



36TH INTERNATIONAL CONFERENCE ON COASTAL ENGINEERING 2018

Baltimore, Maryland | July 30 – August 3, 2018

The State of the Art and Science of Coastal Engineering

MORPHOLOGIC RESPONSE OF BEACHES AND TIDAL INLETS TO HURRICANE IRMA IN SOUTHWEST FLORIDA, USA

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Humiston & Moore Engineers

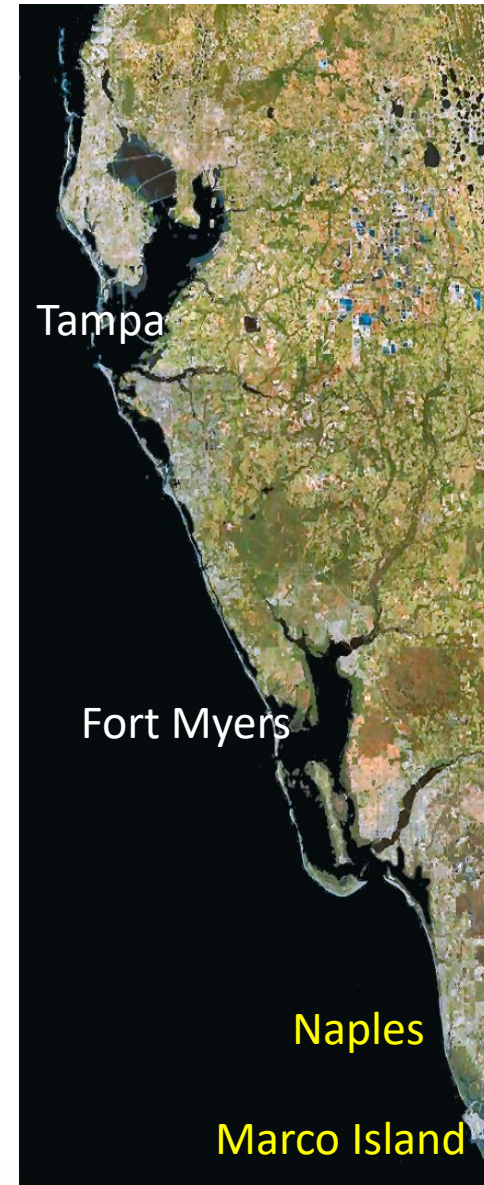
Naples, Florida, USA

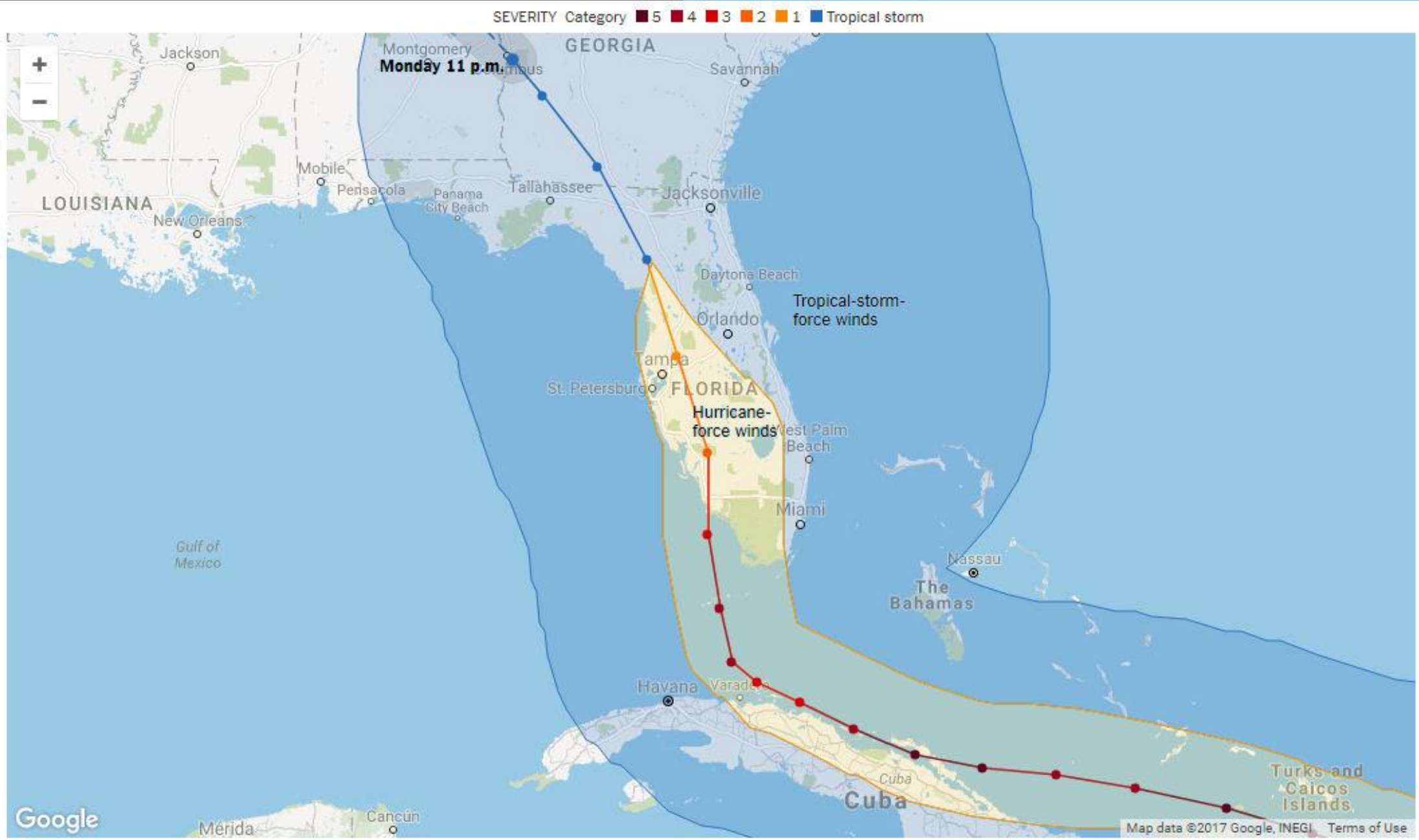
md@humistonandmoore.com



Outline

- **Hurricane Irma (Major Hurricane)**
 - *Intensity*
 - *Path and duration*
 - *Wind, water levels and wave*
 - *Impacts*
- **Study Area**
 - *Southwest and central Florida*
 - *Selected case studies*
 - *Naples Beach*
 - *Marco Island Sand Spit*
 - *Naples Tidal Inlet*
- **Summary and Conclusions**
 - *Major Hurricane and Tropical storms*
 - *Short term and long term impacts*

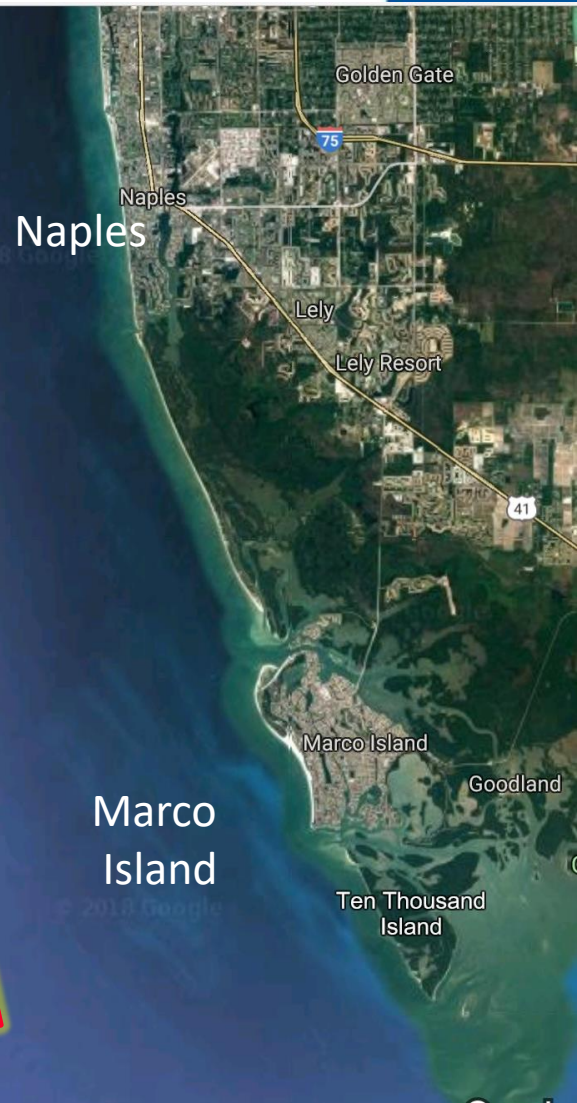
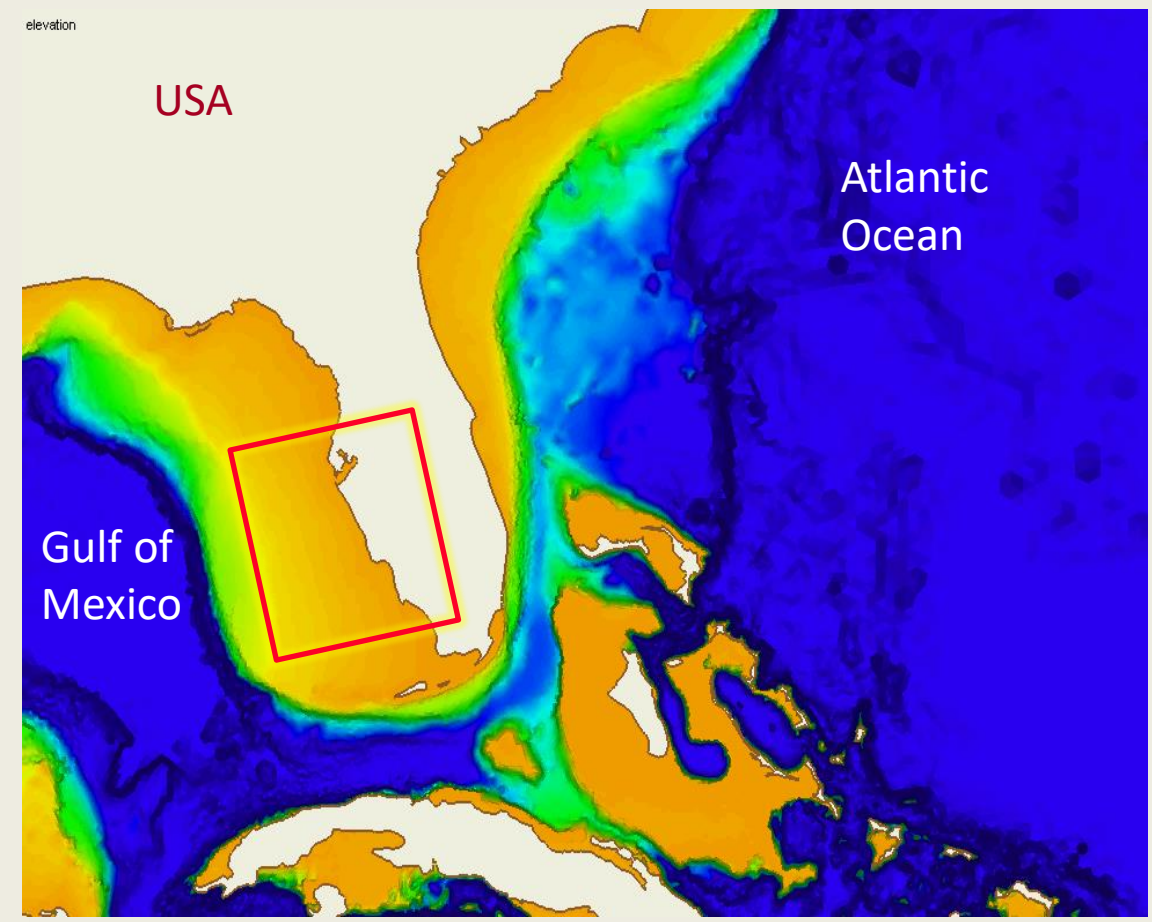


