

# ***NOAA – Hydrographic Services Review Panel Nearshore Bathymetric Data Challenges in the North Coast of PR***

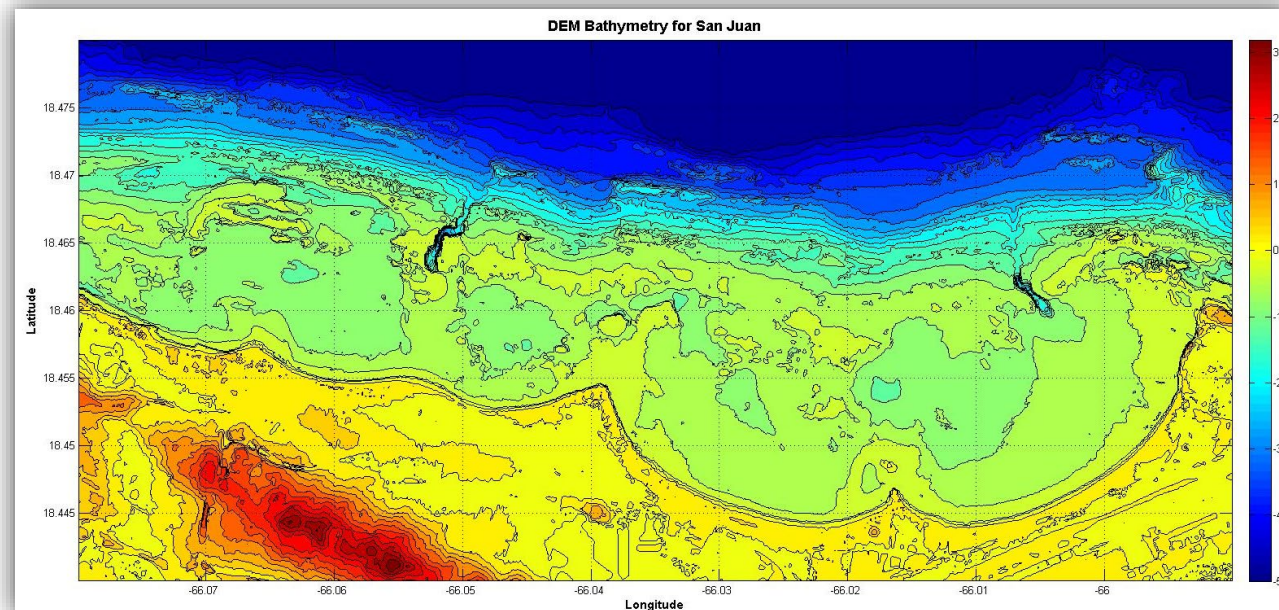
By: Fernando L. Pagés Rangel, PE, D.CE  
Director  
Ports, Harbors and Coastal Engineering  
Tetra Tech, Caribbean

March 2, 2023

- Tetra Tech – Puerto Rico & Caribbean – Environmental and Coastal Engineering
- Principal Coastal Engineer working federal, local governments and private Clients addressing coastal erosion and shoreline stabilization
- Focus on Ports, Harbors, Marinas as well as Nature Based Solutions and/or Hybrid Solutions

