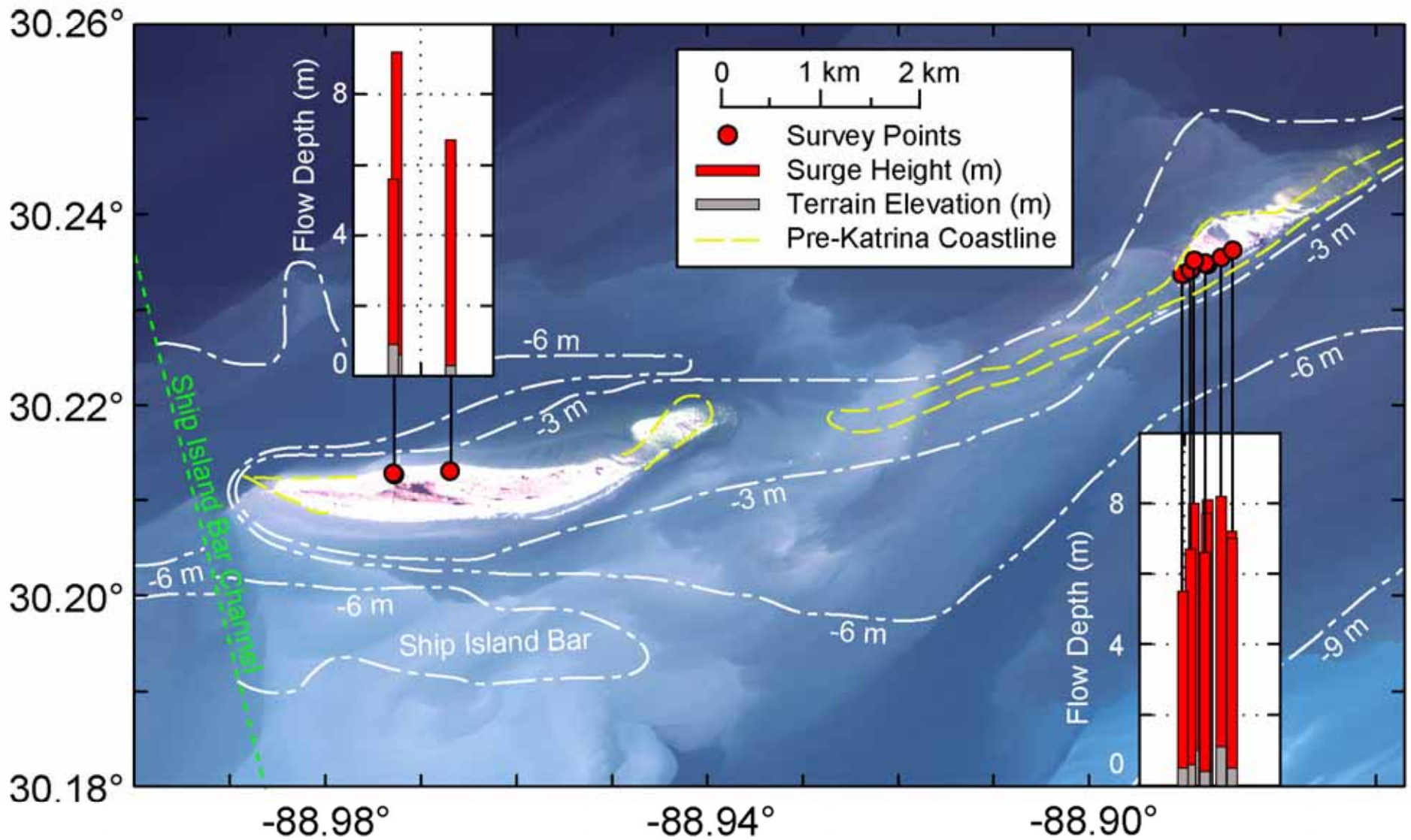


Mississippi Barrier Islands



Cat Island

Mississippi Barrier Islands

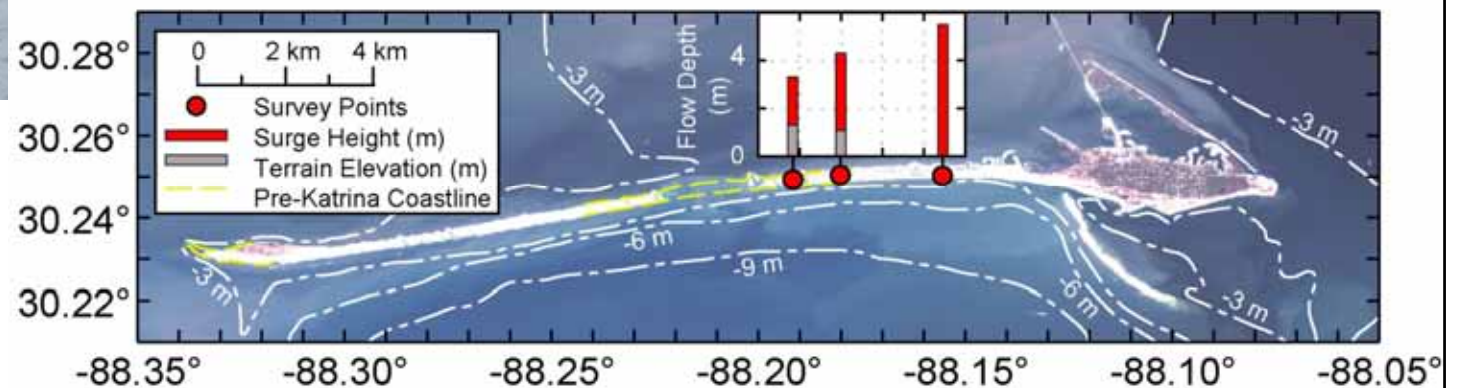


West & East Ship Islands

Storm Surge / Wave effects on Trees



Breach – Dauphin Island, AL





