

# Response of Engineered Berms and Natural Shell Hash Fronting-Features to Hurricane Nicole, St. Johns County

A scenic view of a coastal landscape. In the foreground, there is a dense thicket of green and yellowish vegetation. To the left, a paved road with a sign is visible. In the middle ground, a sandy beach stretches along the coast, with waves breaking on the shore. The background shows a clear blue sky and distant land.

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# A BIG THANK YOU TO...



# OUTLINE

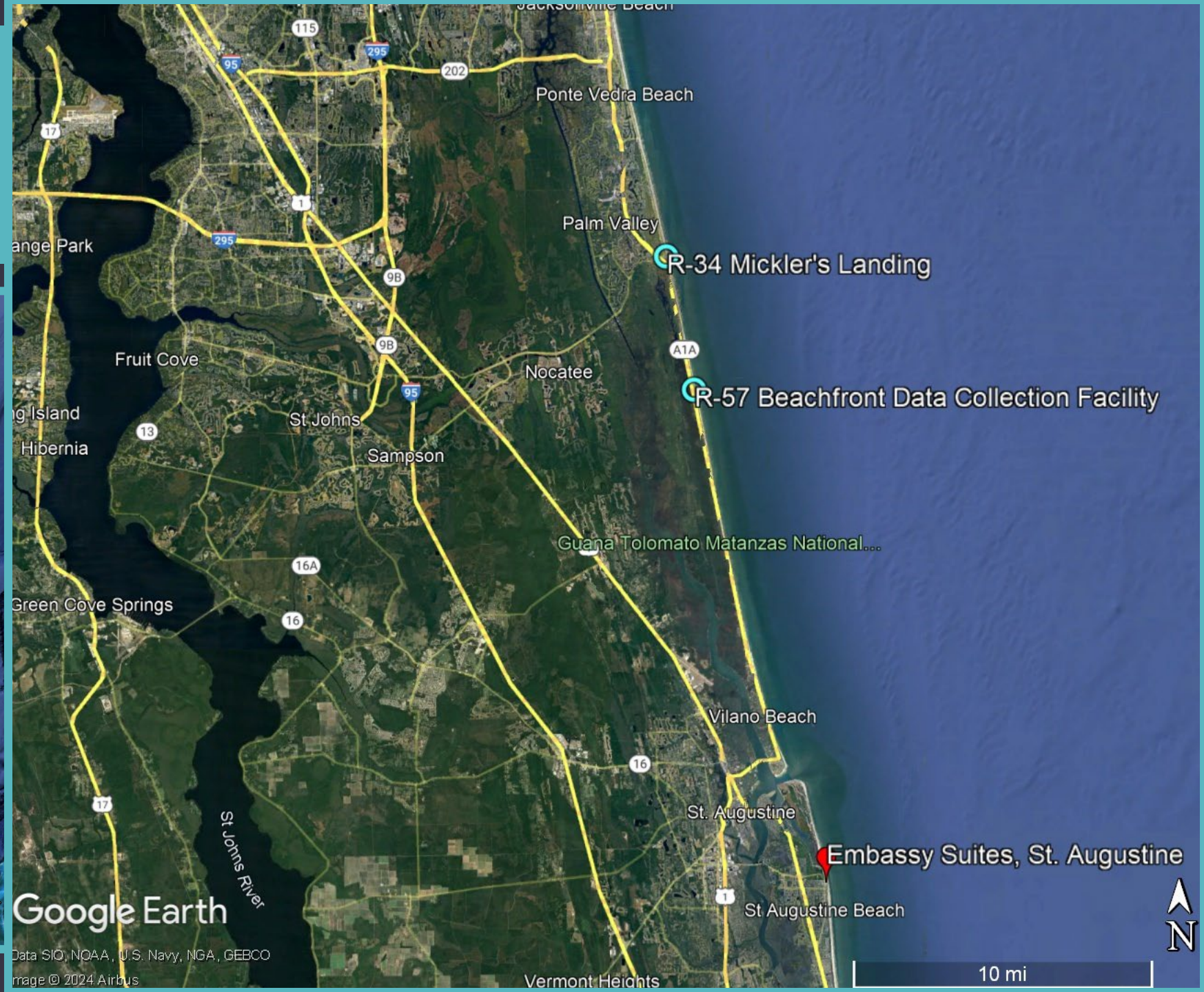
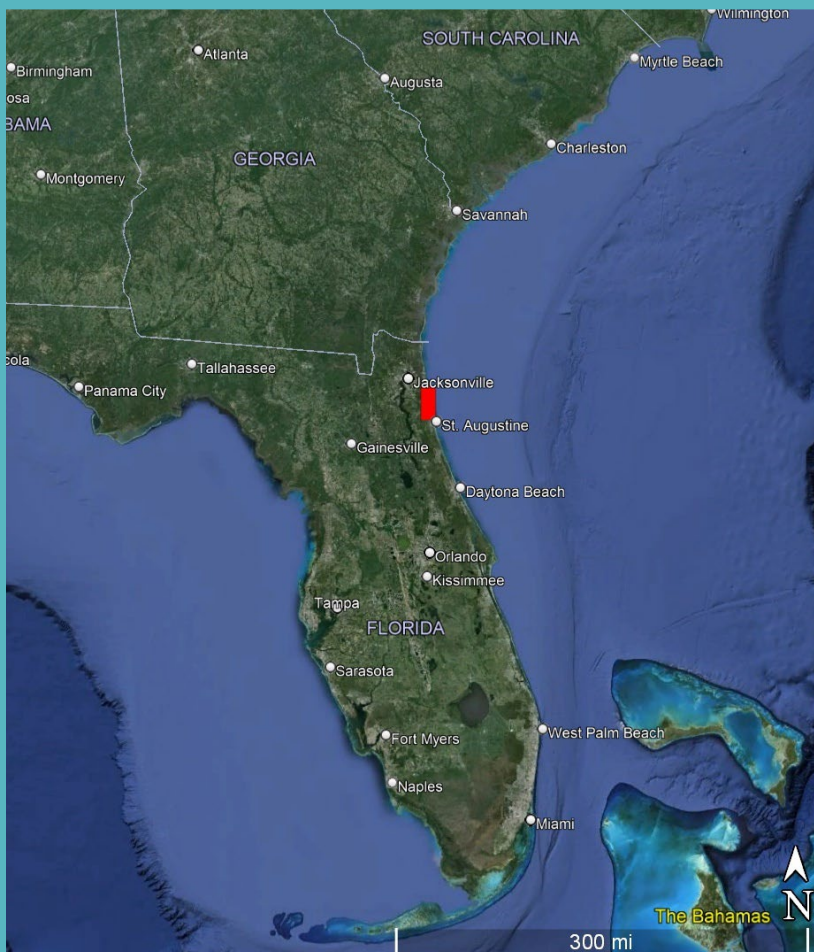
1. Matthew & Irma erosion impacts in St. Johns County.

