3D Geospatial Information for Sustainable Coasts: Emerging Solutions and Applications

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MANTIS MEASUREMENT ANALYTICS

UNWGIC
November 21, 2018

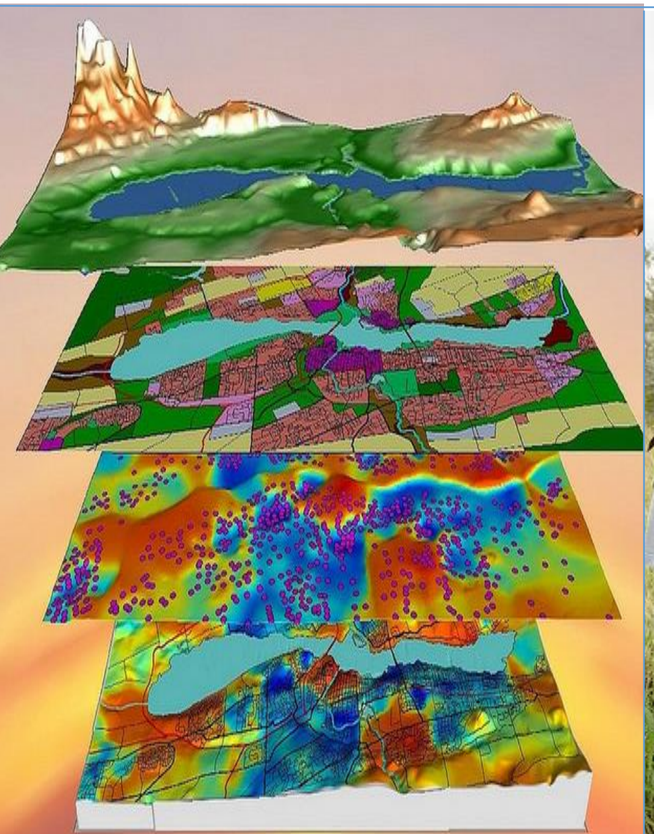
Conrad Blucher Institute for Surveying & Science

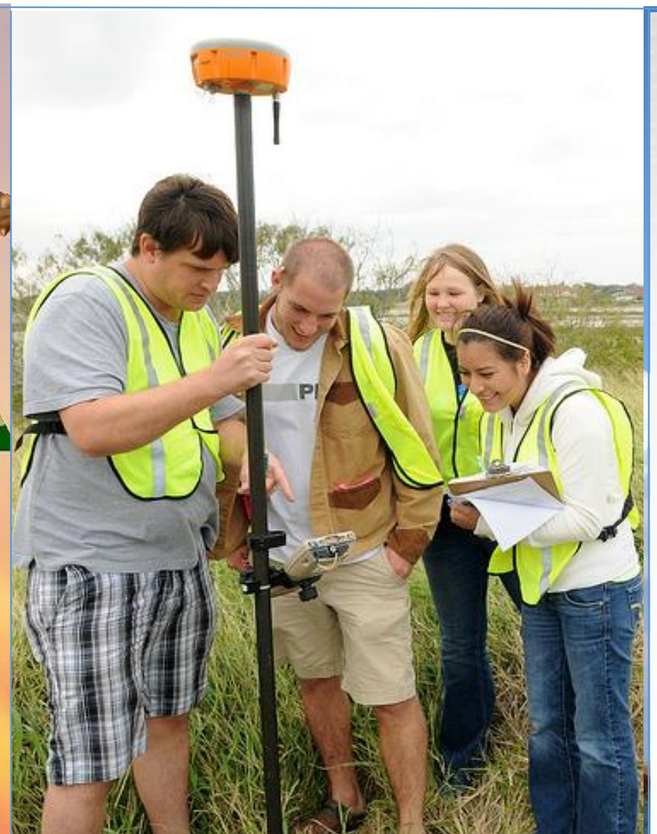
Dedicated May 1987 - Blucher Family: surveyors of South Texas (1882-1954)

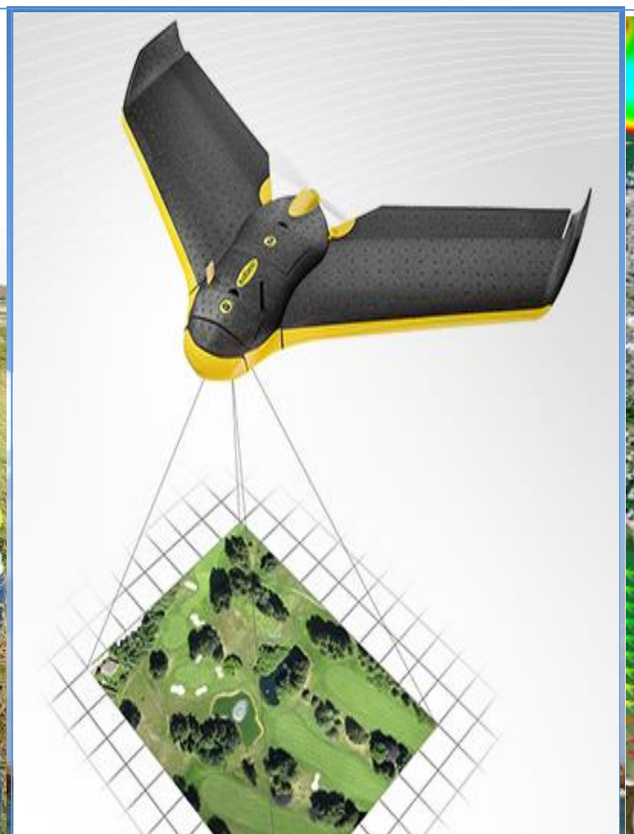
Support of academic programs (BS – MS – PhD)

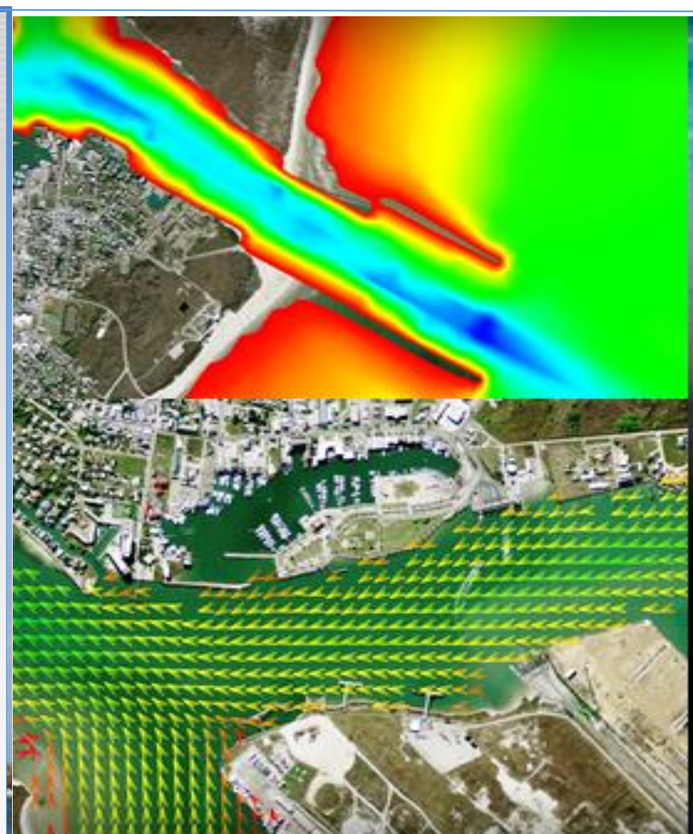
Research in coastal and environmental observation and modeling, geomatics, GIS…