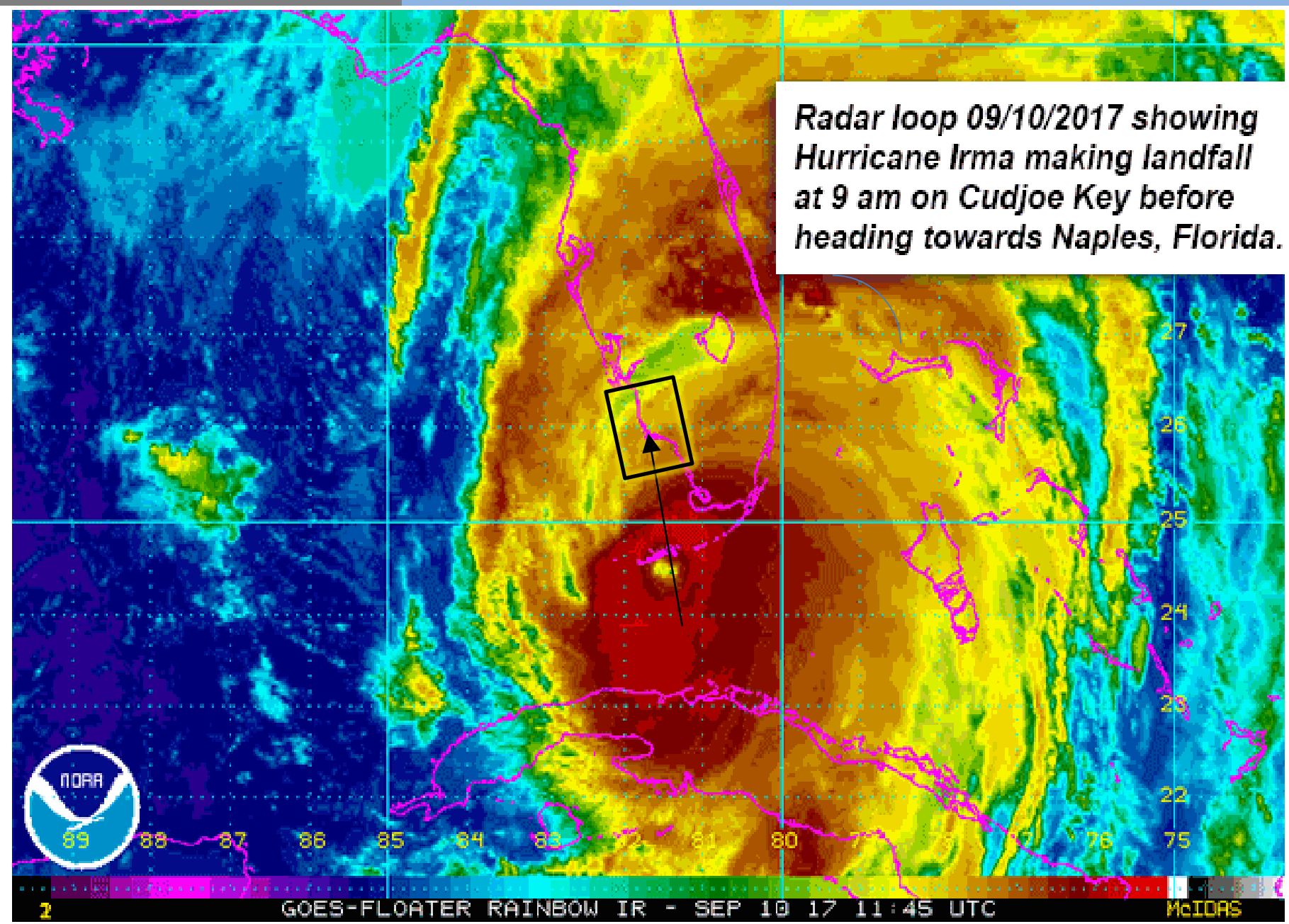
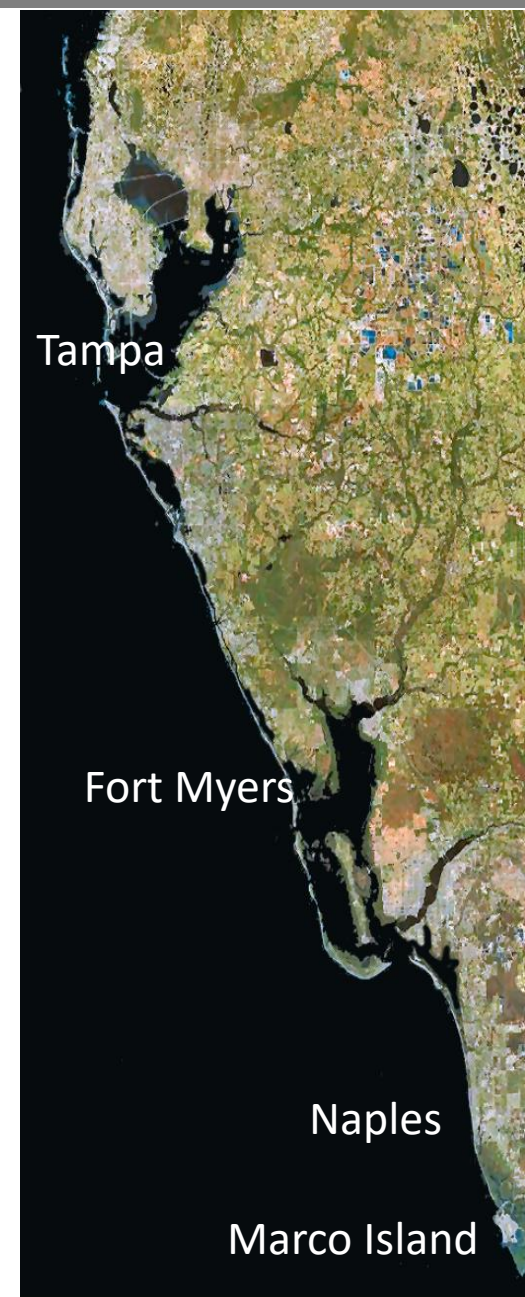