2. The impacts of Hurricane Nicole in St. Johns County.

3. Why did St. Johns County Erode the way it did?

4. What can we do to mitigate future erosion?

# AREA OF STUDY



Google Earth

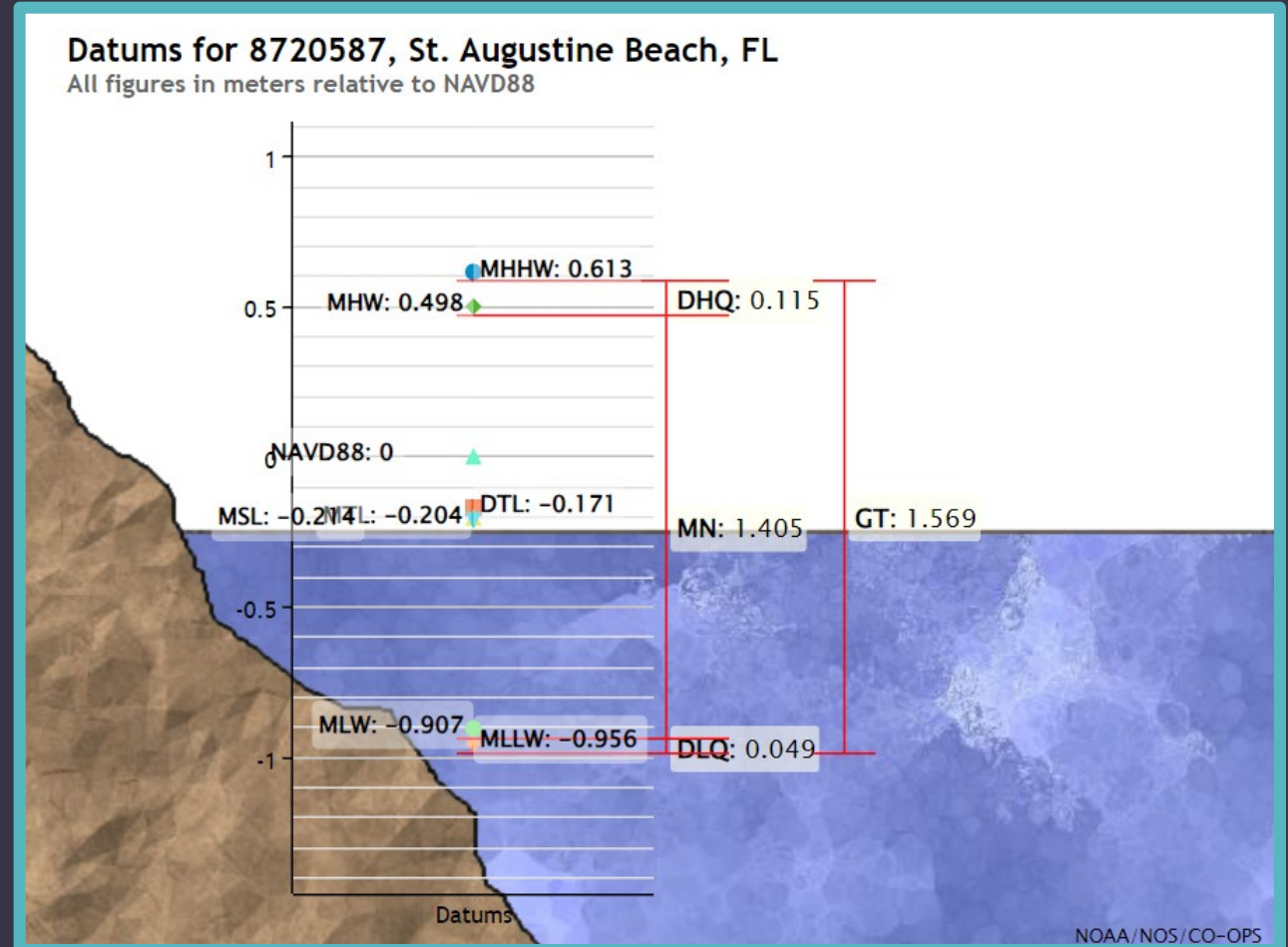
Data SIO, NOAA, U.S. Navy, NGA, GEBCO  
Image © 2024 Airbus