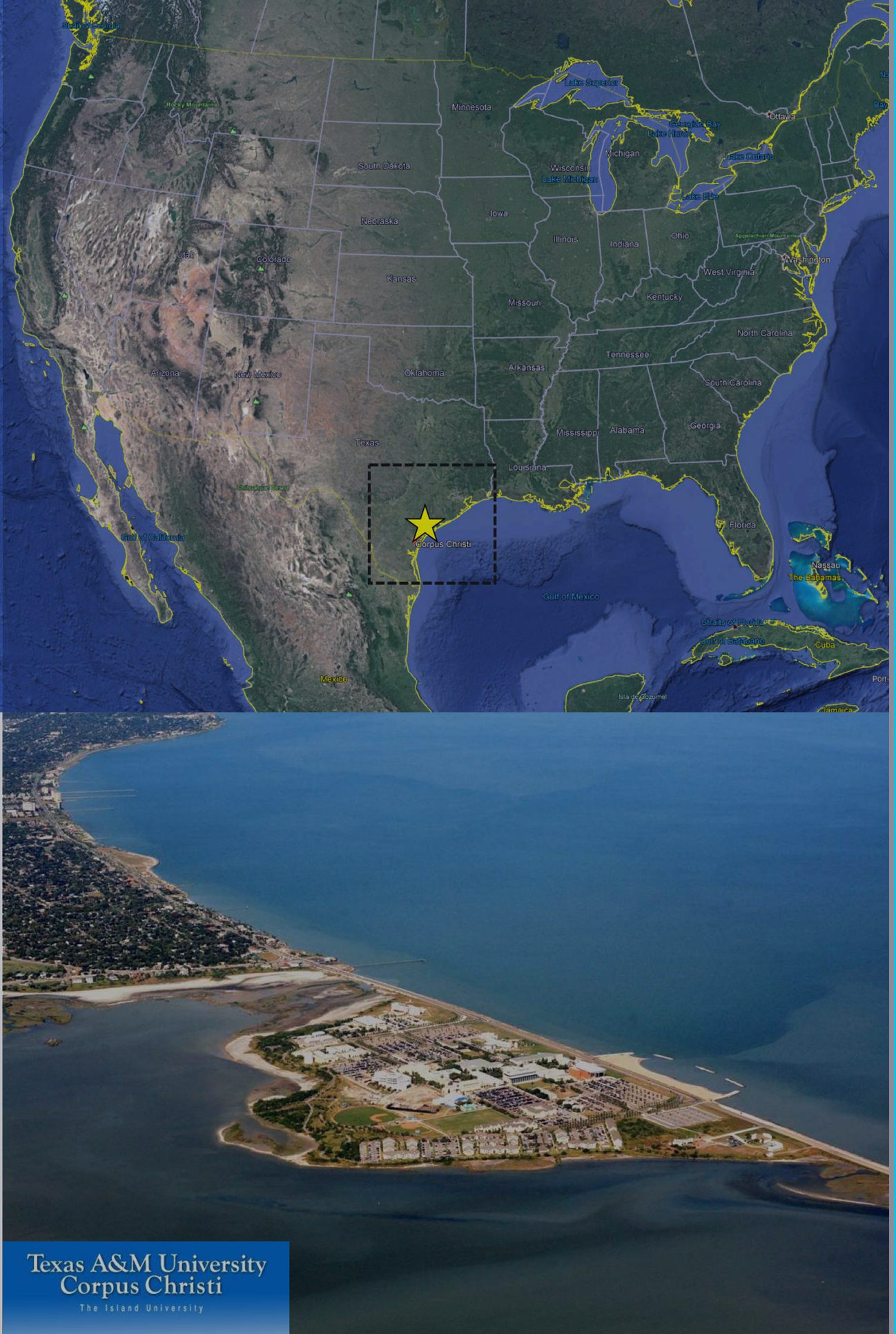
Work critical for resiliency planning, emergency response, …











Topic 1.

Relative sea level rise (RSLR) poses a threat to coastal sustainability along the Texas Gulf Coast.

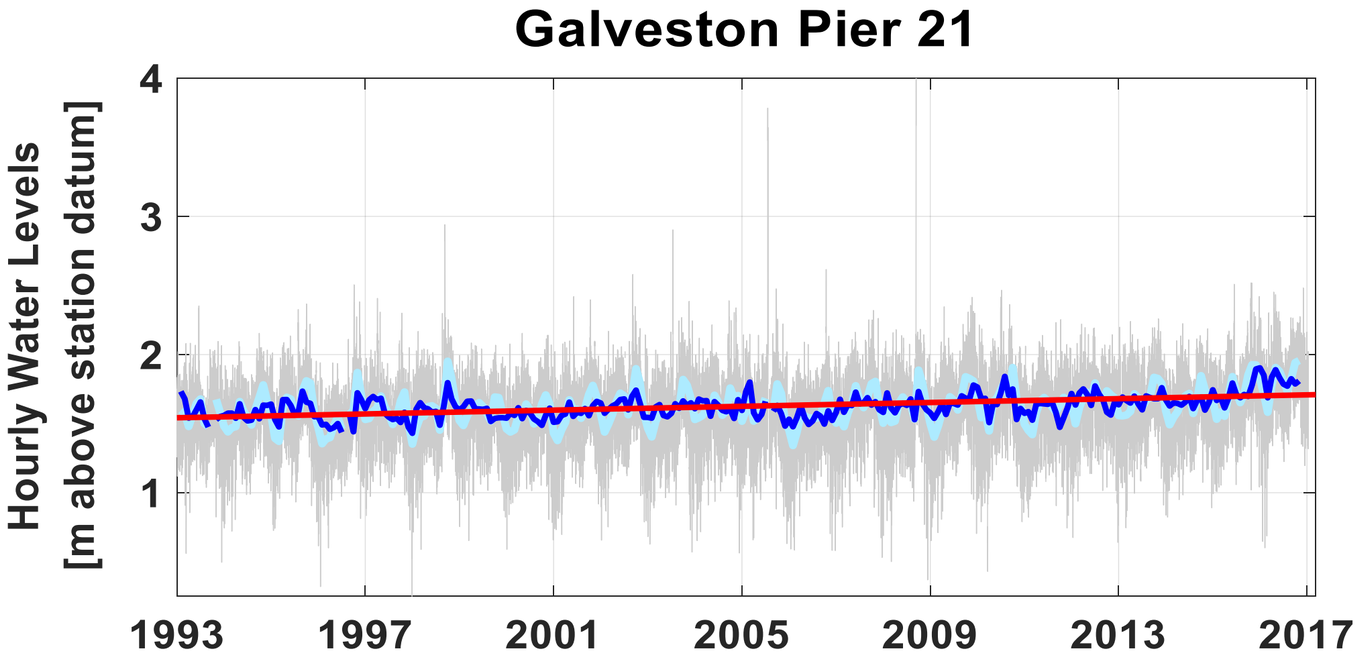
Rates can highly vary locally due to land subsidence.