Hurricane Irma

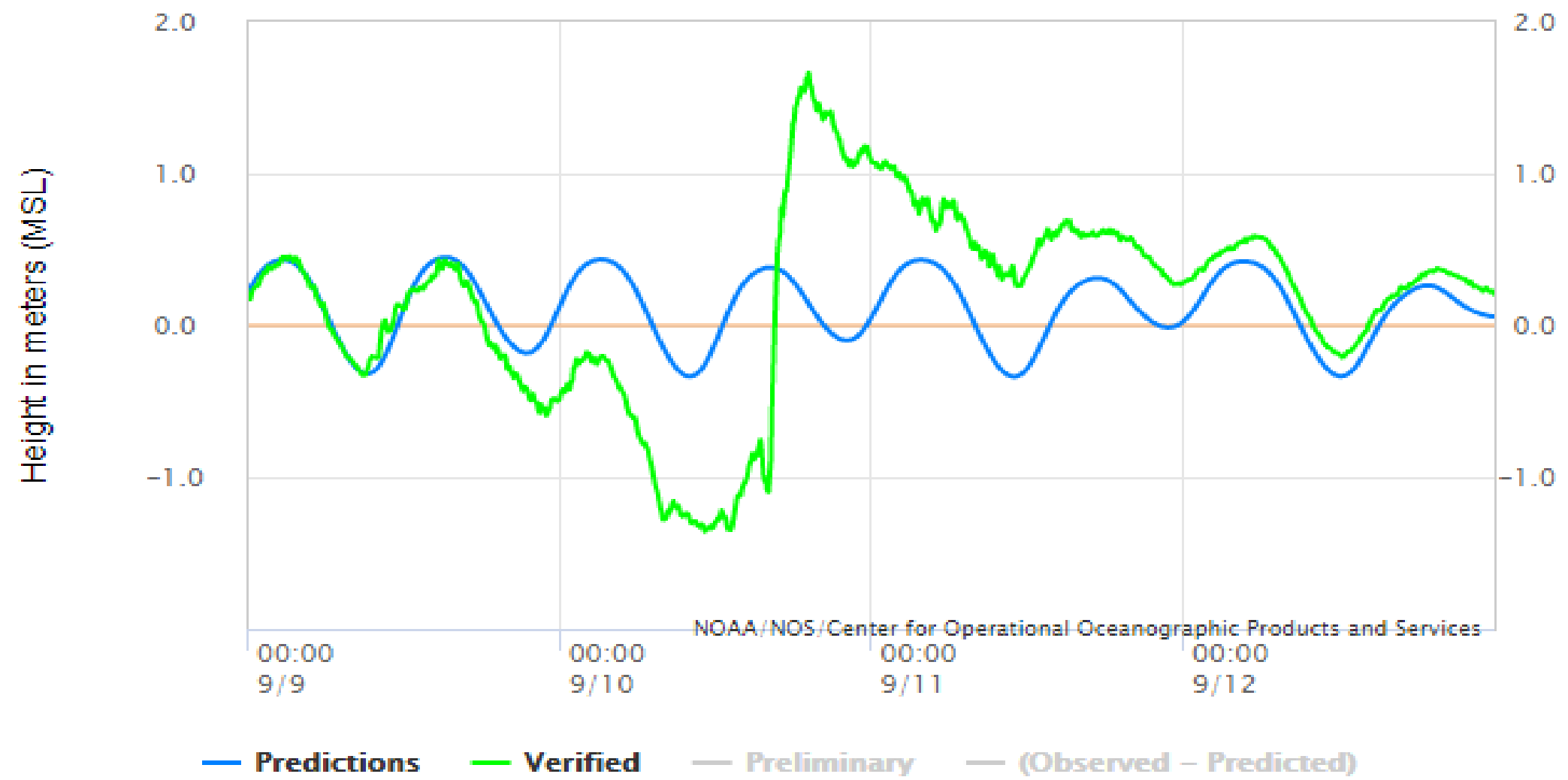
Study Area

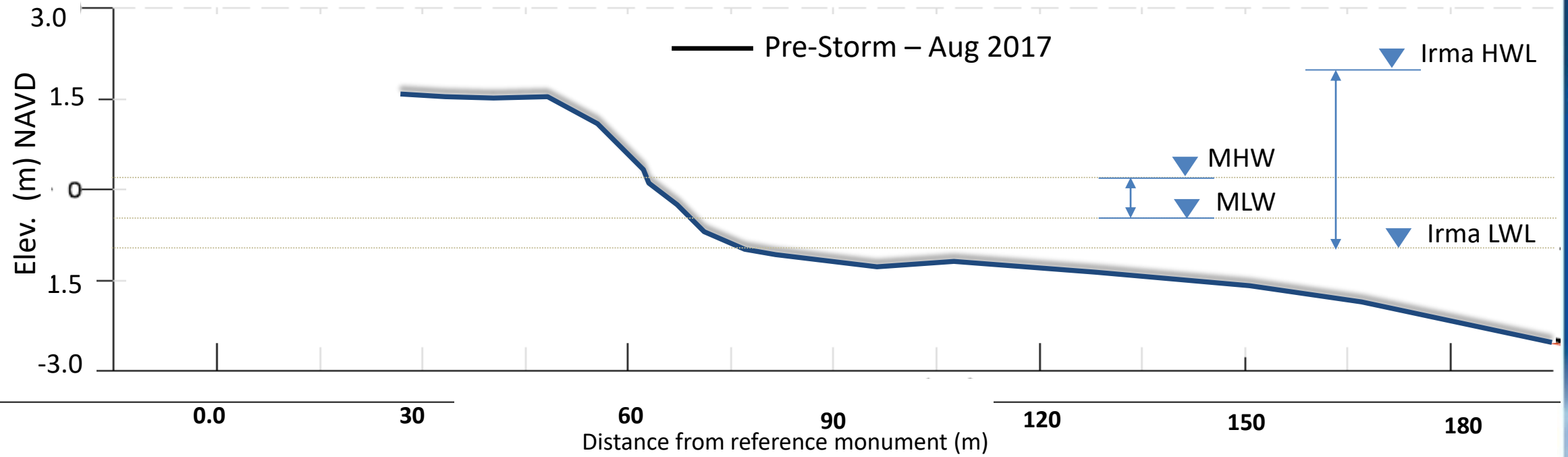
SW and Central FL Coast

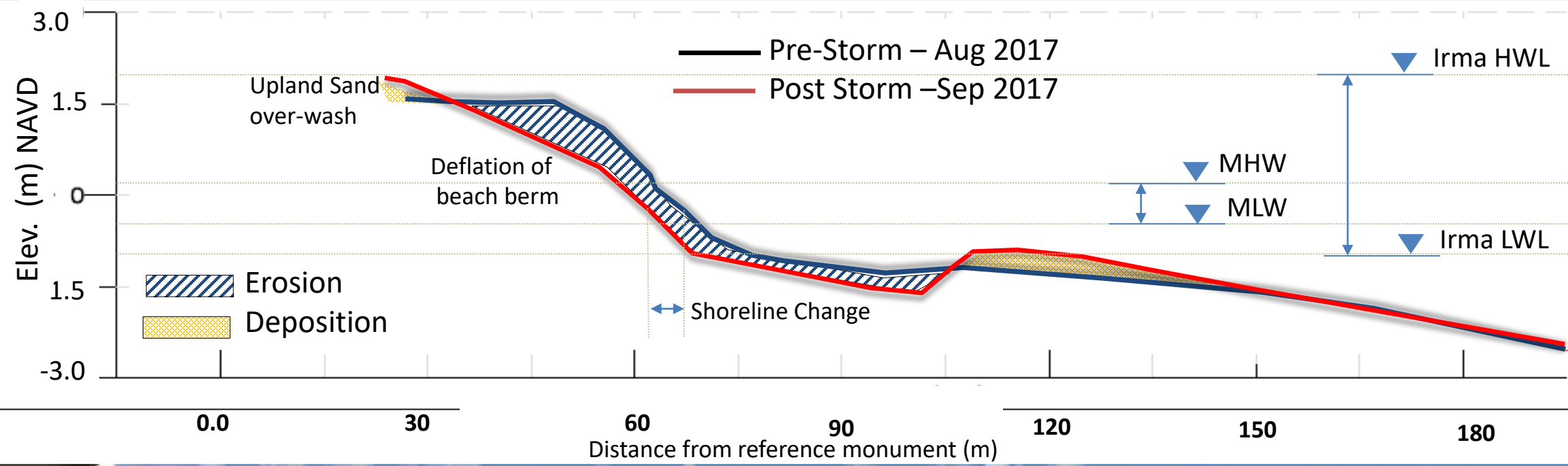


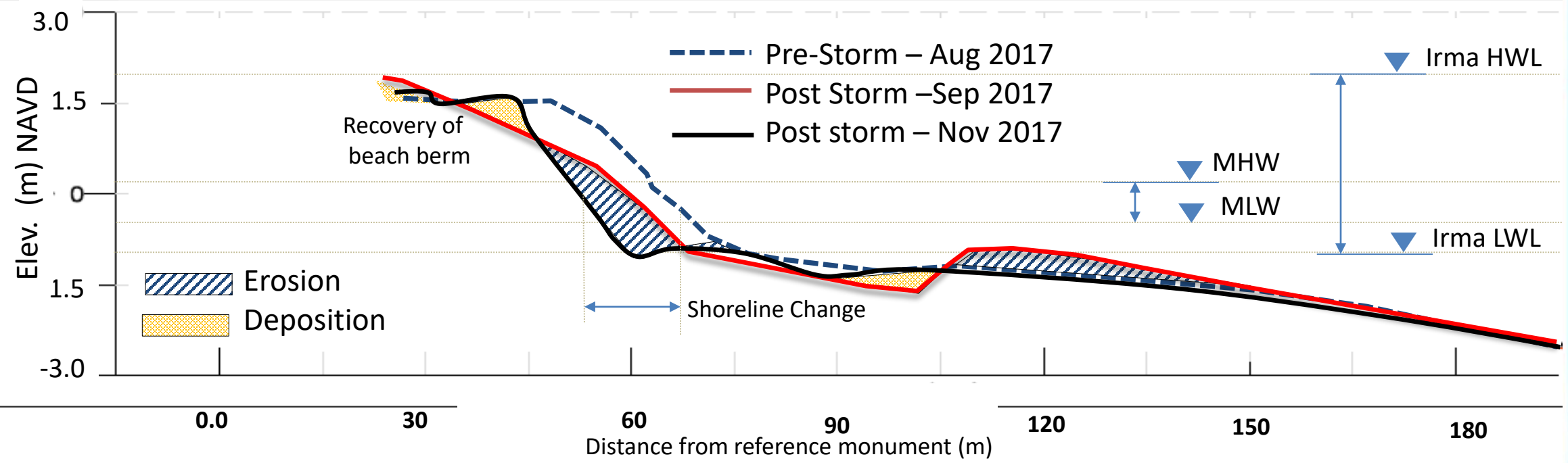


NOAA/NOS/CO-OPS
Observed Water Levels at 8725110, Naples, Gulf of Mexico FL
From 2017/09/09 00:00 LST/LDT to 2017/09/12 23:59 LST/LDT