Erosion – Dauphin Island AL



Deposition – Dauphin Island AL



Deposition – Dauphin Island AL

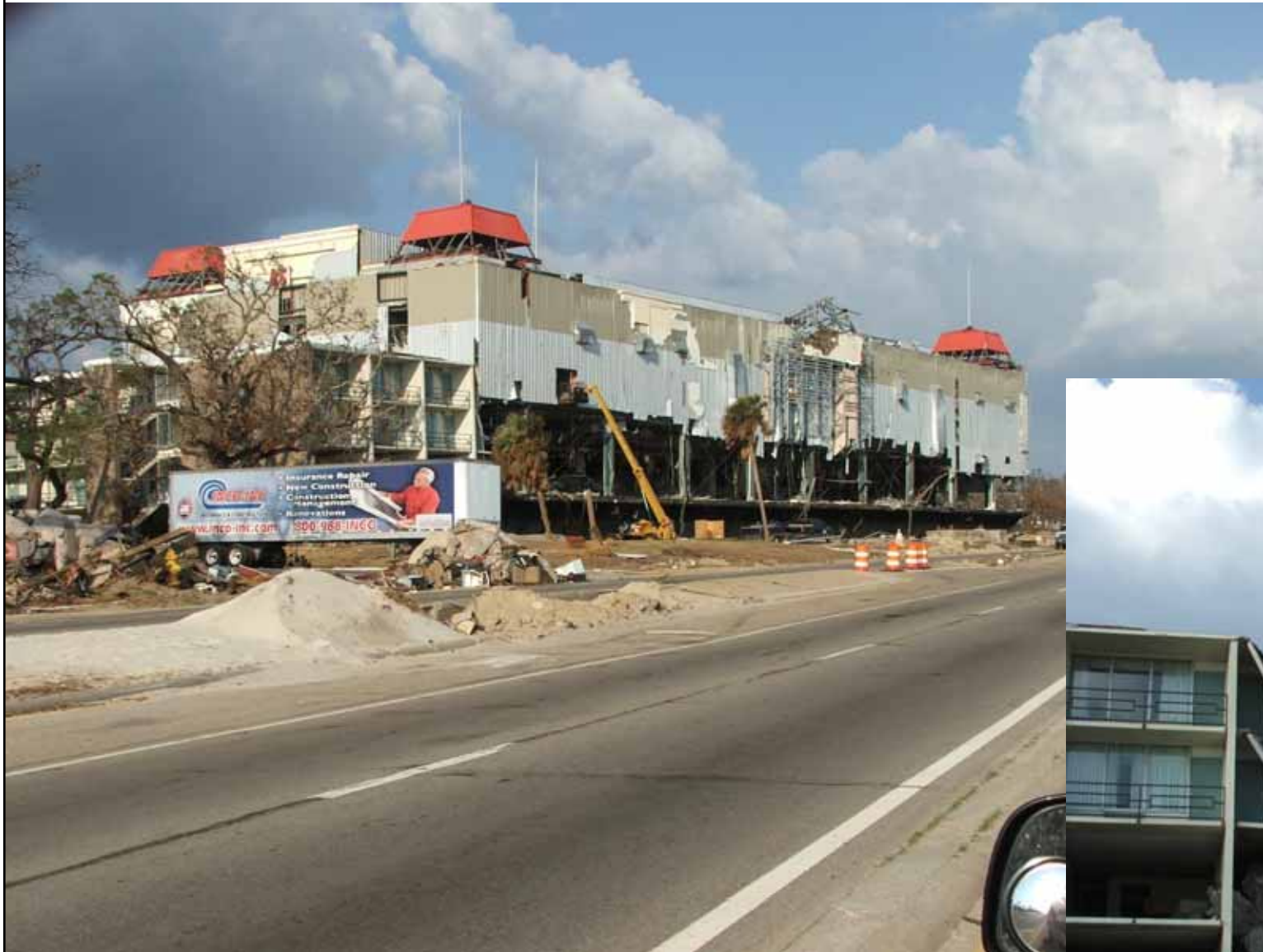


Storm Surge Damage Trimline

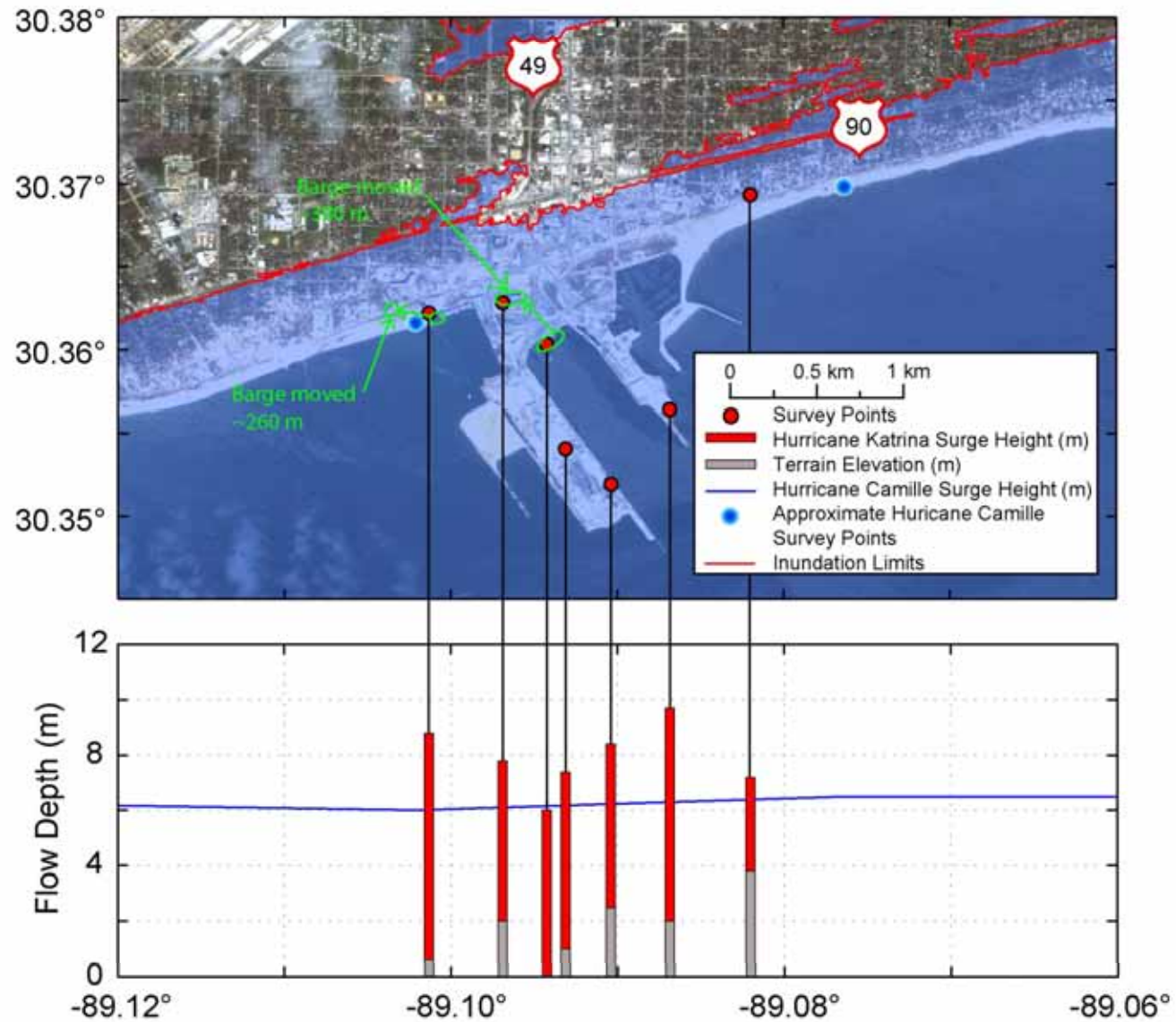


Biloxi – Mississippi

Casino washed ashore – Biloxi, MS