Vermont Heights

10 mi

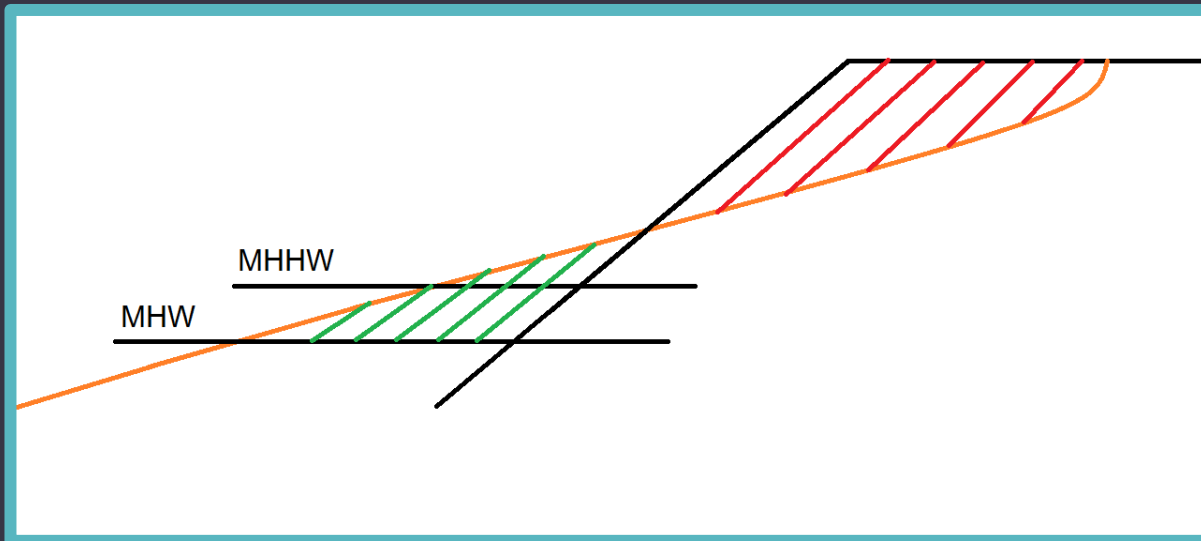
# DEFINITIONS

- NAVD88: North American Vertical Datum of 1988
- MHW: Mean High Water
  - (NAVD88 + 0.498 m)
- MHHW: Mean Higher High Water
  - (NAVD88 + 0.613 m)