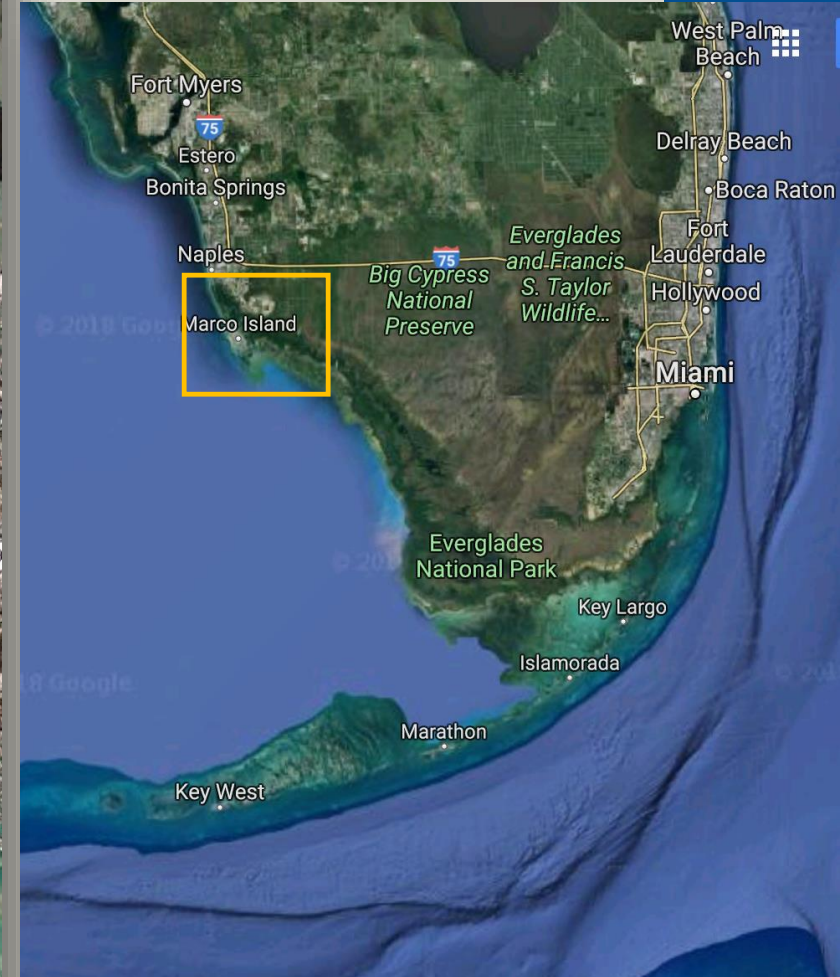








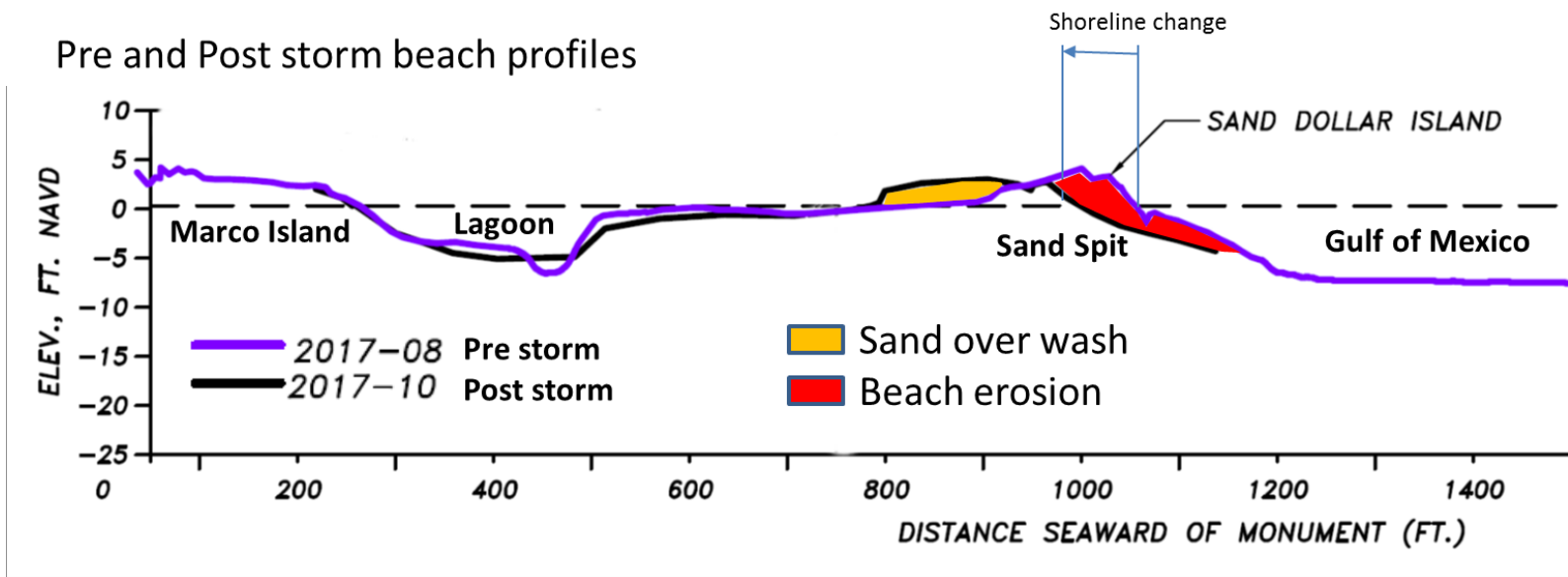
Marco Island





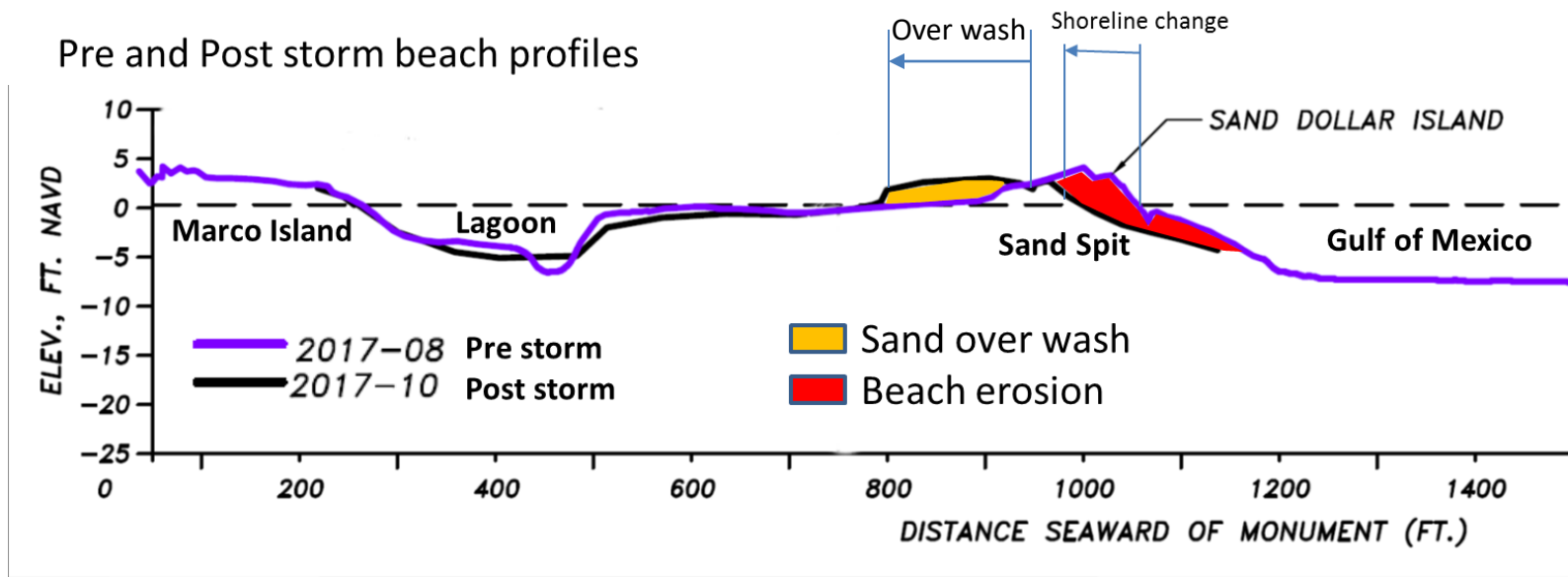


Pre and Post storm beach profiles



H1

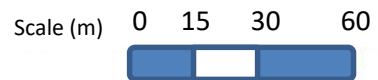




Sep 14, 2017



May, 2017



R 128 – R129

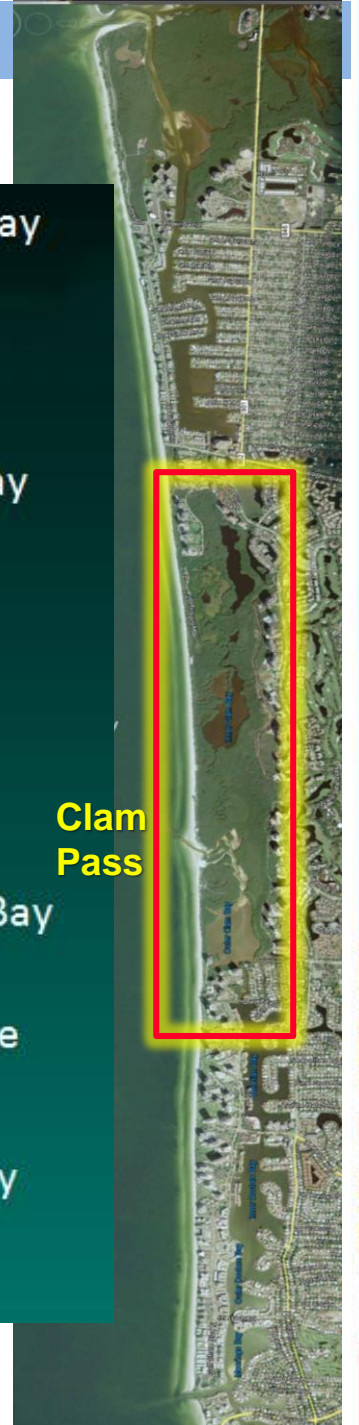
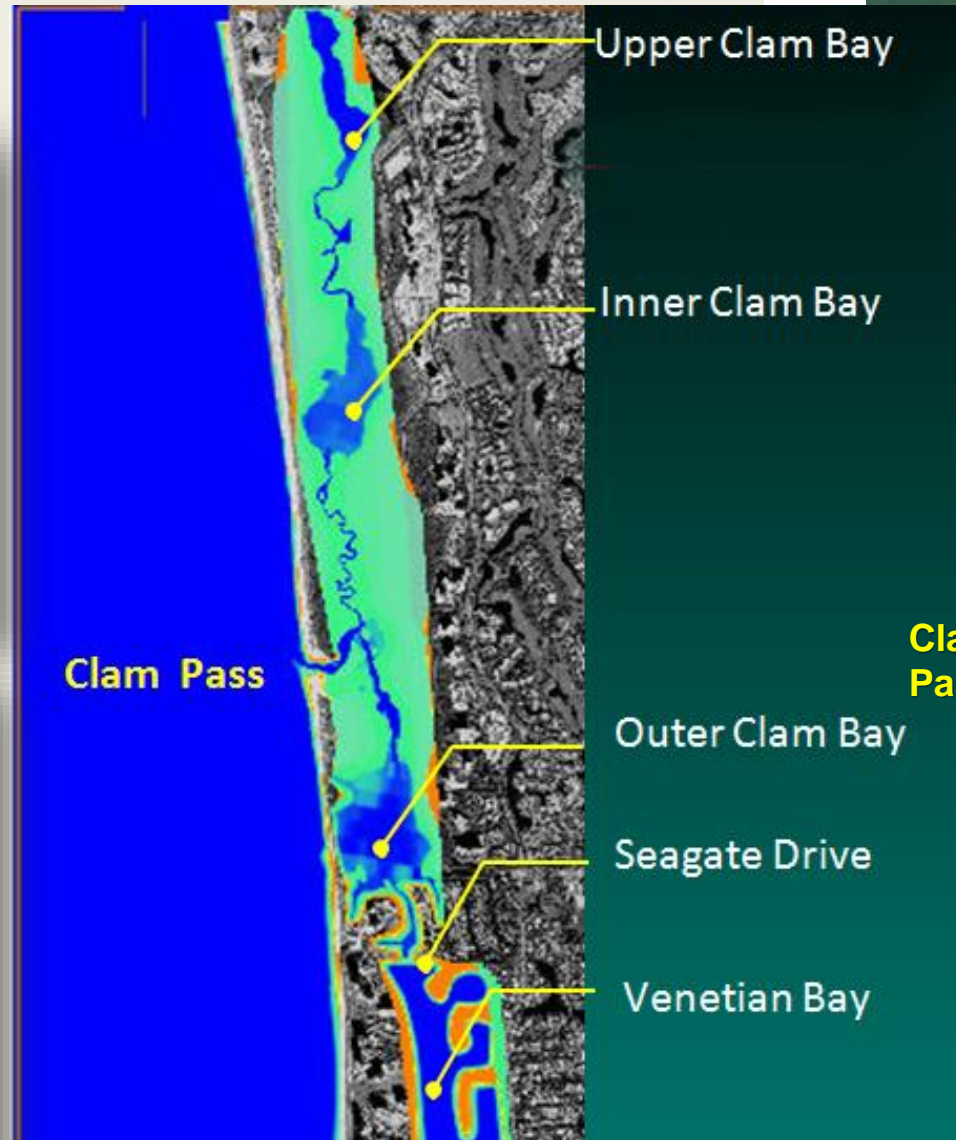
Pre storm shoreline

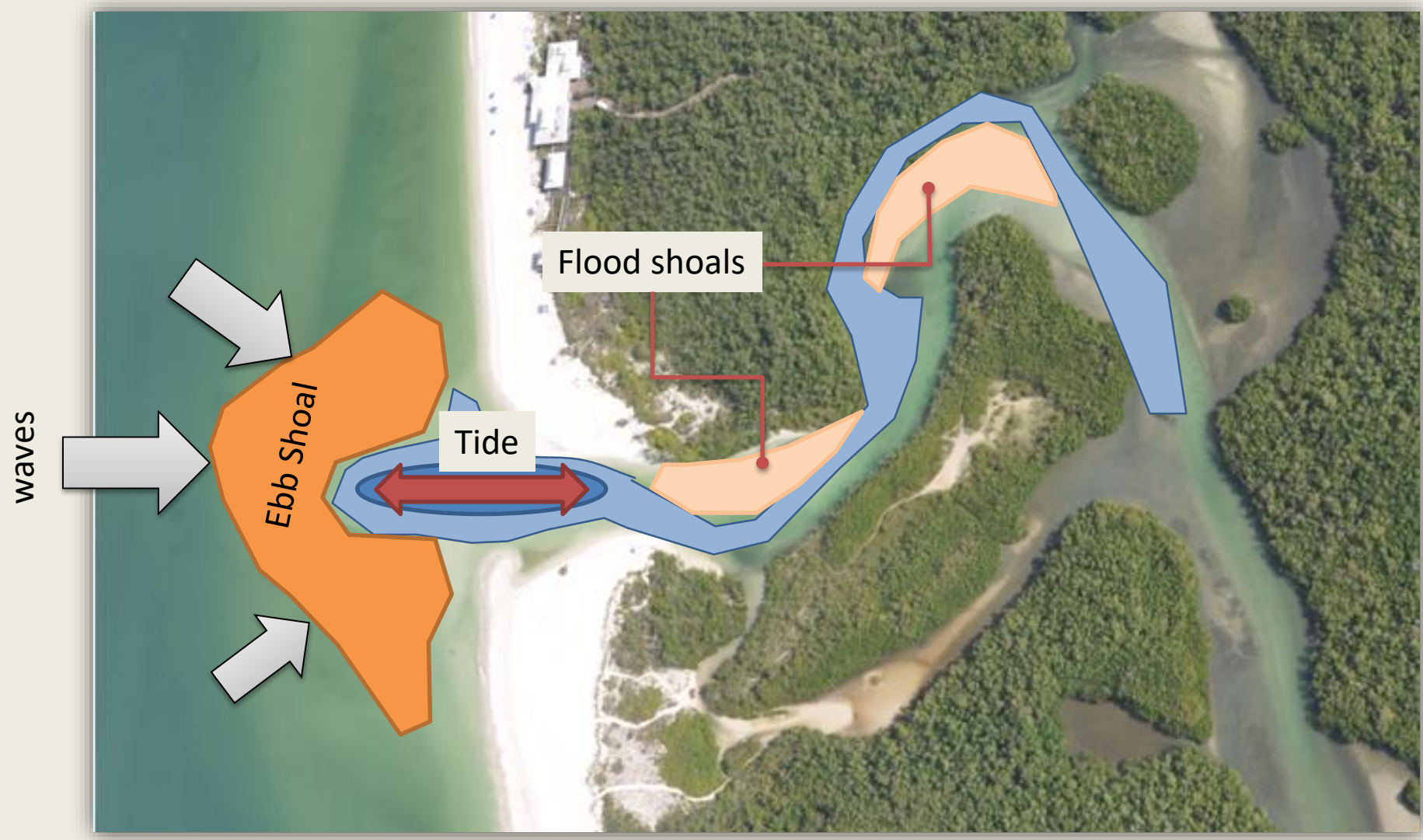
H1





- Clam Pass system





ICCE
2018

This block contains the ICCE 2018 logo at the top, which includes a stylized wave graphic. Below the logo is a vertical strip showing a city skyline at night, with lights reflecting on a body of water.