# Bathymetric Data Sources

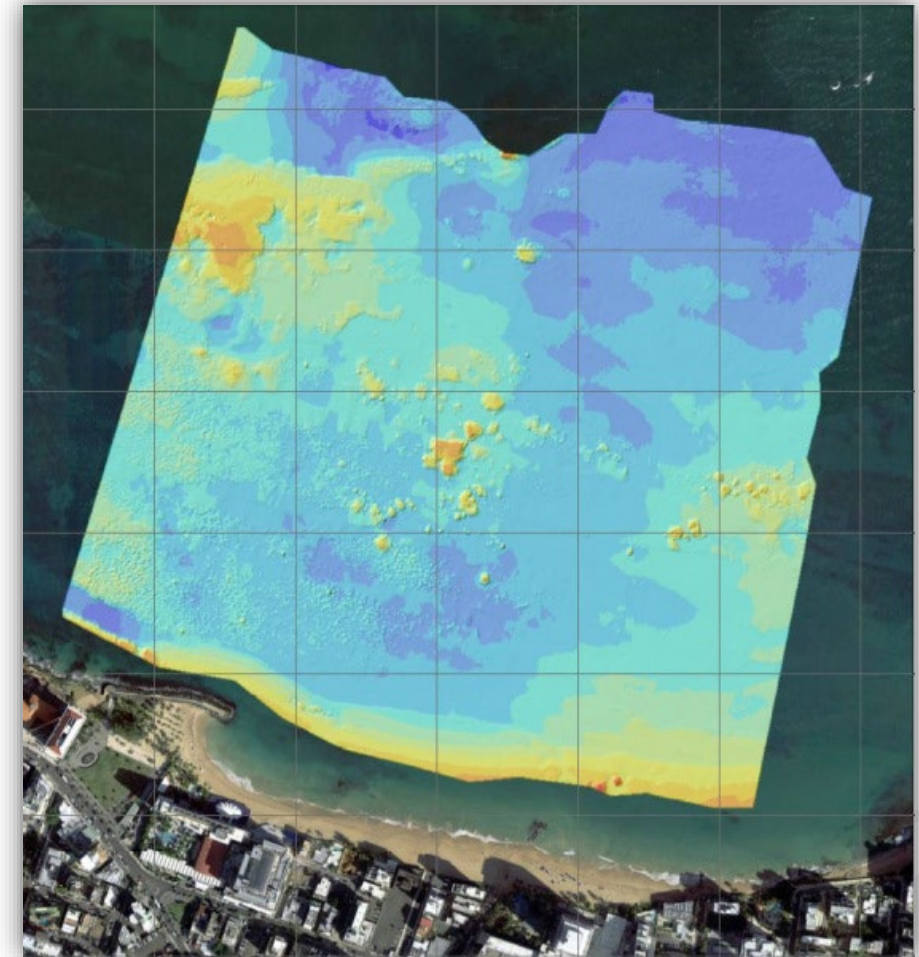
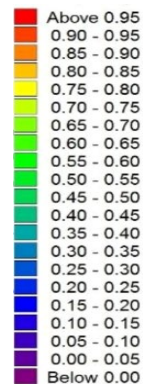
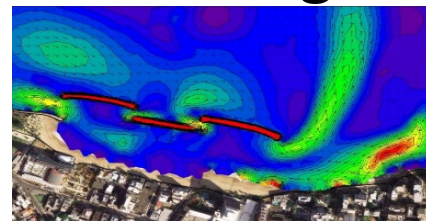
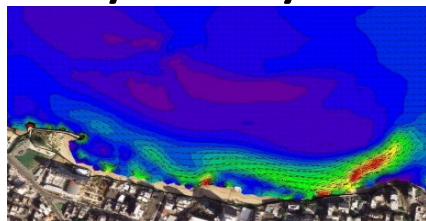
- NOAA Lidar Data July 2018 after Hurricane Maria
  - Good overall coverage
  - Dependent of water clarity
  - Nearshore seasonal bathymetric changes





# Bathymetric Data Sources

- Nearshore Multi-Beam Echosounder Surveys
  - Supplement Lidar Data
  - Complex Bathymetric Features (coral reefs, river mouths, etc.)
  - Challenging Nearshore Hydrodynamic Modeling