Observations

Tidal Gauges

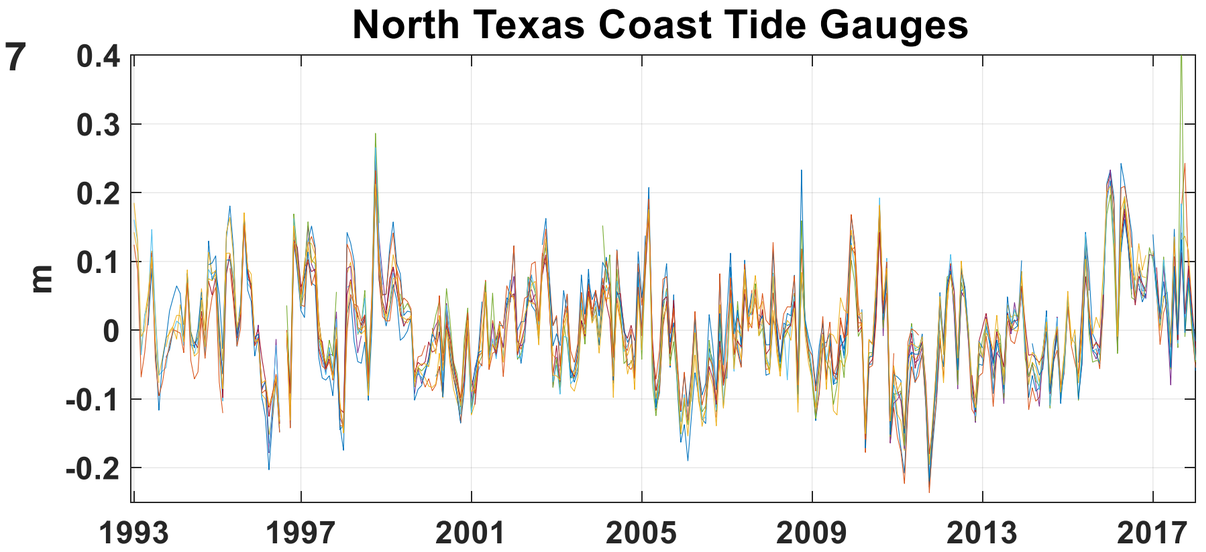
Continuously operating GPS stations (cGPS)

Tidal Gauge Records: Improved RSLR Precision

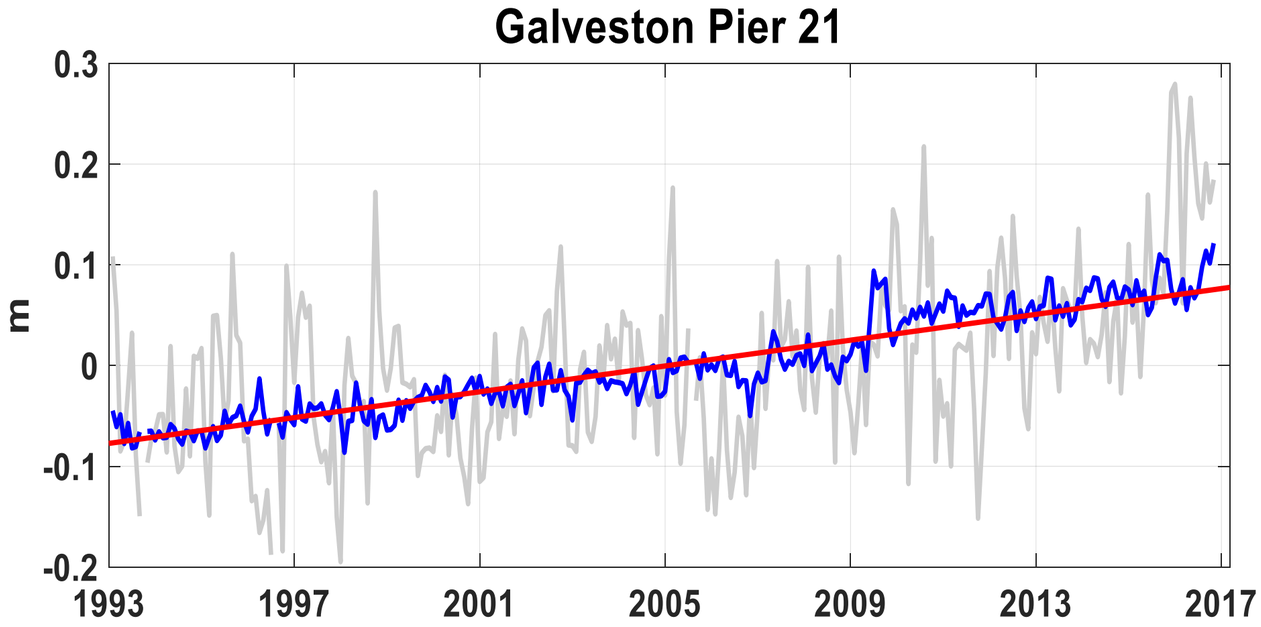


(1993-2017)