Jan 2013

Clam Pass closed following 2012 tropical storms Debbie and Isaac



Clam Pass

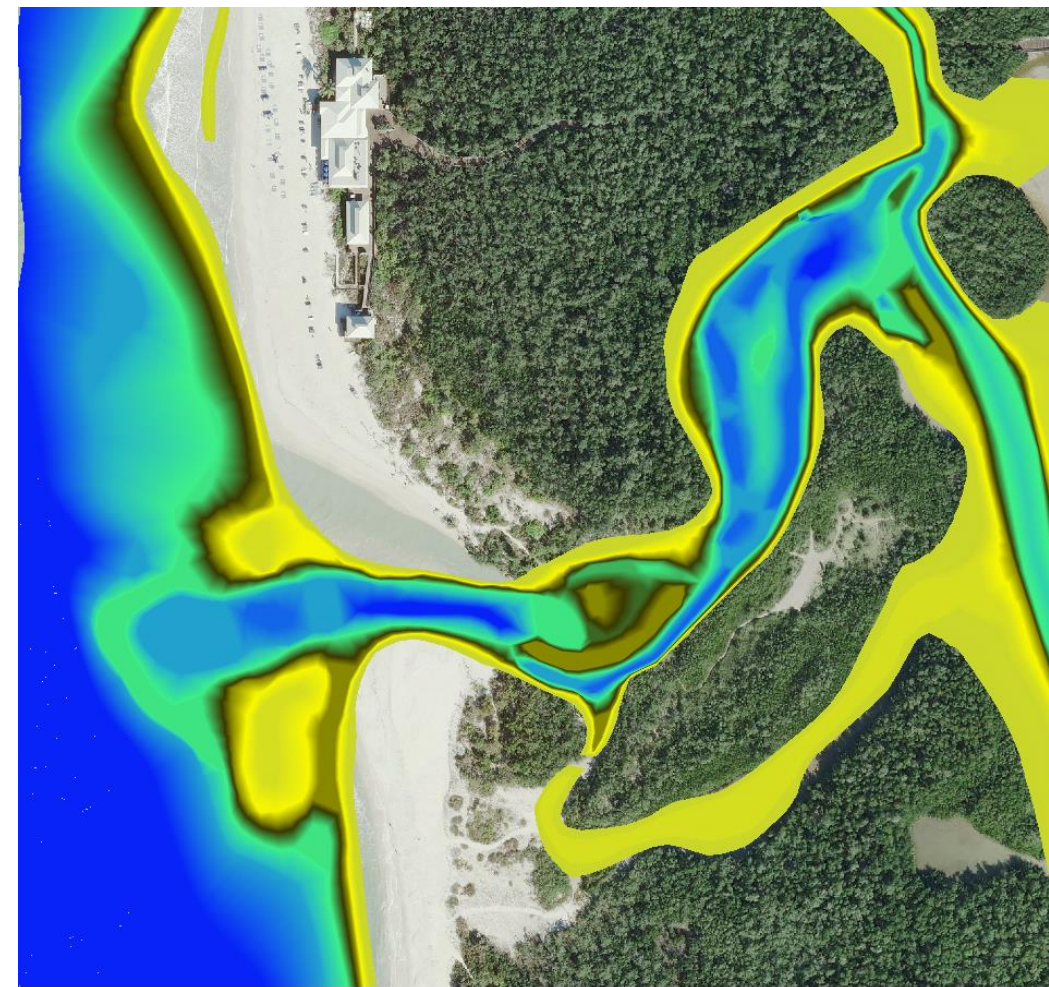




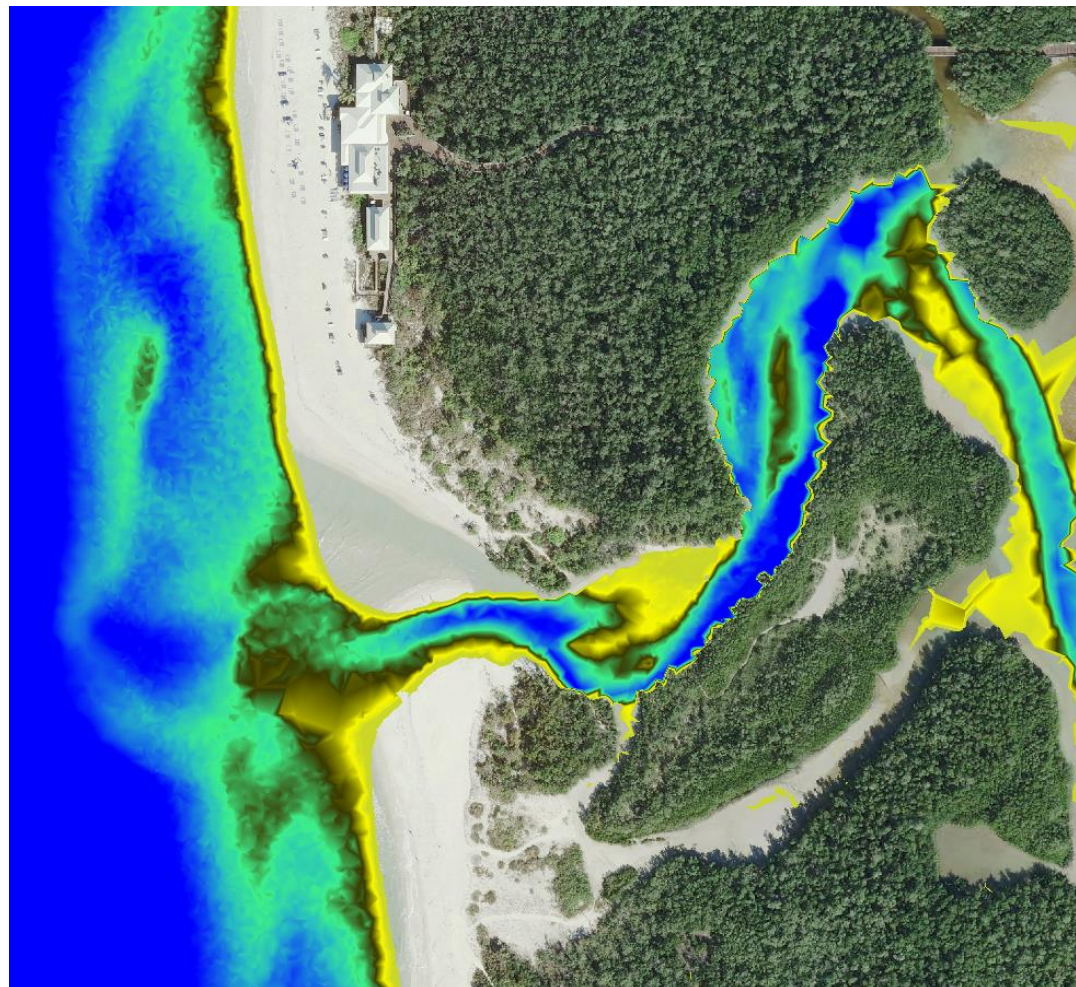
Clam Pass post Hurricane Irma

September 18, 2018

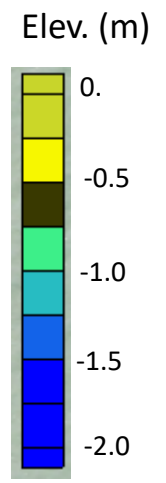


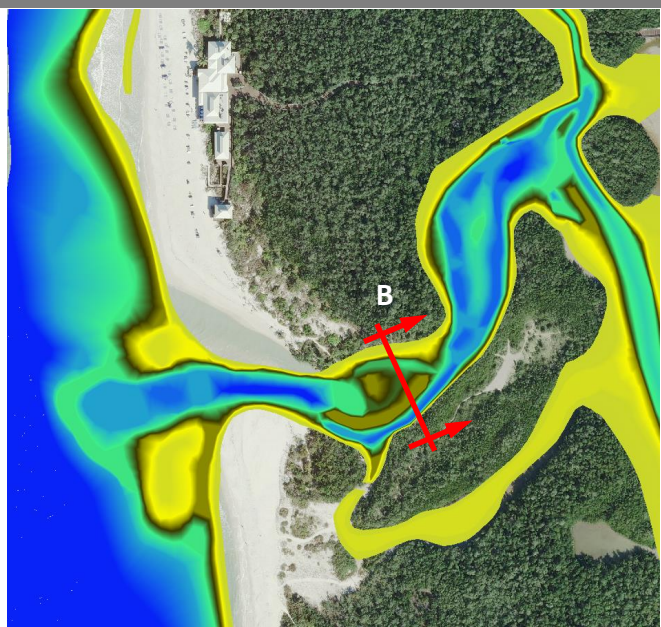


Pre-Irma (August 2017 conditions)

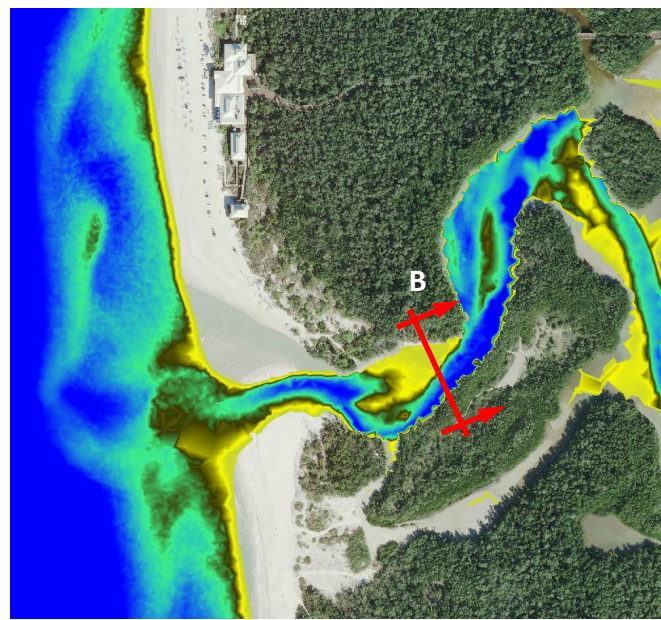


Post-Irma (September 2017 conditions)

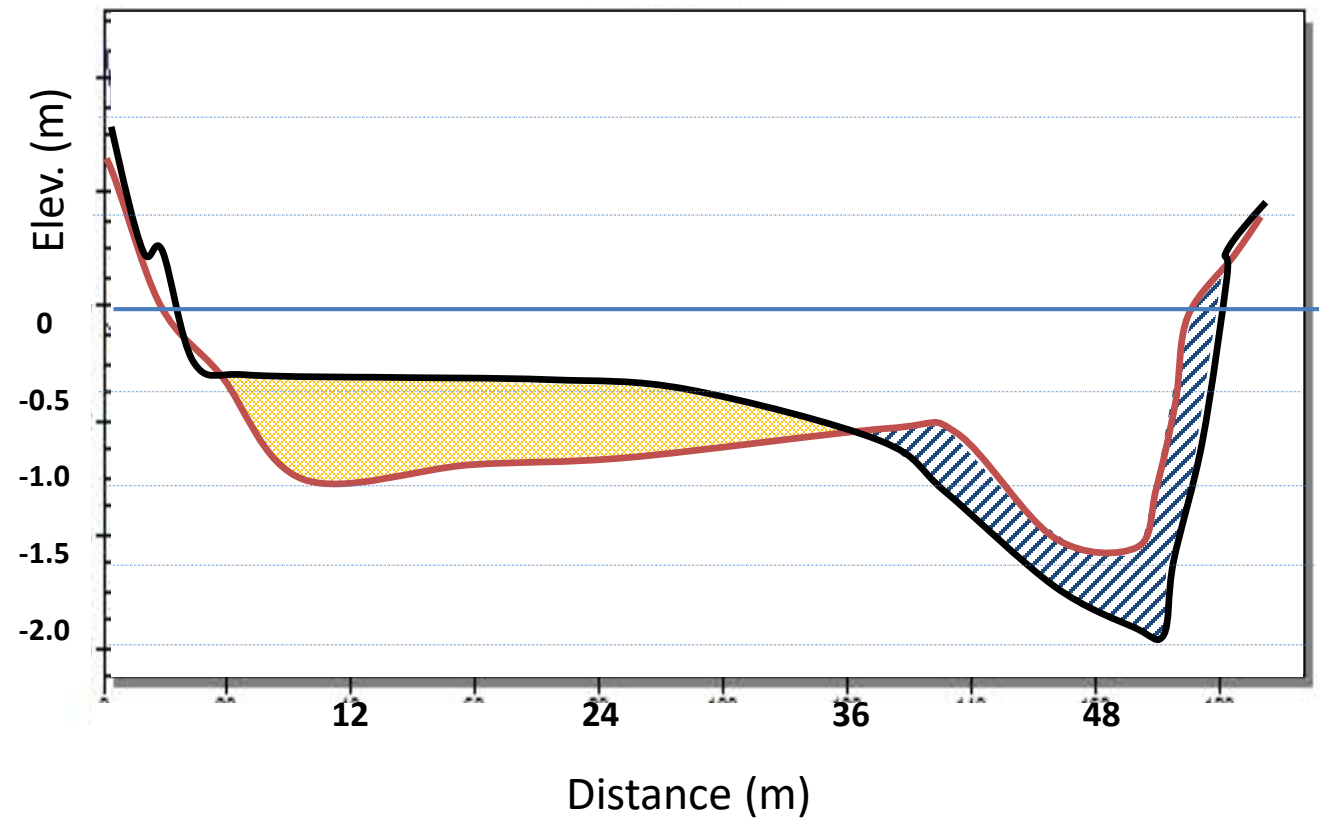
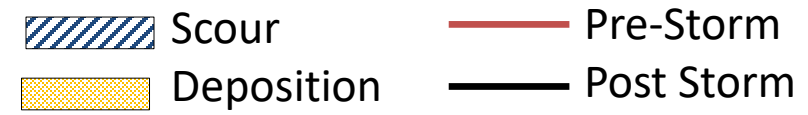
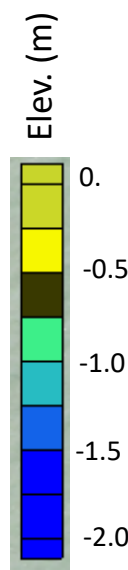