Gulfport - Mississippi



Storm Surge Damage Timeline



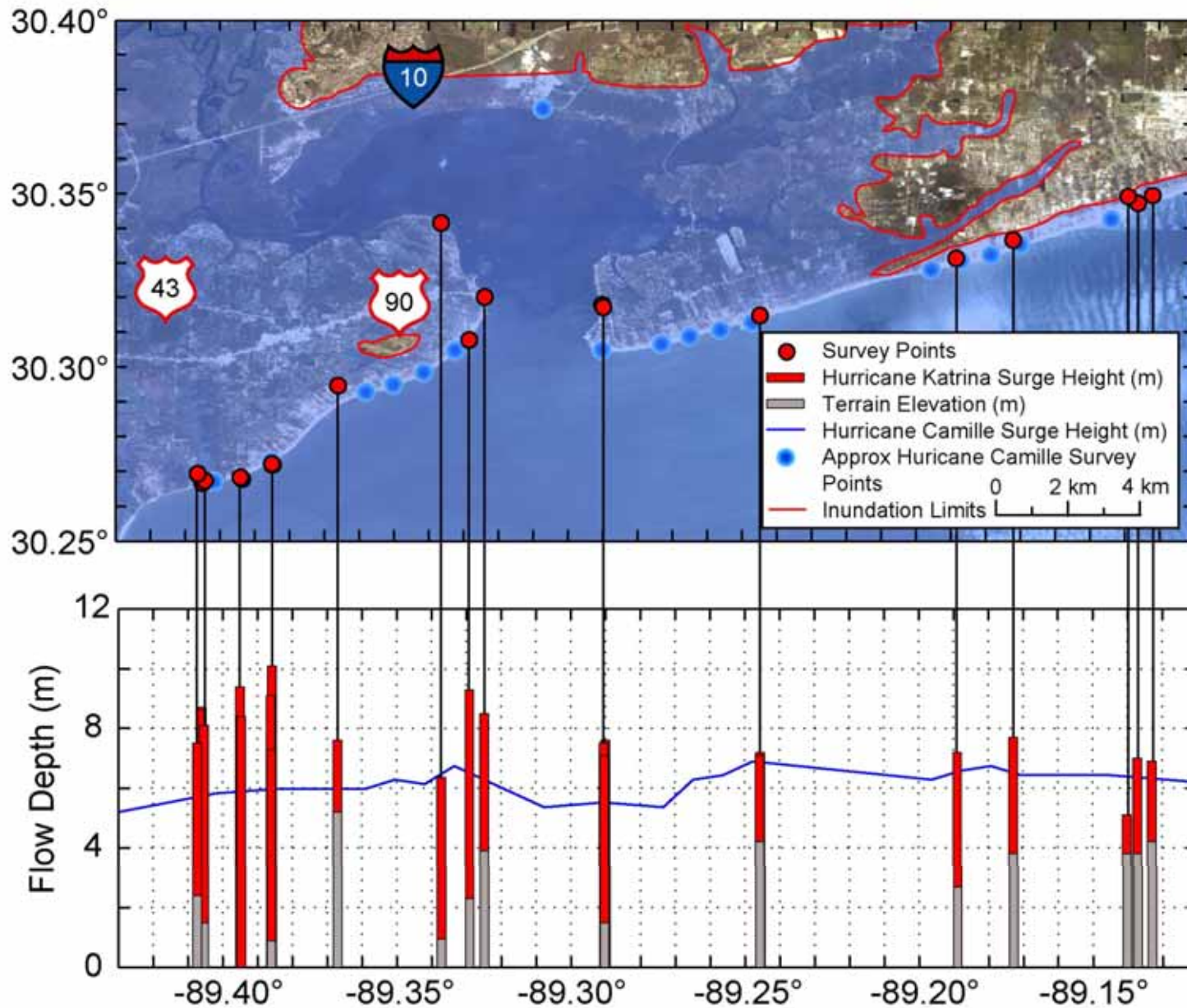
Gulfport – Mississippi

Storm Surge Damage Timeline

Gulfport – Mississippi



Bay St. Louis, MS



Erosion / Deposition – Bay St. Louis, MS