6.4 +/- **2.5 mm/ year**



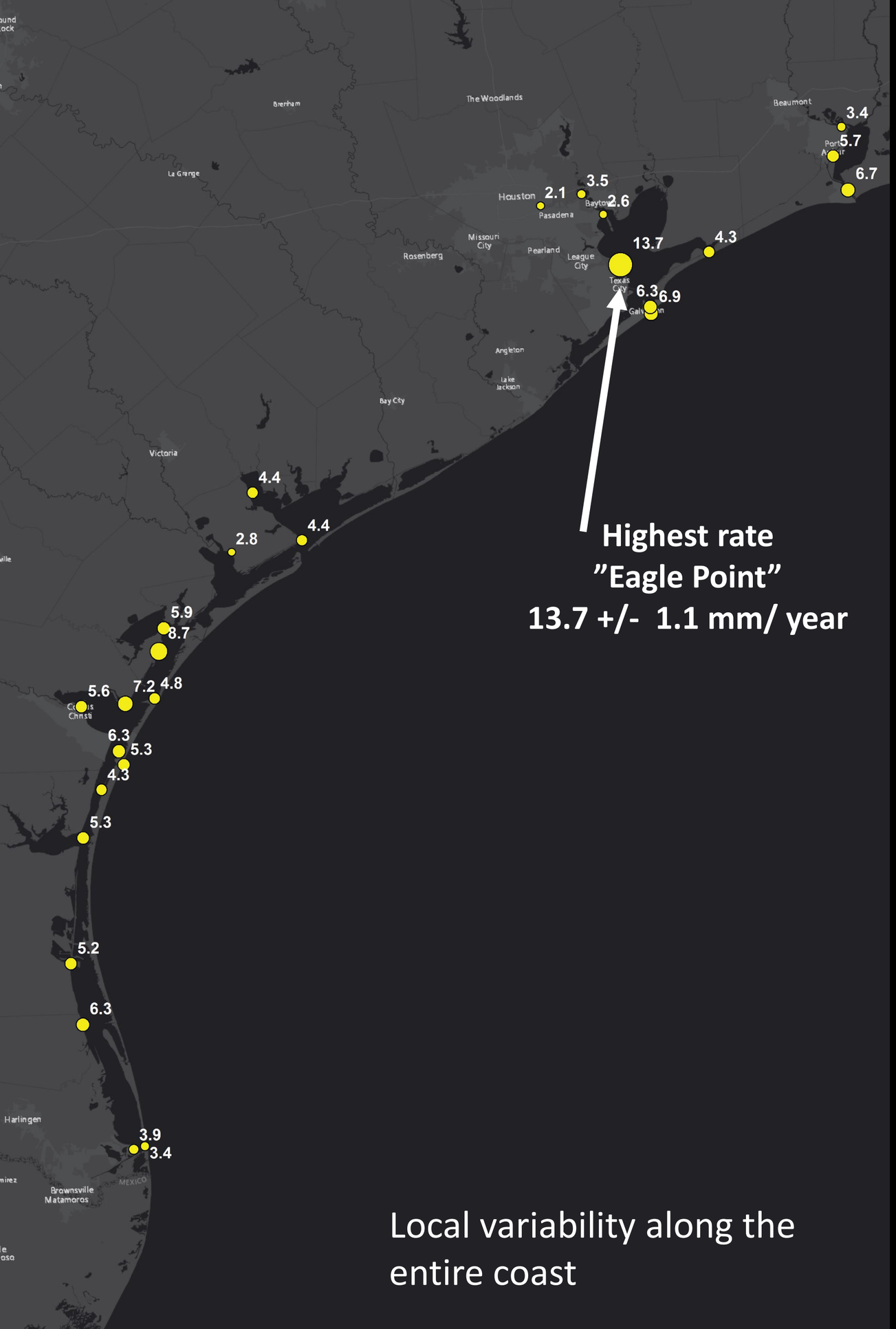
Remove regional low frequency oceanographic signal

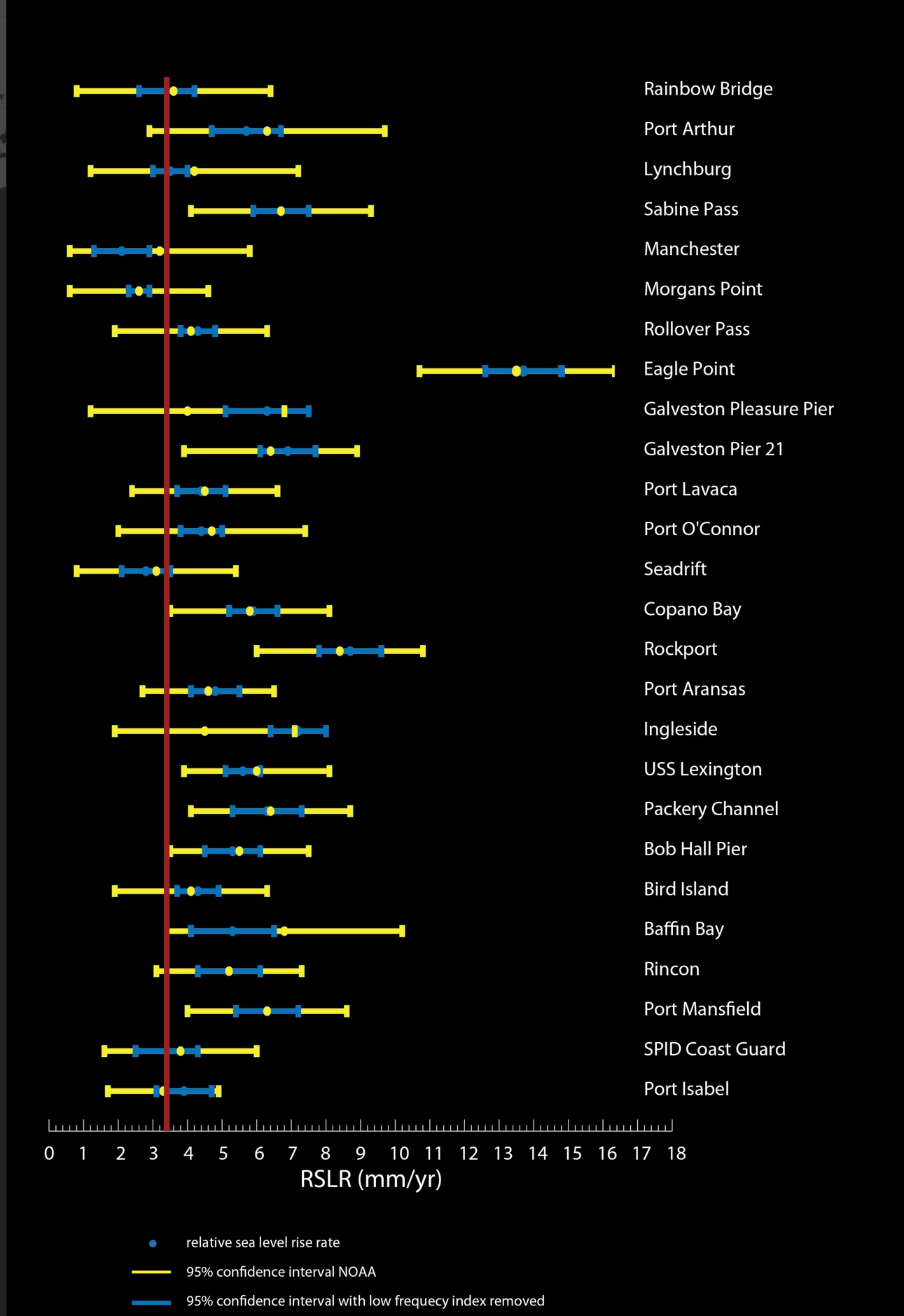


(1993-2017)