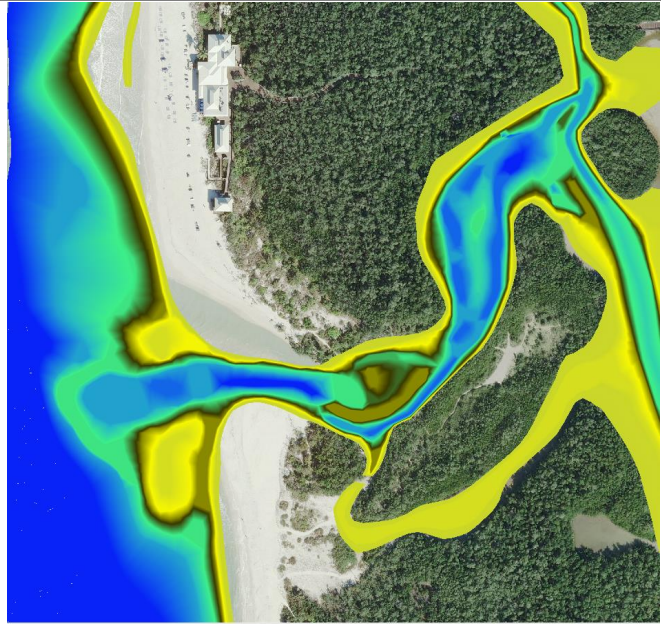


Pre-Irma (August 2017 conditions)

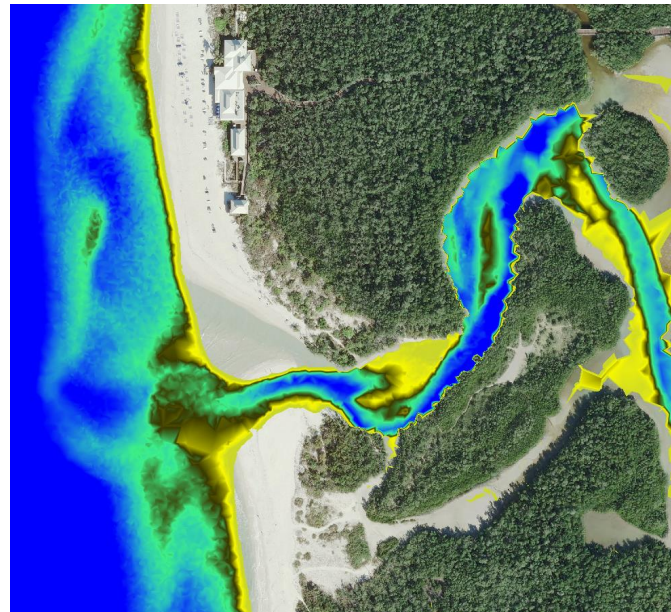


Post-Irma (September 2017 conditions)

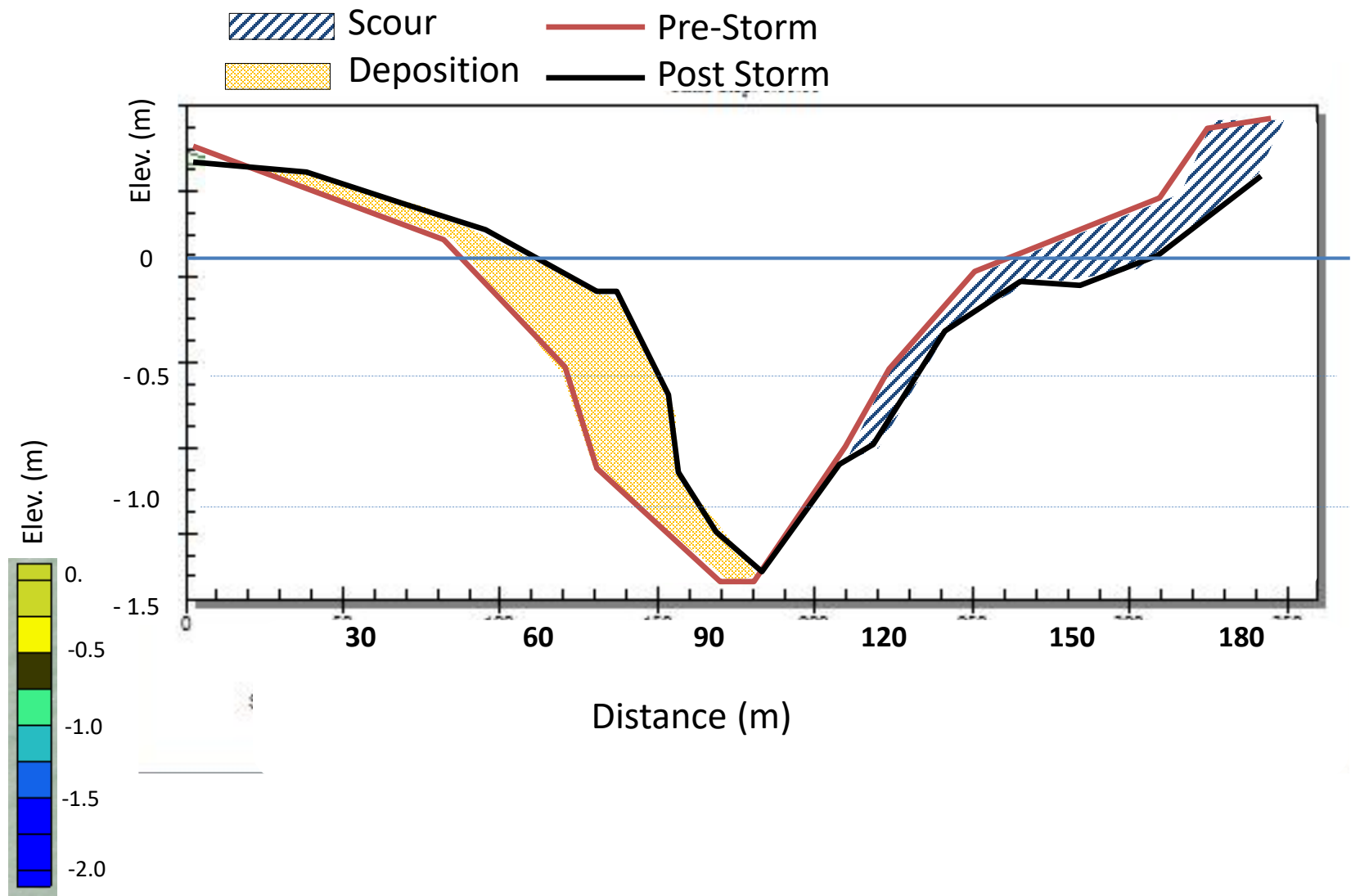


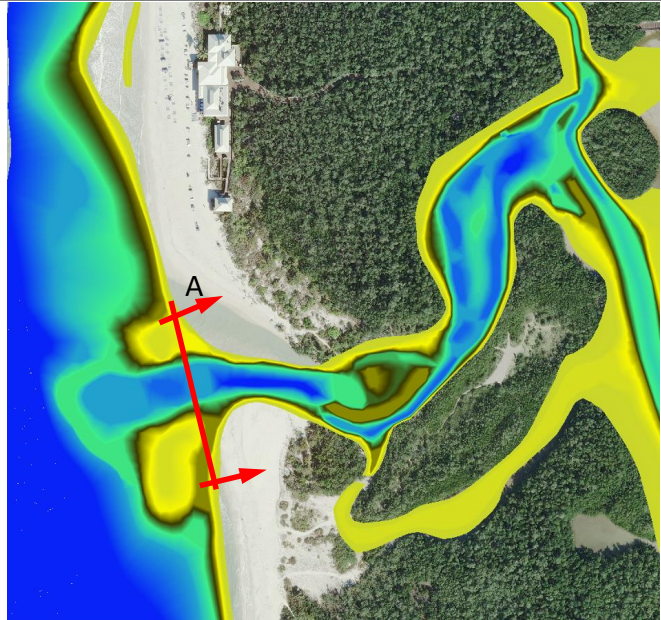


Pre-Irma (August 2017 conditions)

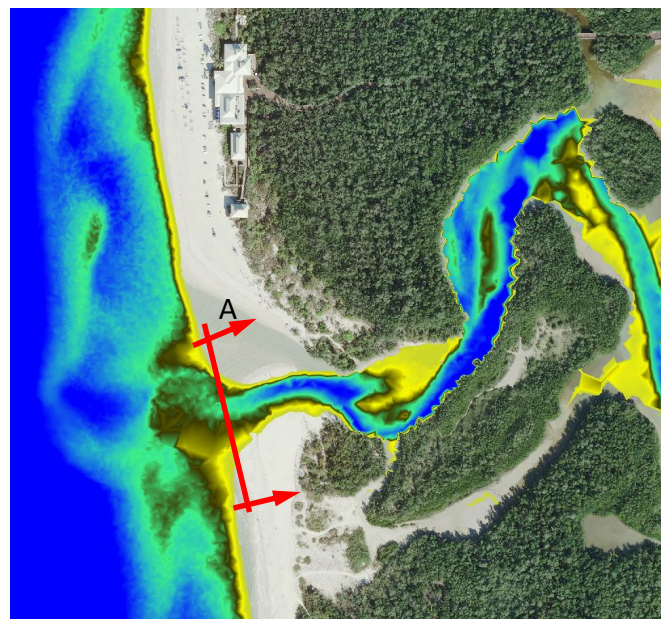


Post-Irma (September 2017 conditions)