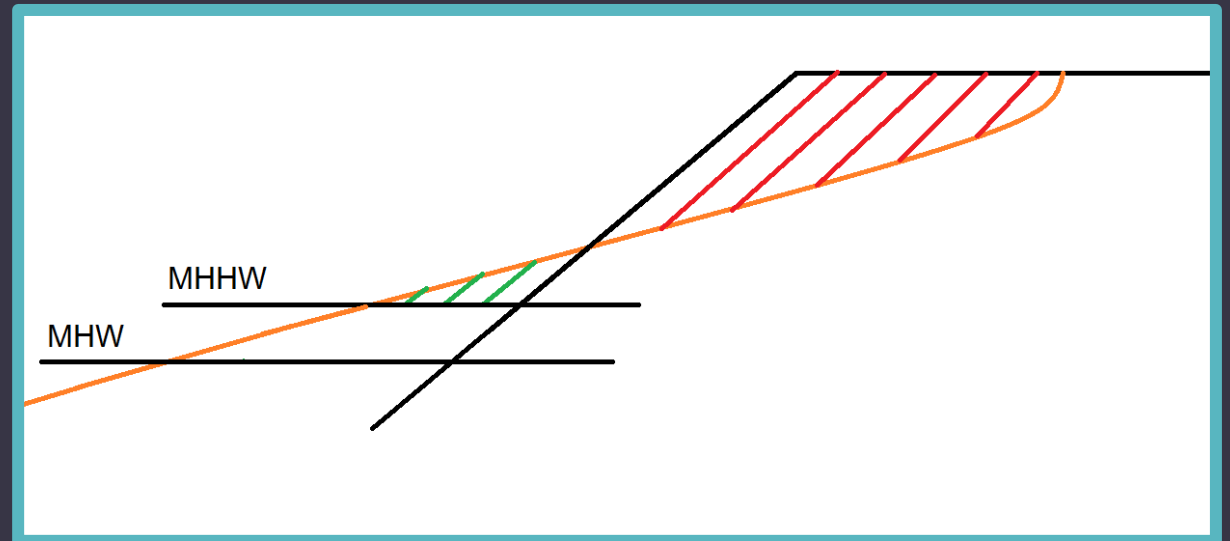


# HISTORICAL EROSION DATA

## Hurricane Nicole Data

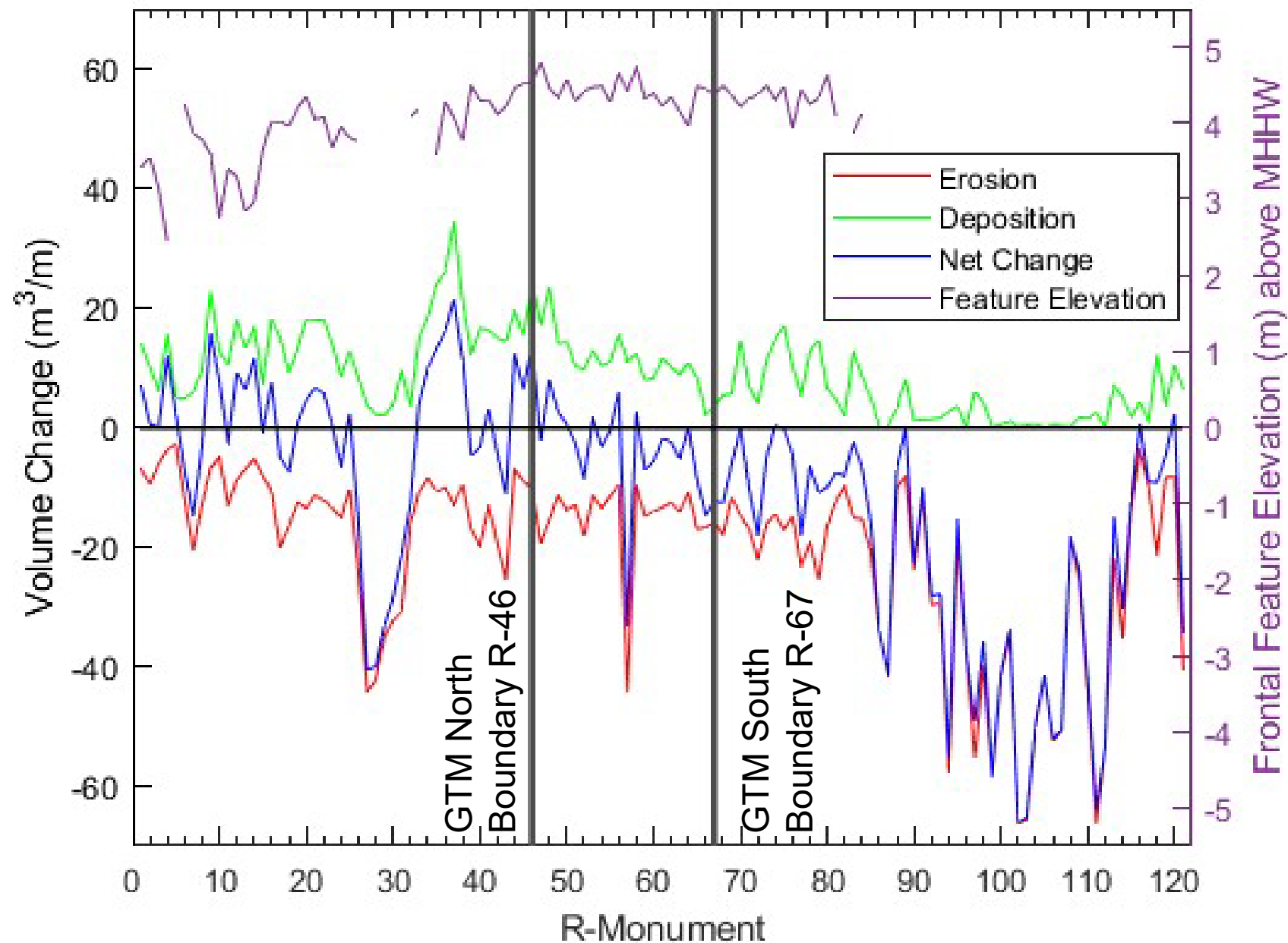


## Hurricanes Matthew and Irma Data



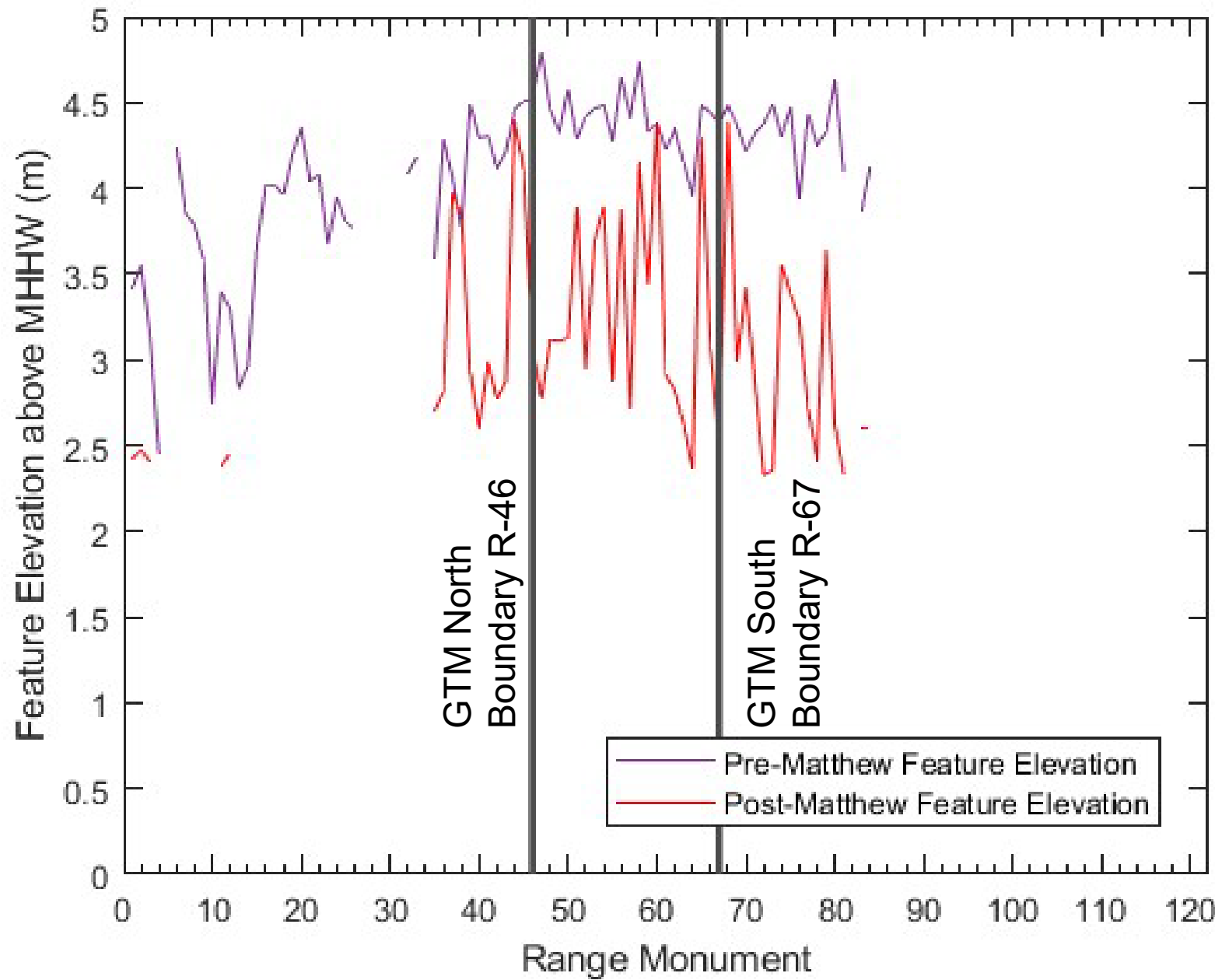


# HURRICANE MATTHEW

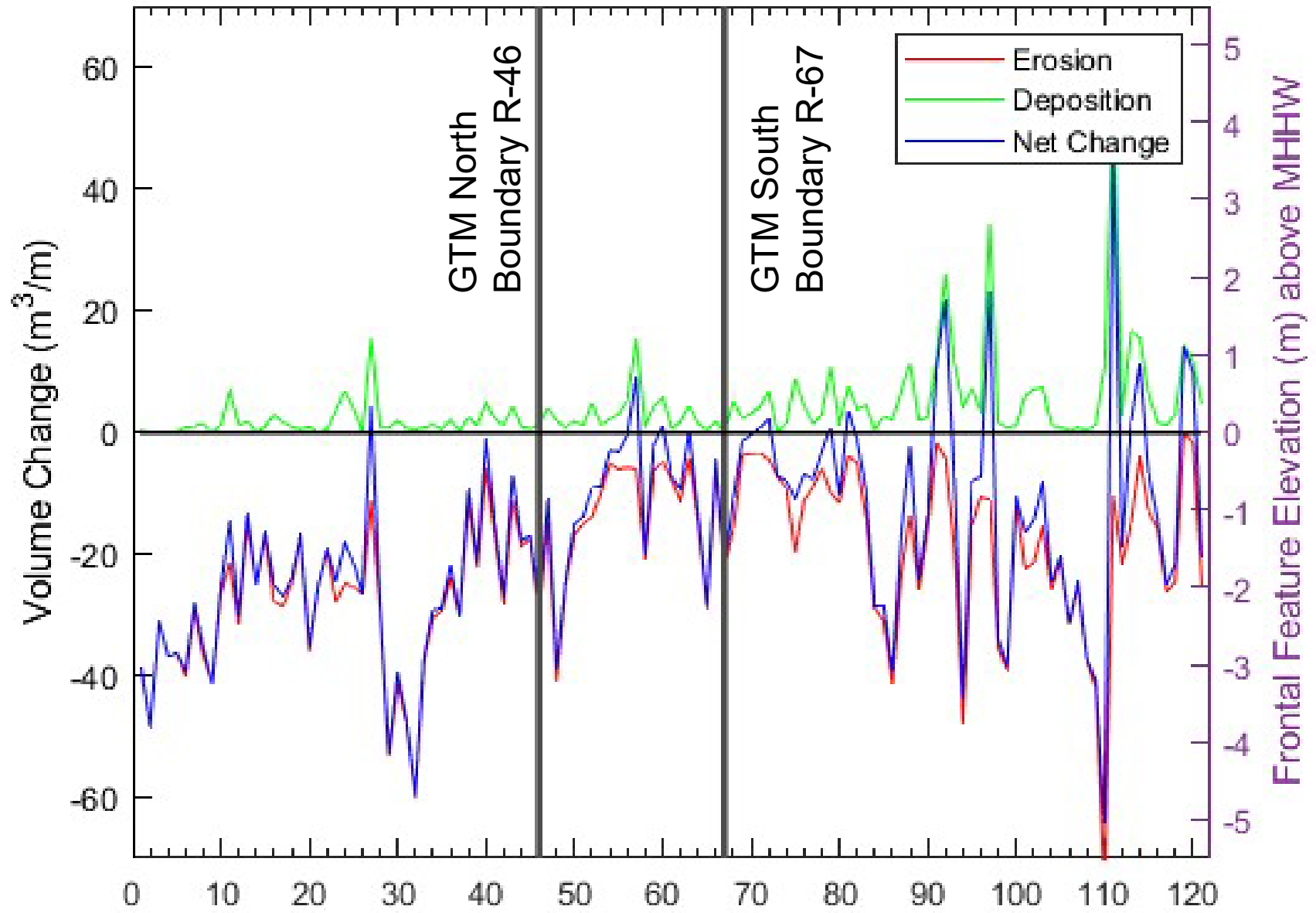