6.9 +/- **0.8 mm/ year**

Philippe Tissot, CBI





Philippe Tissot, CBI

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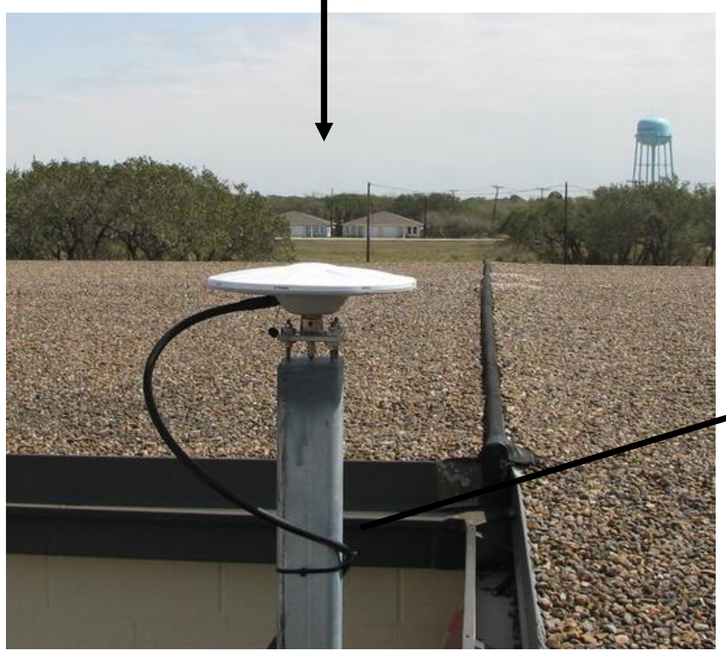
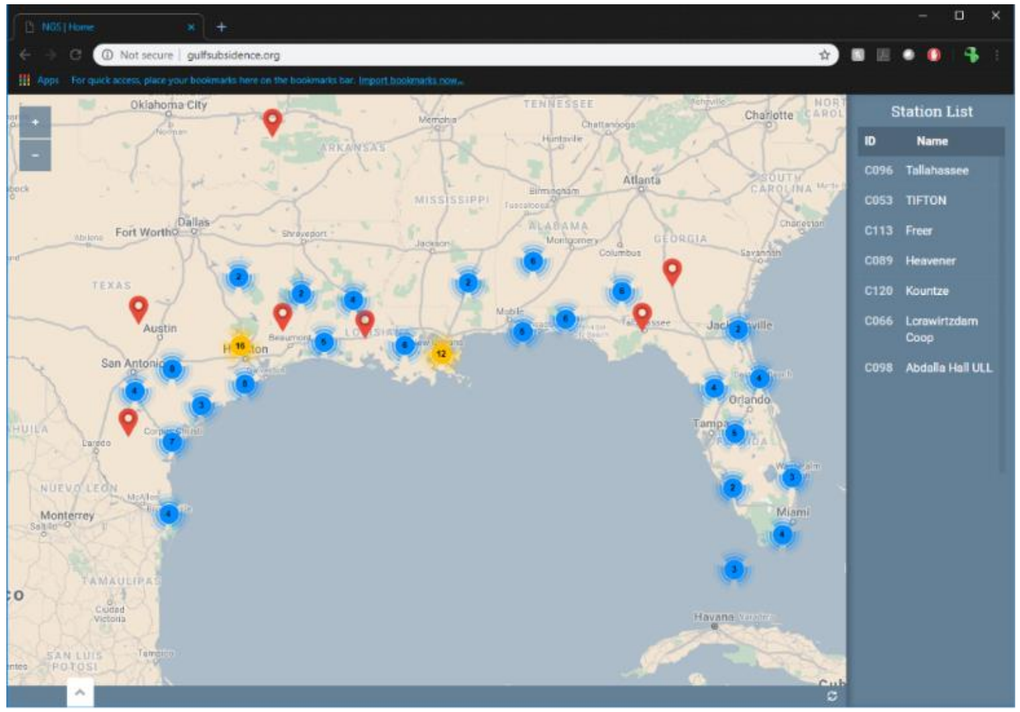
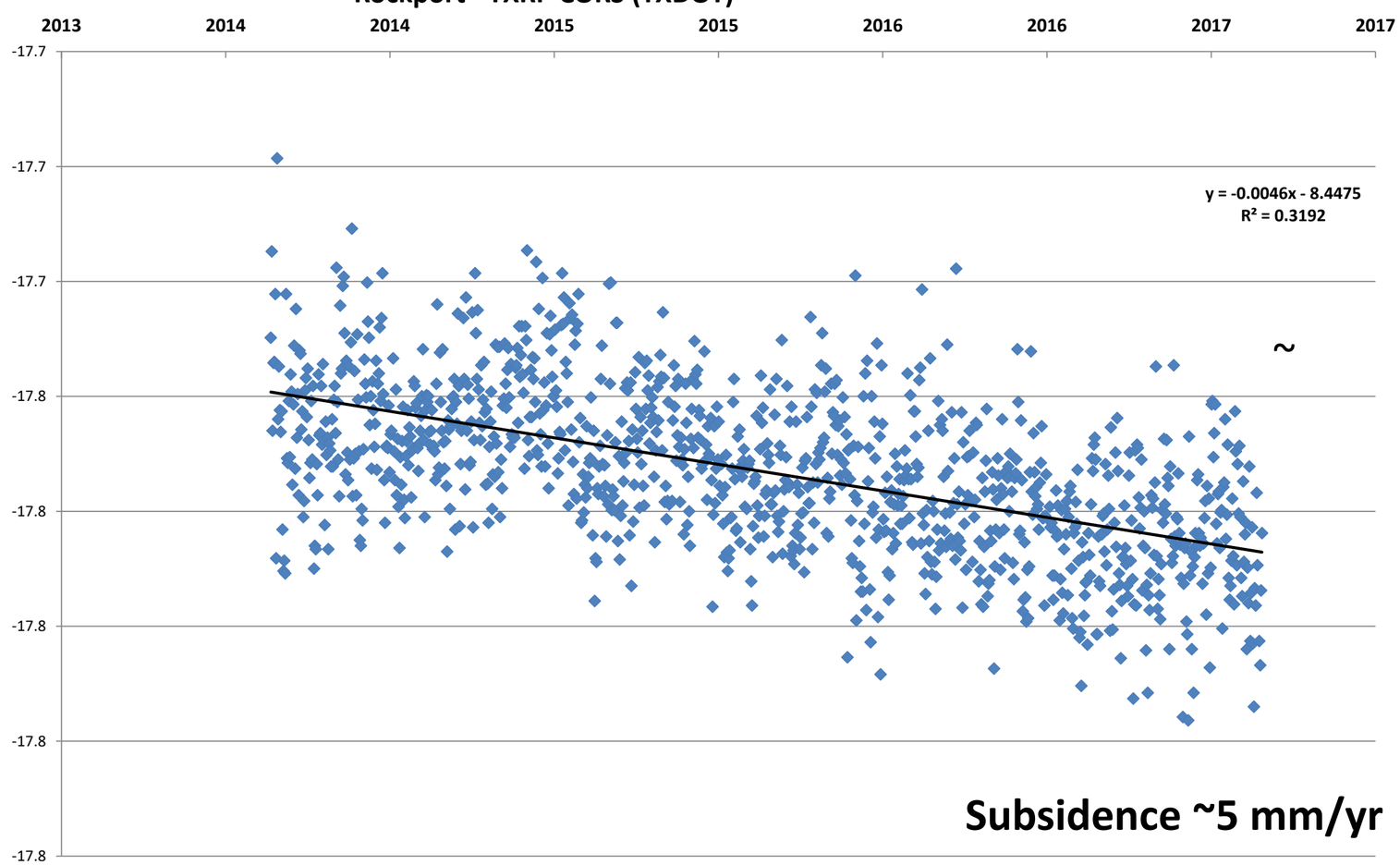
Densify Observations with cGPS