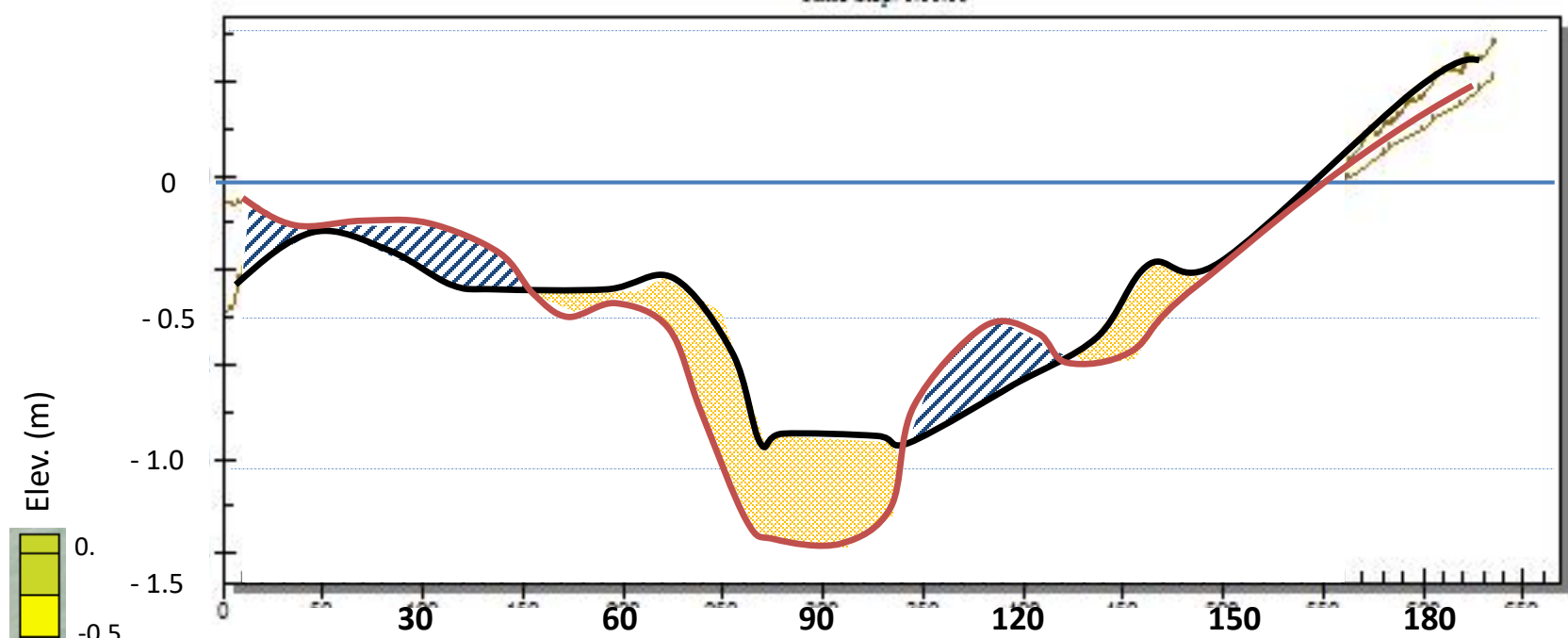
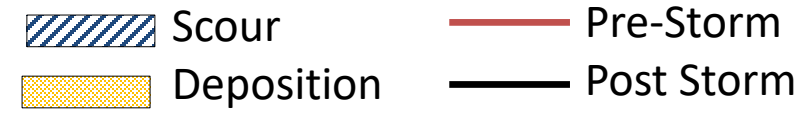




Pre-Irma (August 2017 conditions)

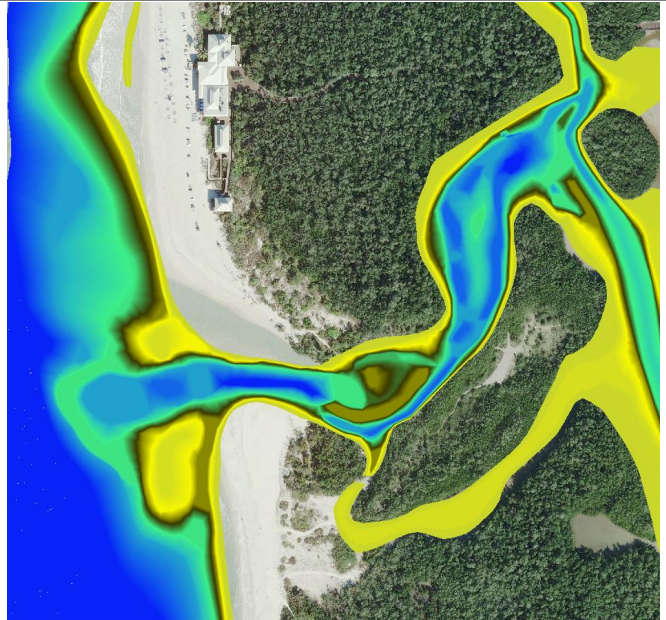


Post-Irma (September 2017 conditions)

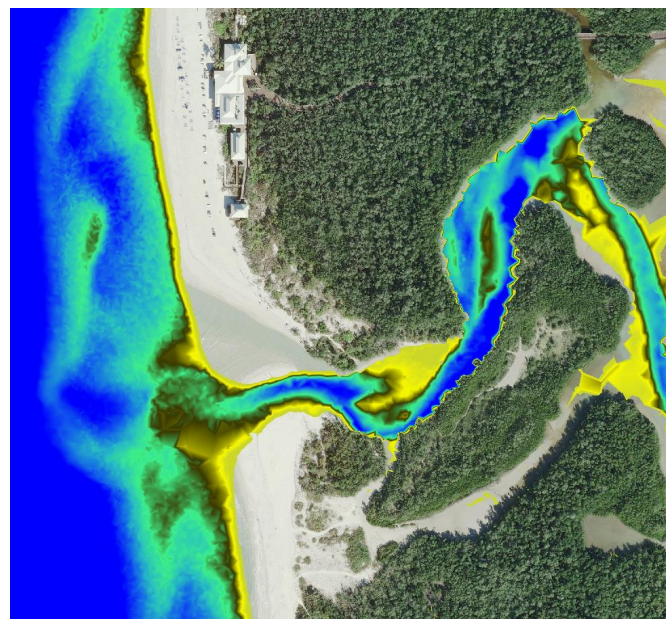


Clam Pass-Flood shoal Section A

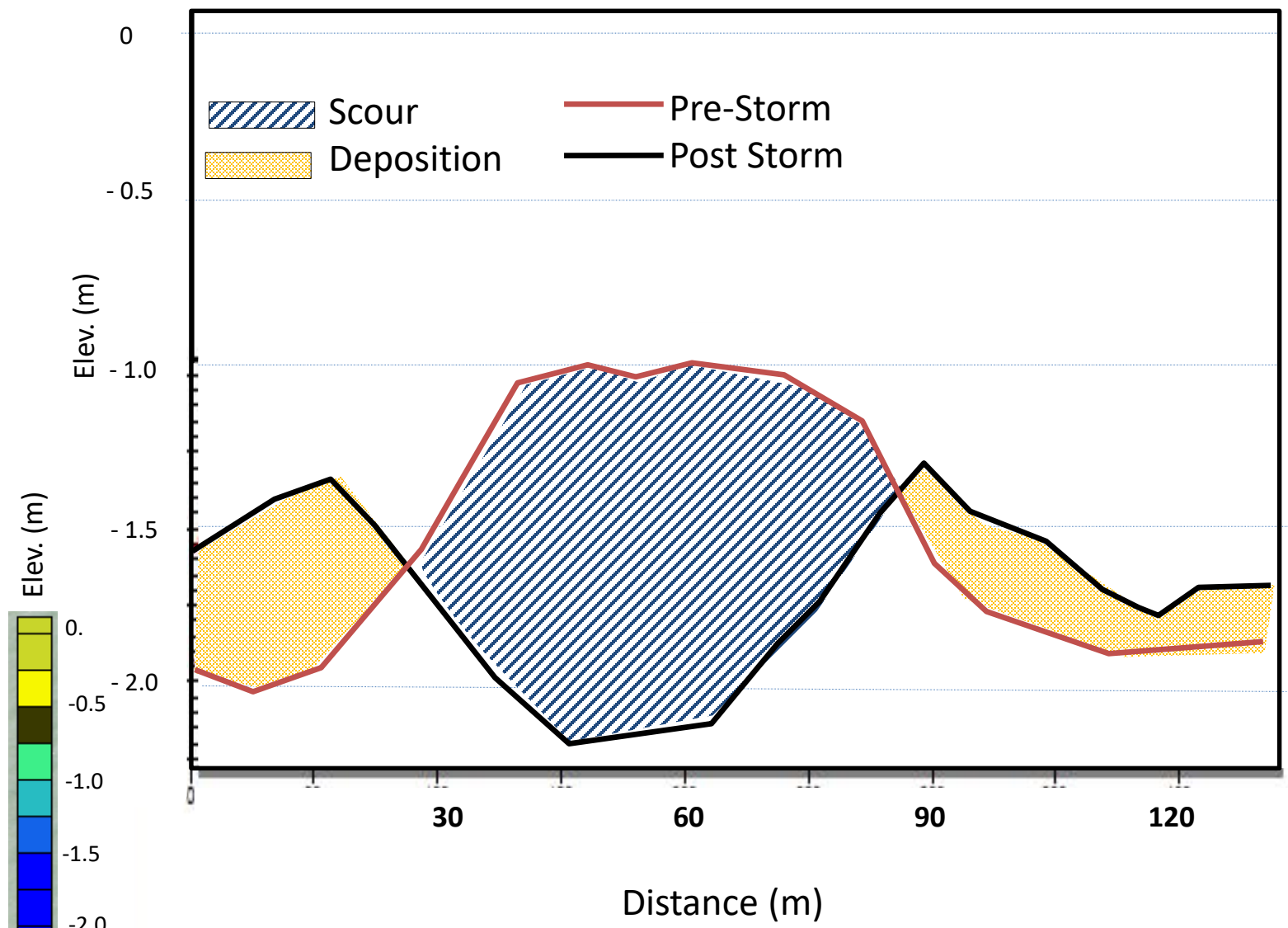


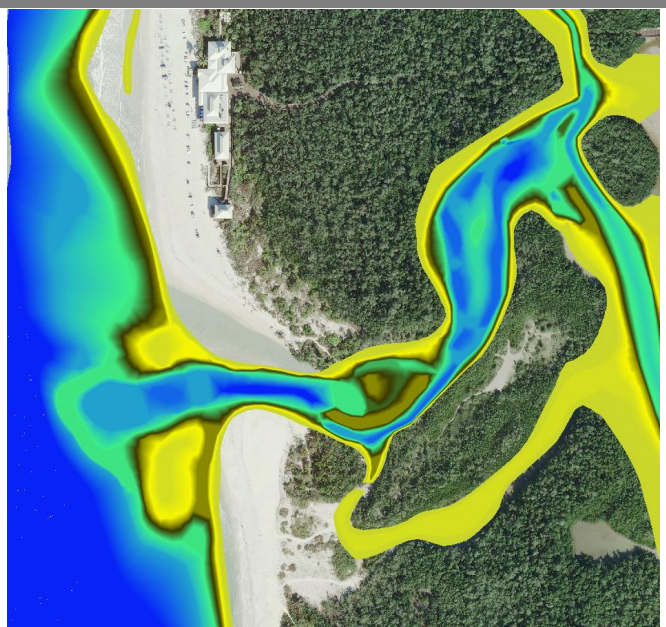


Pre-Irma (August 2017 conditions)