# HURRICANE MATTHEW



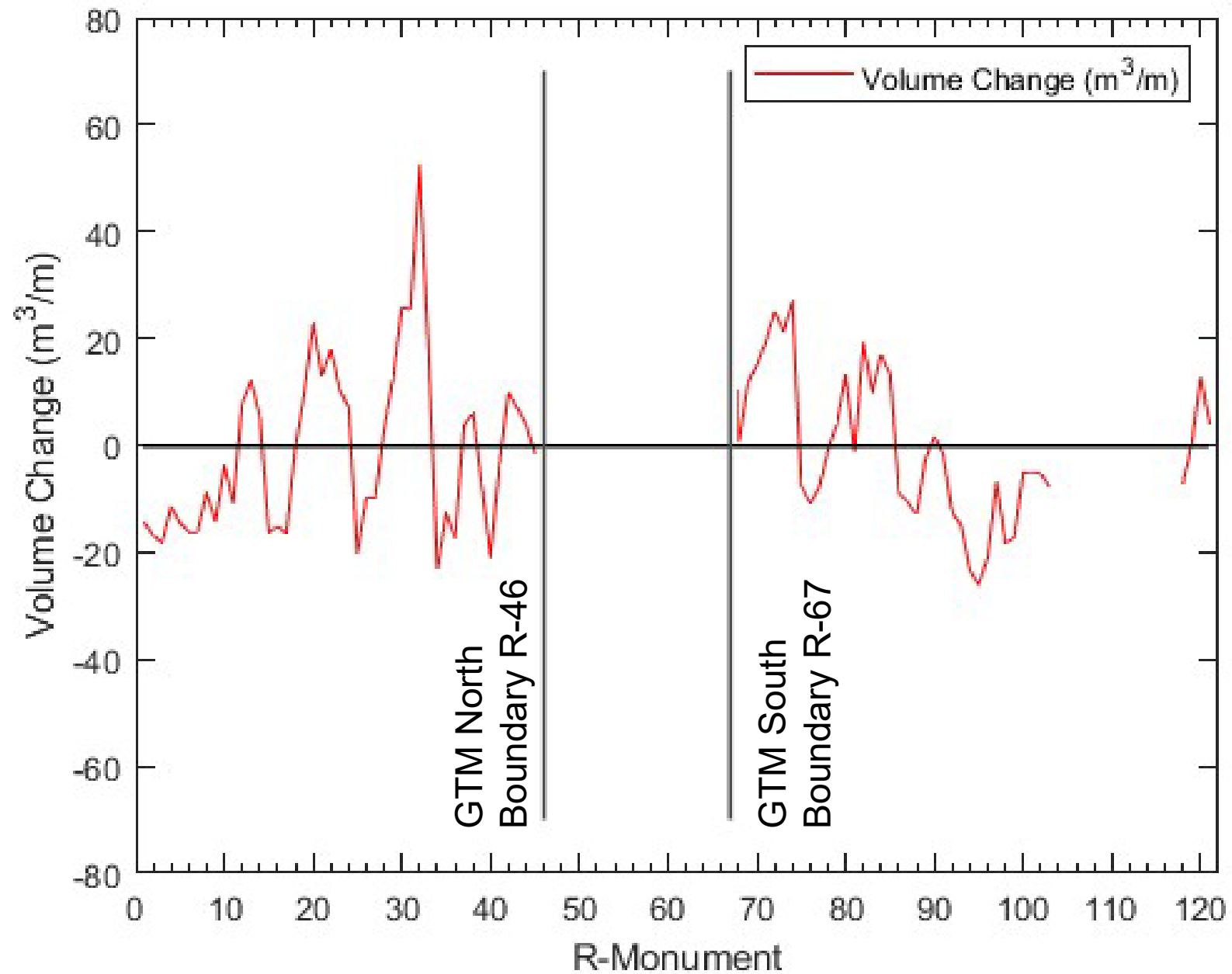
# HURRICANE IRMA



# HURRICANE NICOLE IN ST. JOHNS COUNTY

- The Beachfront Data Collection Facility recorded maximum:
  - Sustained Onshore Winds:  $22.4 \frac{\text{m}}{\text{s}}$  (50 mph)
  - Nearshore Significant Wave Height: 4.4 m (14.4 ft)
  - Wave Period: 13 seconds
- Hurricane Nicole also caused significant, *but not uniform* erosion throughout St. John's County

# HURRICANE NICOLE



# MICKLER'S LANDING R-34



# BEACHFRONT DATA COLLECTION FACILITY R-57



# GOURLAY/DEAN NUMBER

- Shell hash is the last to erode, first to accrete.
- $GD = \frac{H_b}{\omega T}$ 
  - $H_b$  = Breaking Wave Height
  - $\omega$  = Fall Velocity
  - $T$  = Wave Period
- When  $GD \lesssim 2$ , the beach tends to accrete
- When  $GD \gtrsim 2.5$ , the beach tends to erode