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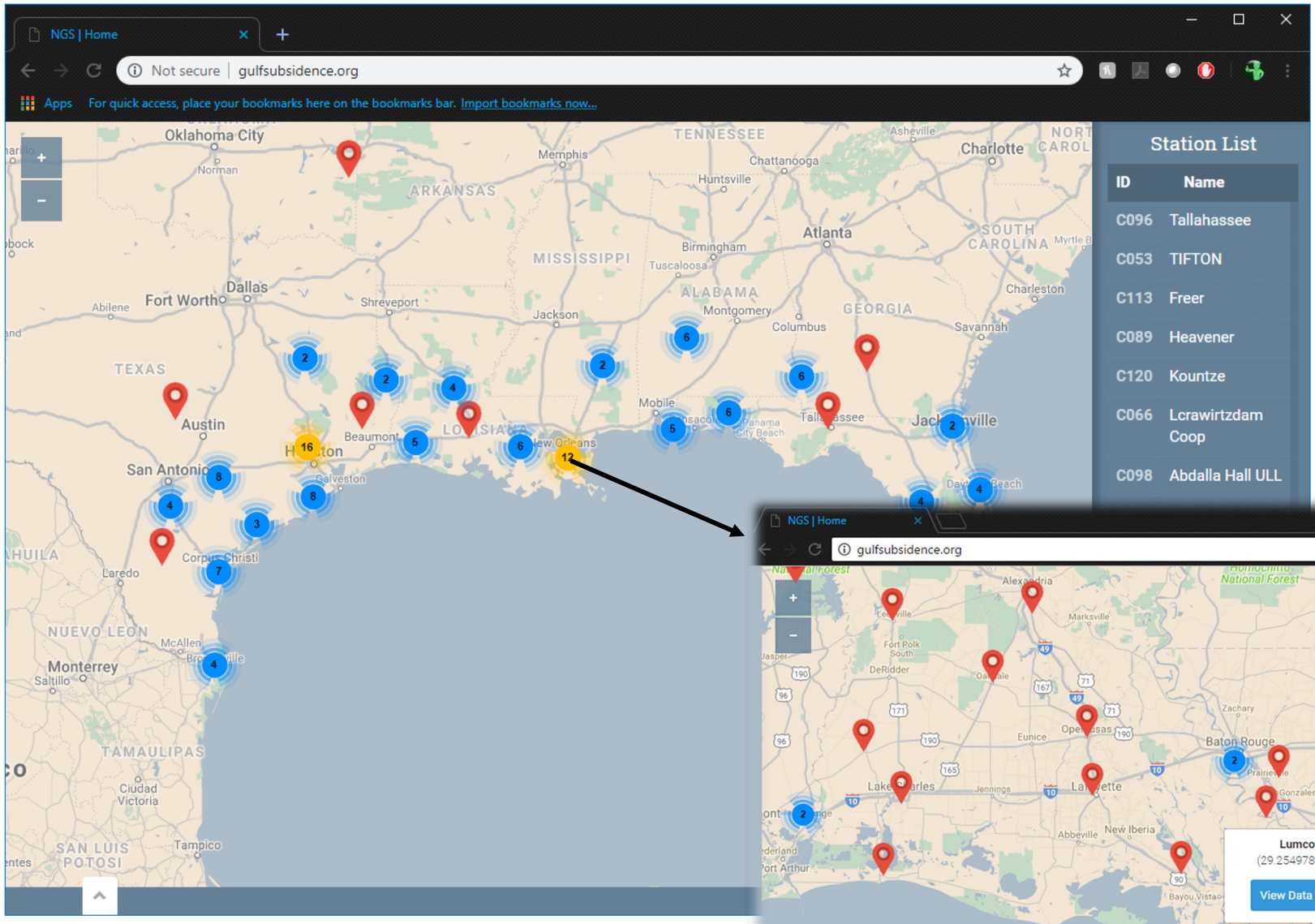
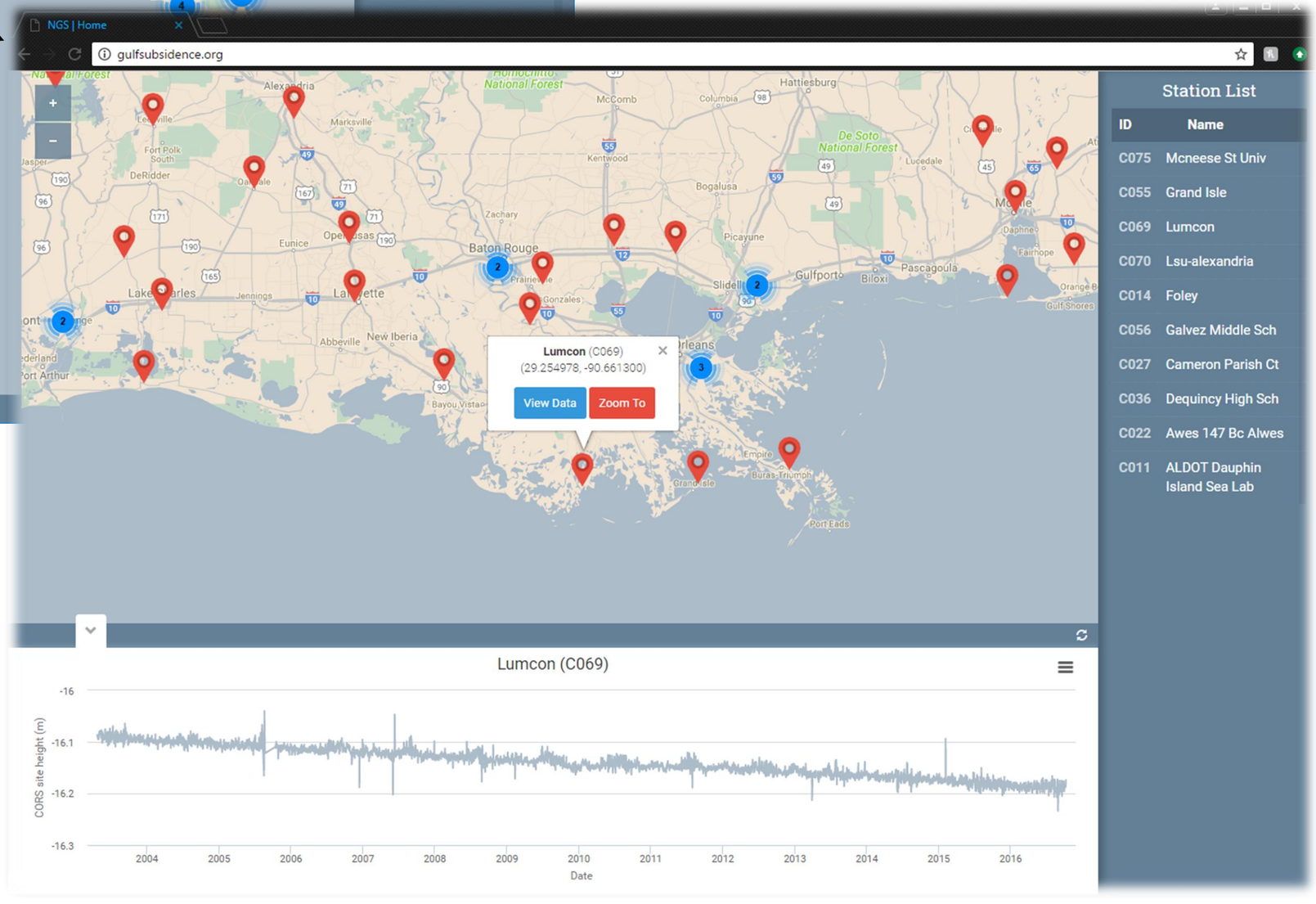
cGPS Real-time Tracking