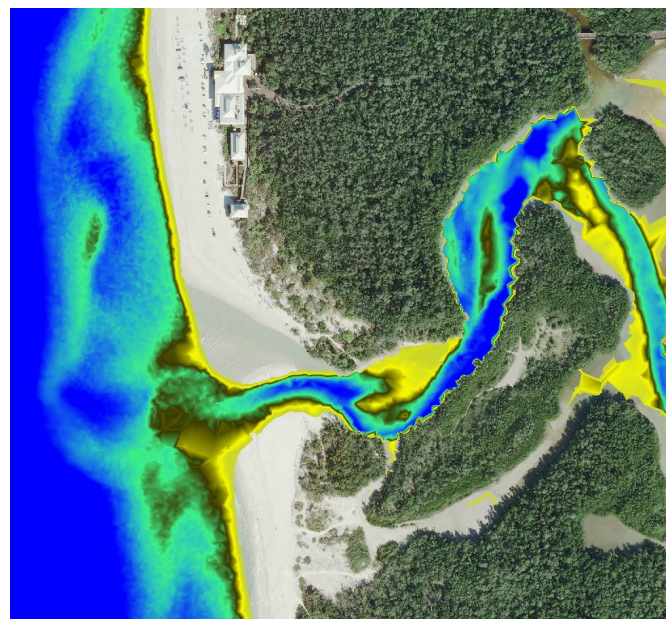


Post-Irma (September 2017 conditions)





Pre-Irma (August 2017 conditions)



Post-Irma (September 2017 conditions)



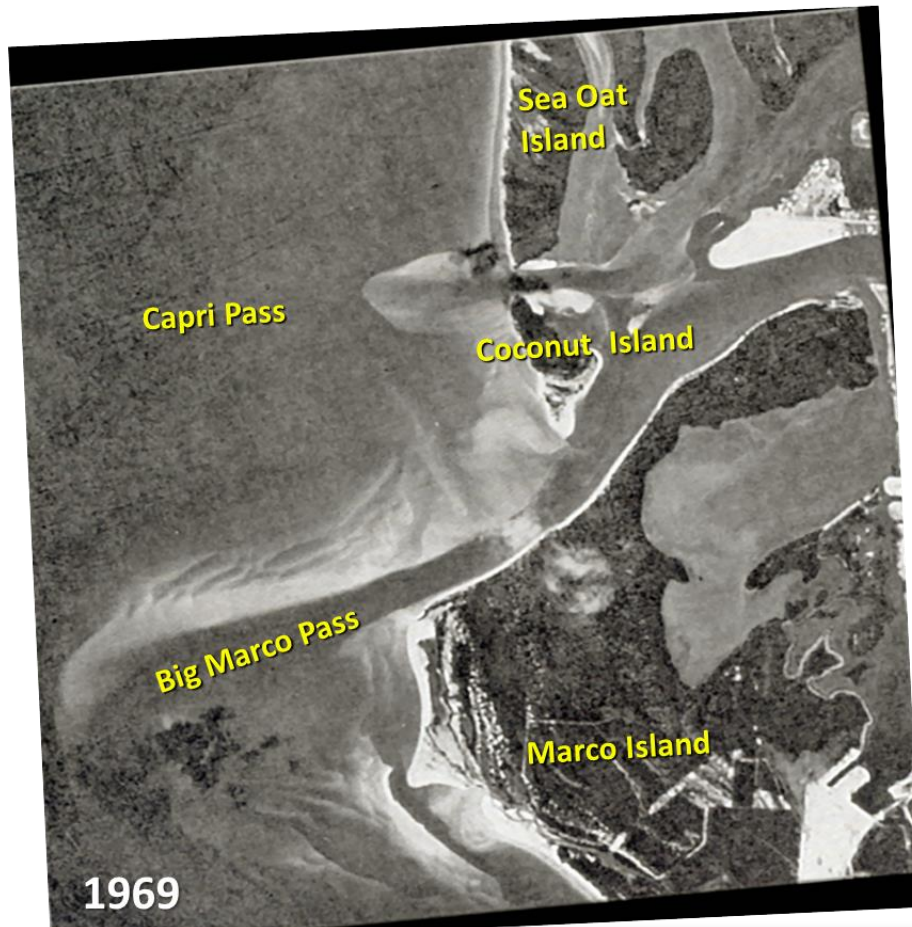
Scour



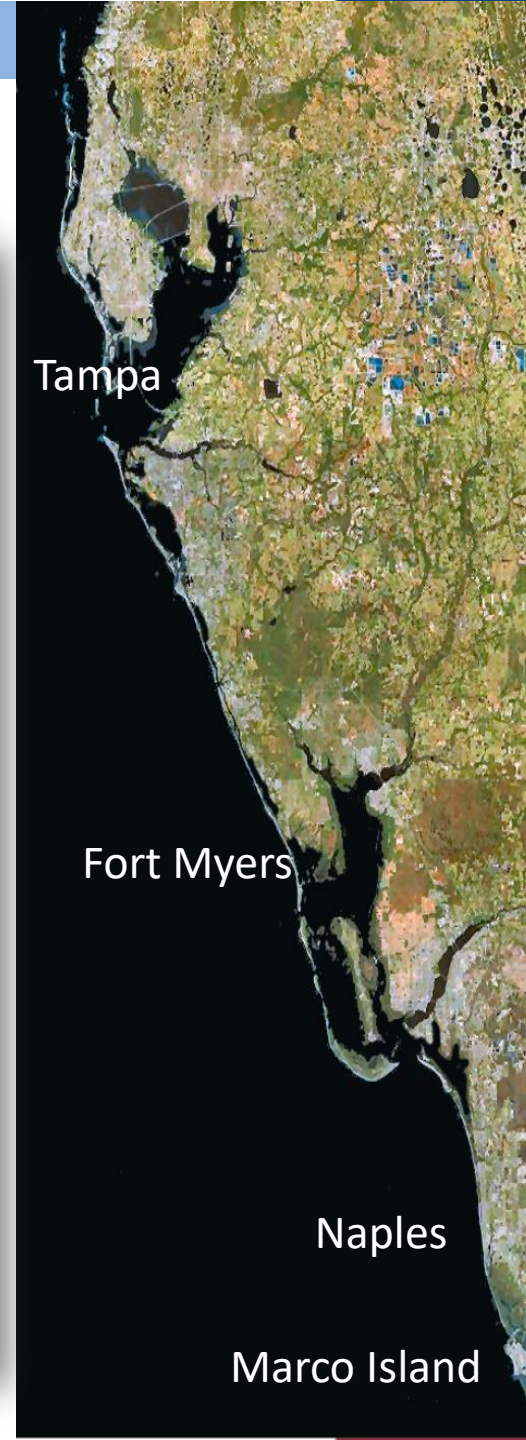
Deposition



- Major Hurricanes and Tropical Storms effects on coastal morphology
 - *Hurricanes long term morphology response*

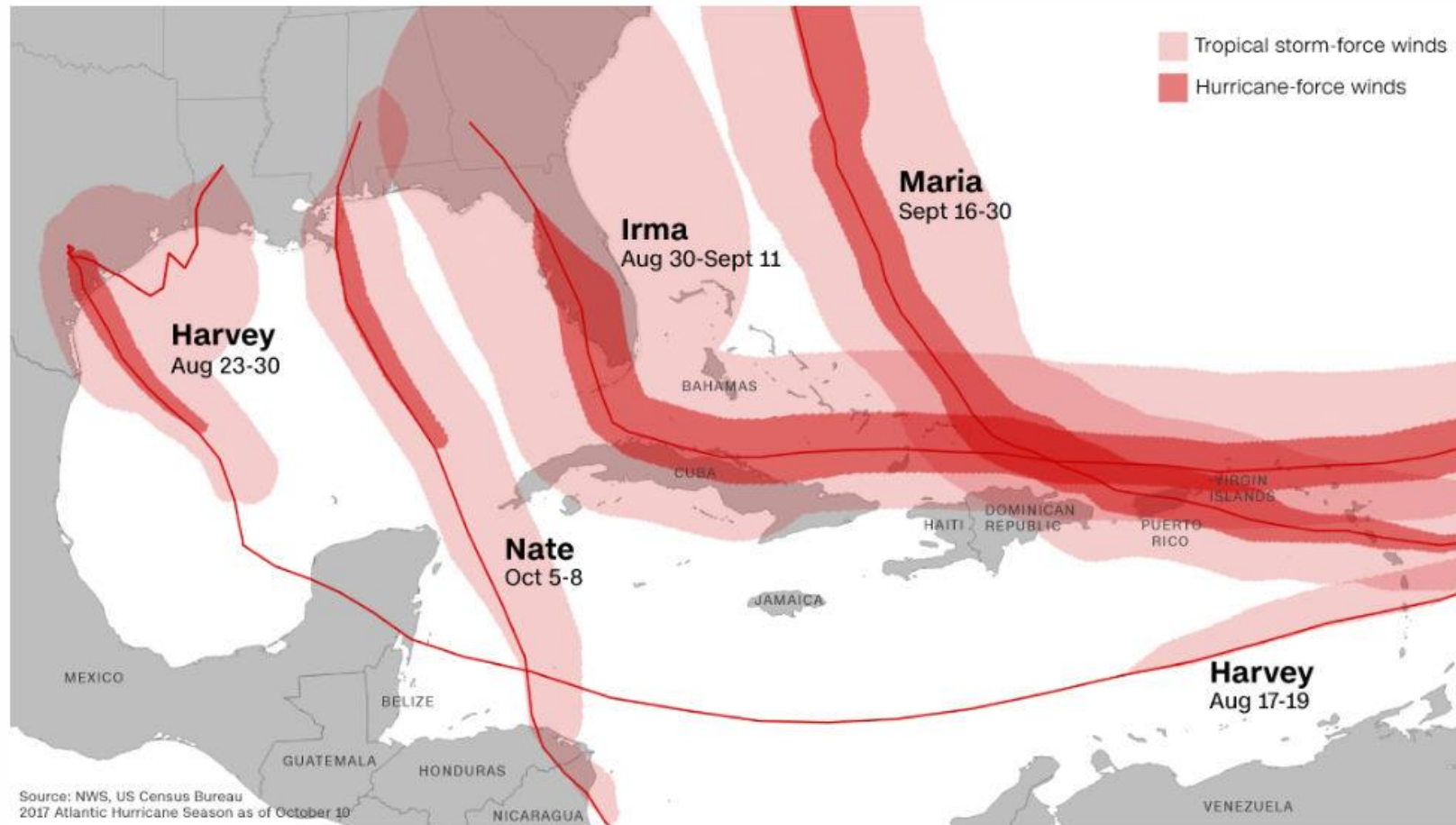


Natural inlet migration up-drift
Up-drift erosion and downdrift sand spit growth



- Major Hurricanes and Tropical Storms effects on coastal morphology
 - Major Hurricane and Tropical storms
 - Storm intensity, path, duration

Harvey, Irma and Maria.



■ Short term morphologic impacts

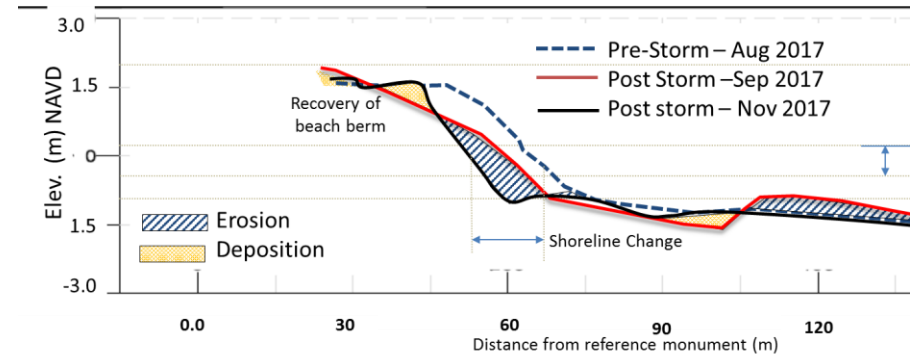
- *Initial response and following adjustments*
- *Natural recovery stages*
- *Sequence of events*
- *Duration of events and calm conditions*
- *Maintenance projects*

■ Long term morphologic impacts

- *Barrier islands and sand spits*
- *evolution stage and size*
- *Natural systems Vs Managed coastal areas*
- *Inlet migration/closures/opening*
- *Limitations of restoration projects*
 - *Beaches/inlet channel*
 - *Morphologic features*

■ Storm Surge, water levels and sea level rise

- *Storm surge projections*
- *Resiliency and sustainable developments*





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