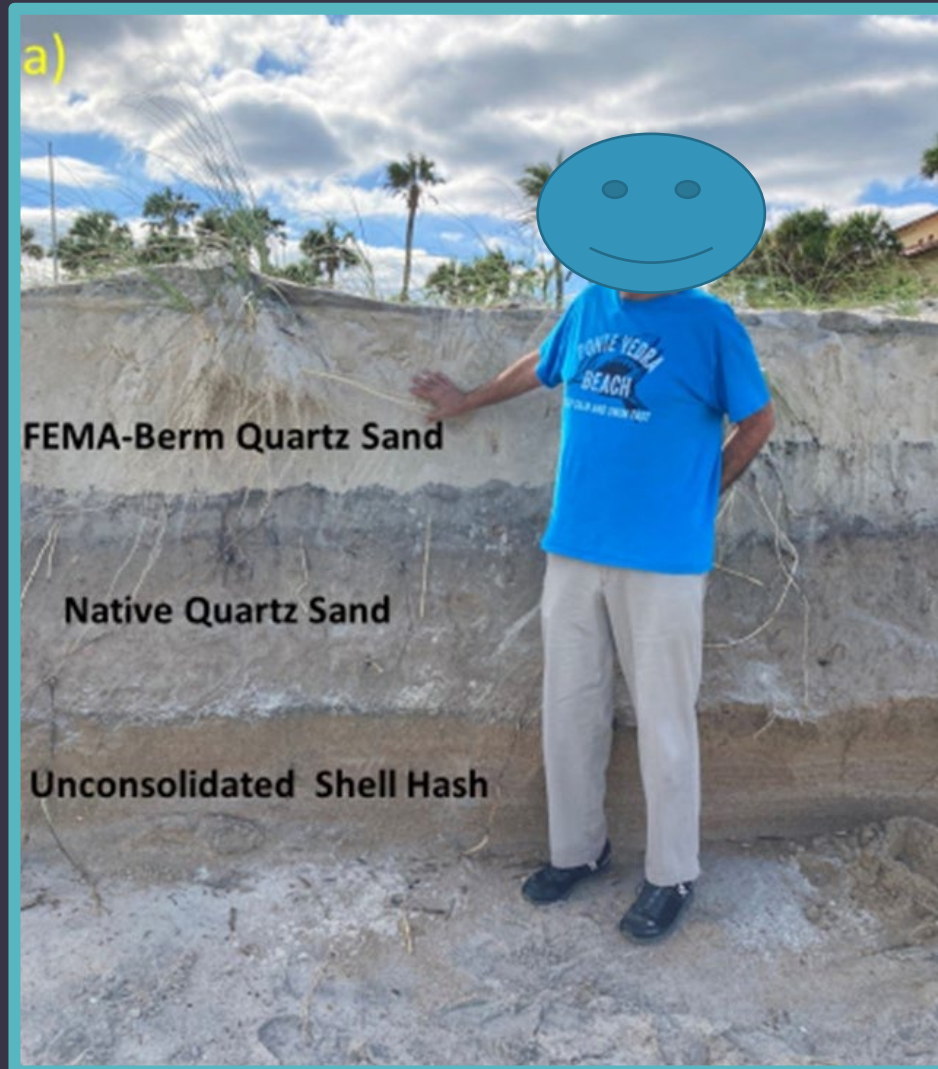


# Beachfront Data Collection Facility (R-57)





# Mickler's Landing (R-34)



# Mickler's Landing (R-34)



# FDEP Regulation 62B-33.005:

- (7) Only beach compatible fill shall be placed on the beach or in any associated dune system. All fill material placed seaward of the CCCL shall be sand which is similar to that already existing in the same fixed coastal cell in coloration, grain size, and composition. Beach compatible fill is material that maintains the general character and functionality of the material occurring on the beach and in the adjacent dune and coastal system. Such material shall be predominately of carbonate, quartz or similar material with a particle size distribution ranging between 0.062mm (4.0  $\Phi$ ) and 4.76mm (-2.25  $\Phi$ ) (classified as sand by either the Unified Soils or the Wentworth classification), shall be similar in color and grain size distribution (sand grain frequency, mean and median grain size and sorting coefficient) to the material in the existing coastal system at the placement area and shall not contain:
  - (a) Greater than 5 percent, by weight, silt, clay or colloids passing the #230 sieve (4.0  $\Phi$ );
  - (b) Greater than 5 percent, by weight, fine gravel retained on the #4 sieve (-2.25  $\Phi$ );
  - (c) Coarse gravel, cobbles or material retained on the 3/4 inch sieve in a percentage or size greater than found at the placement area;
  - (d) Construction debris, clay balls or foreign matter; or,
  - (e) Material that results in cementation of the beach.

# MICKER'S LANDING R-34



# Vilano Beach R-115



# THANK YOU!

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