gulfsubsidence.org





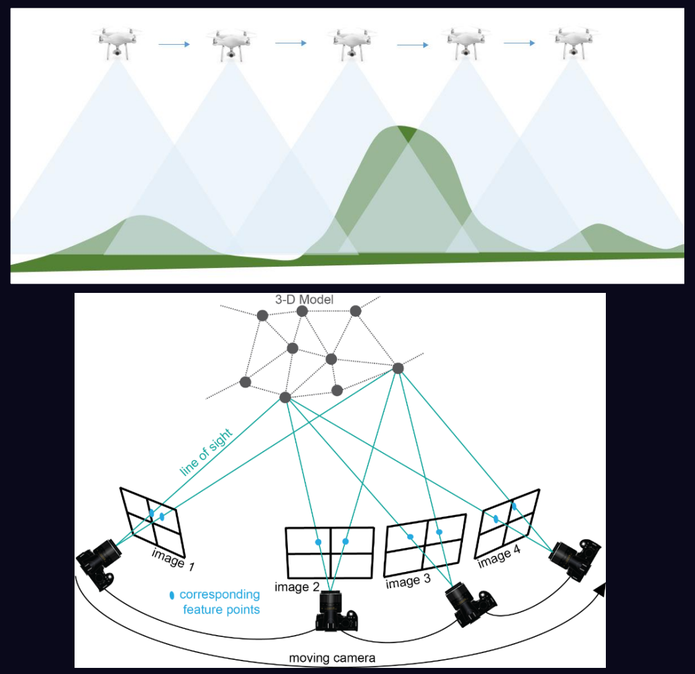
Topic 2.

Unmanned Aircraft Systems (UAS) equipped with cameras and sensors are changing how we survey our coastal zone

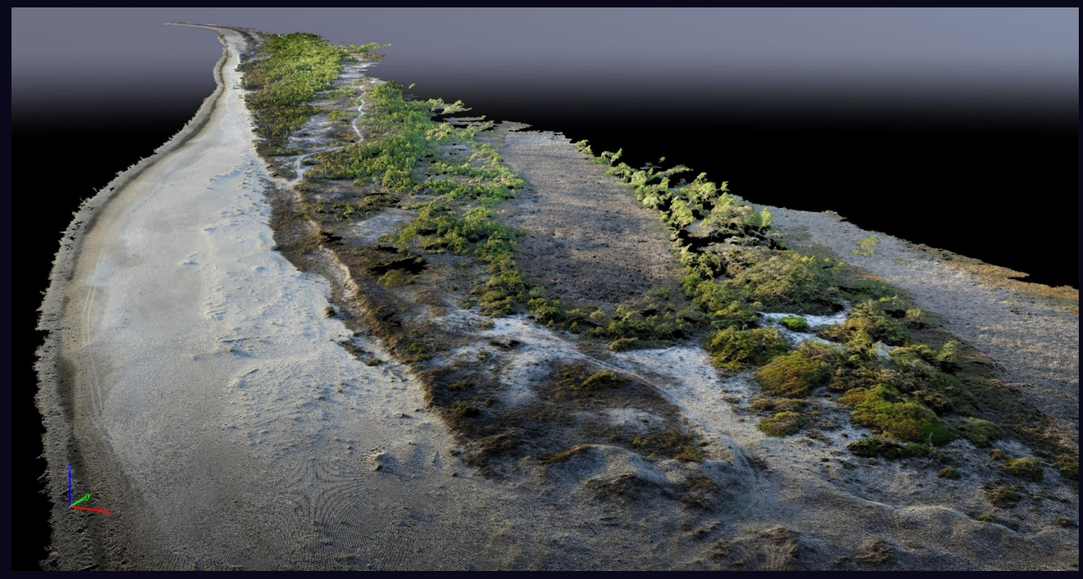
small UAS

- Low-cost mapping at local scales
- Flexibile acquisition
- Hyperspatial resolution
- Temporal repeatability

UAS + SfM
aerial surveying



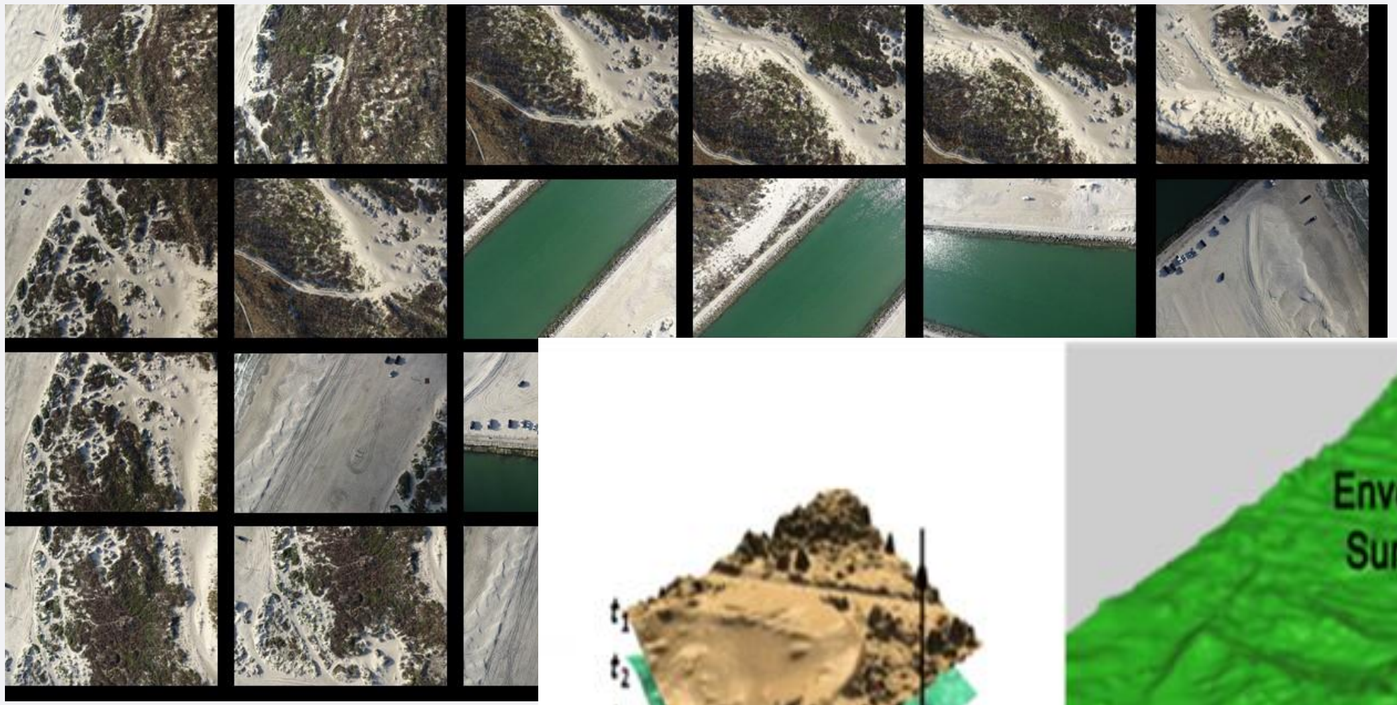
imagery is processed using ***structure-from-motion (SfM)*** *photogrammetry*