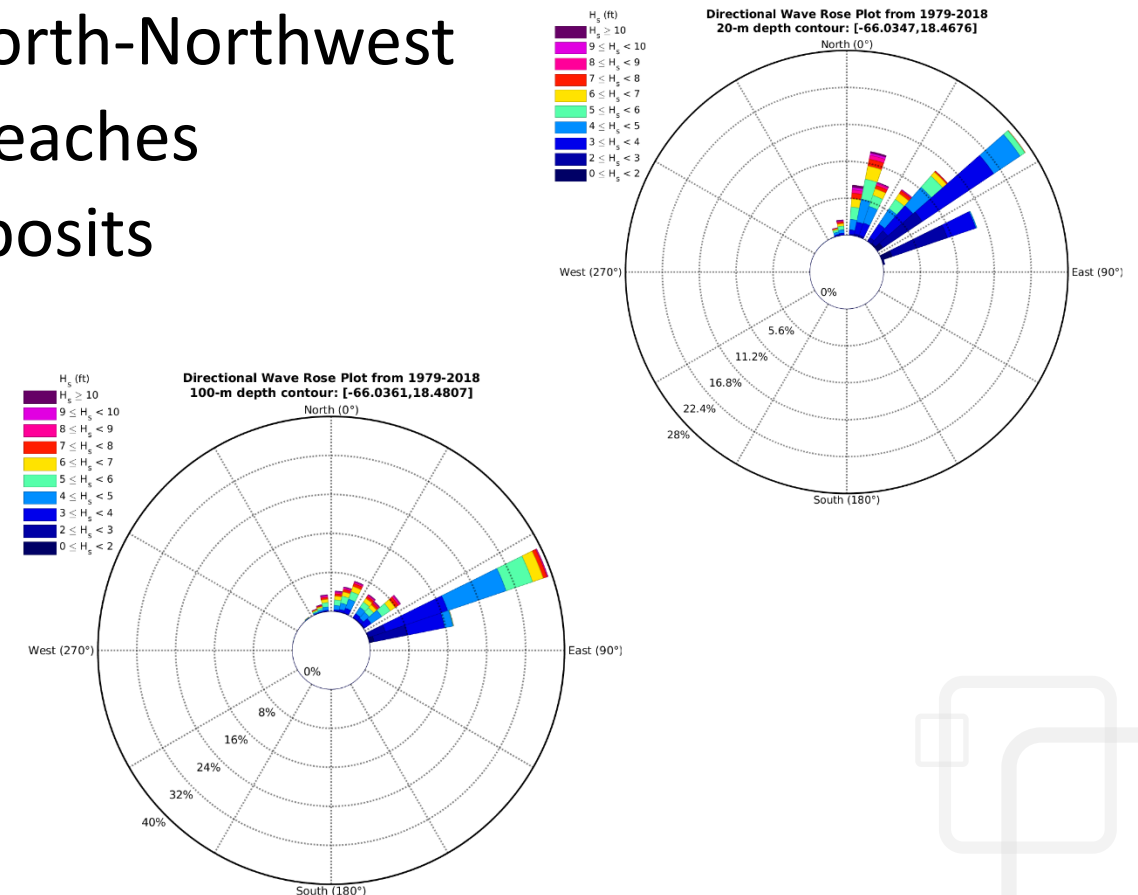


# Wind, Wave, Currents, Temp Data Sources

- CARICOOS Data Sources
  - [CARICOOS Latest Conditions and Forecast](#)
- High Resolution Wave Atlas (Dr. M. Canals, CAOSE-UPRM) Stations at 100m and 20m water depths for PR
  - [PR Wave Climate Atlas — UPRM Center for Applied Ocean Science and Engineering \(canalsresearch.com\)](#)
- Required wave transformation analysis to determine  $H_s$  and design wave at shore/site

# Considerable Seasonal Nearshore Changes

- Prevailing Wind and Wave Directions => North and Northeast
- Occasional Reversals => North and North-Northwest
- Alarming Rates of Erosion in Urban Beaches
- Uncertainties on Nearshore Sand Deposits
- Lack of Beach Nourishment Projects



# Benefits of Increased NOAA Surveys

- Identify Case Study Areas
- Regional Sediments Management Studies
- Recurrent Seasonal Nearshore Surveys (winter and summer)
- Understand Sediment Transport Mechanisms, Patterns and Sand Sources
- Support Viability/Feasibility Beach Nourishment Projects

***PR Needs more frequent and reliable nearshore Lidar Surveys along the north coast of PR (Fajardo to Rincon)***