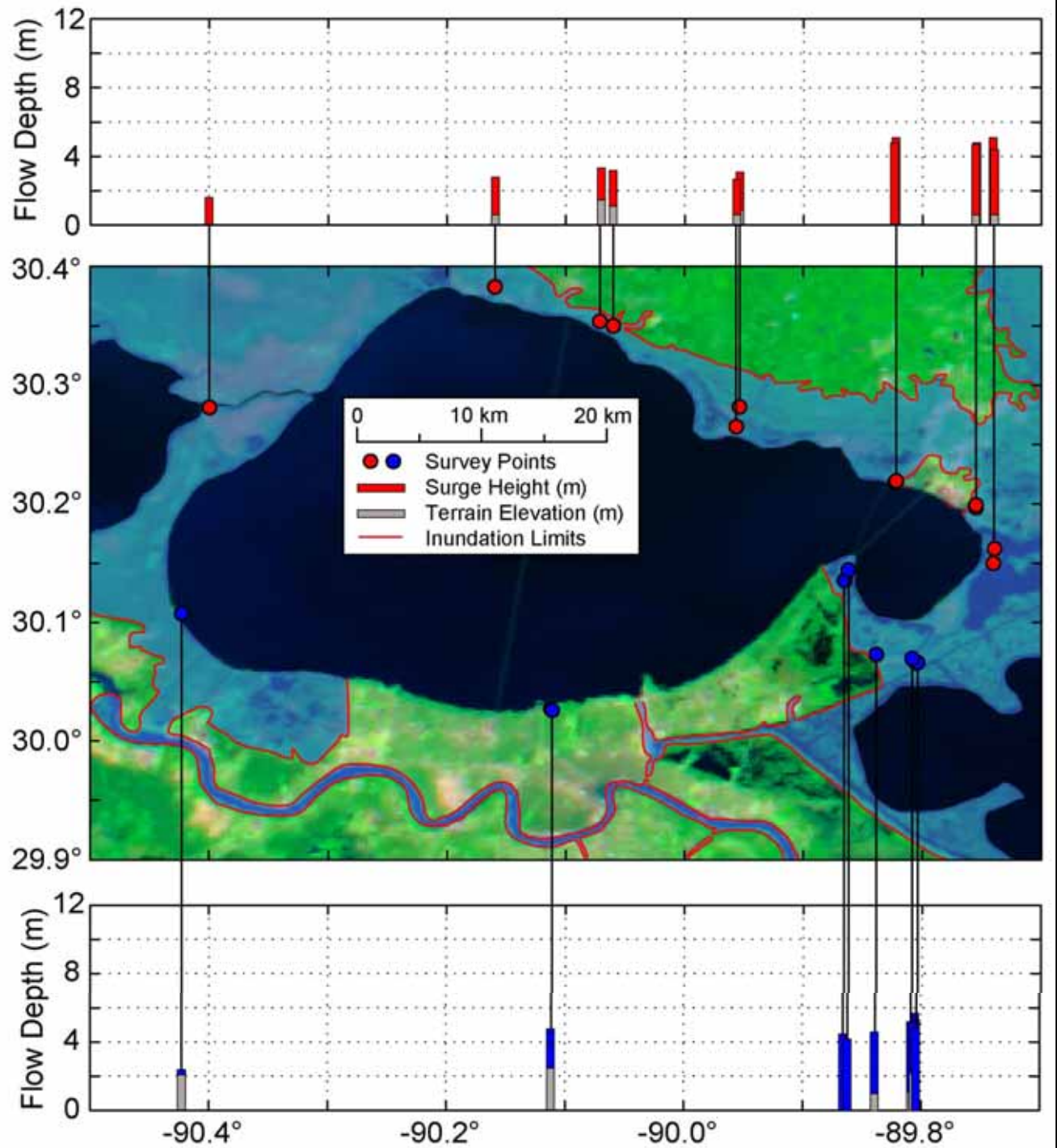


Uplift on Structures



Hwy 90 Bridge – Ocean Springs, MS

New Orleans between River and Lake





New Orleans Flooding



Conclusions

- Cyclone Awareness and Education
- Palm Trees are ineffective
- Mangrove Belt Reforestation
- Land Use, Planning and Management
- Flood zones and Vulnerability Maps
- Relocation of most vulnerable Villages
- Critical Infrastructure Cyclone Safe
- Building Codes / Cyclone Shelters
- Multi-hazards (land loss, tsunami, sea level)

Questions?