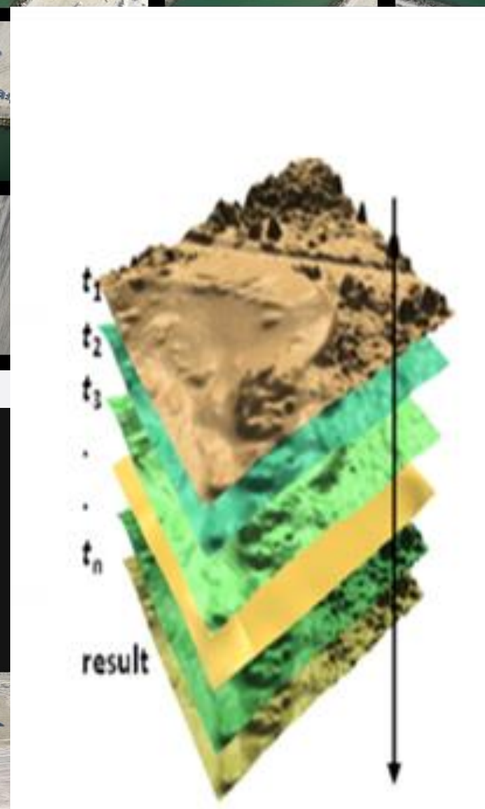


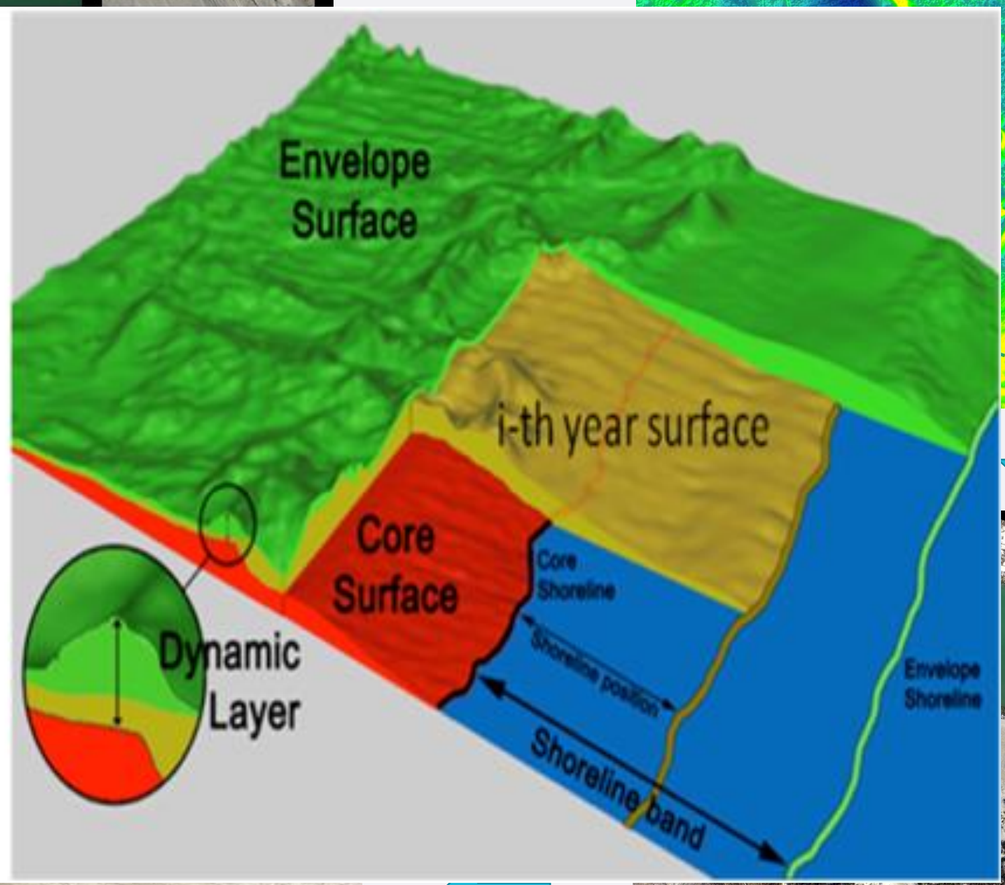
Dense, **textured** 3D point cloud, Little St. George Island, FL

- *1000 pts/m²*

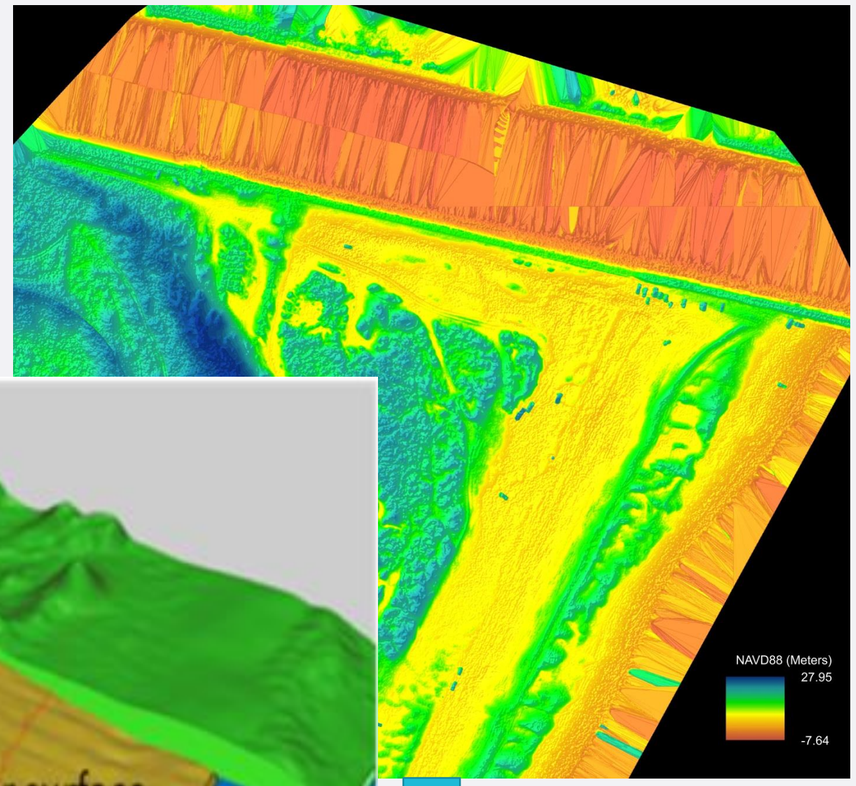
Example
North Padre Island, TX







Digital Elevation Model (DEM)



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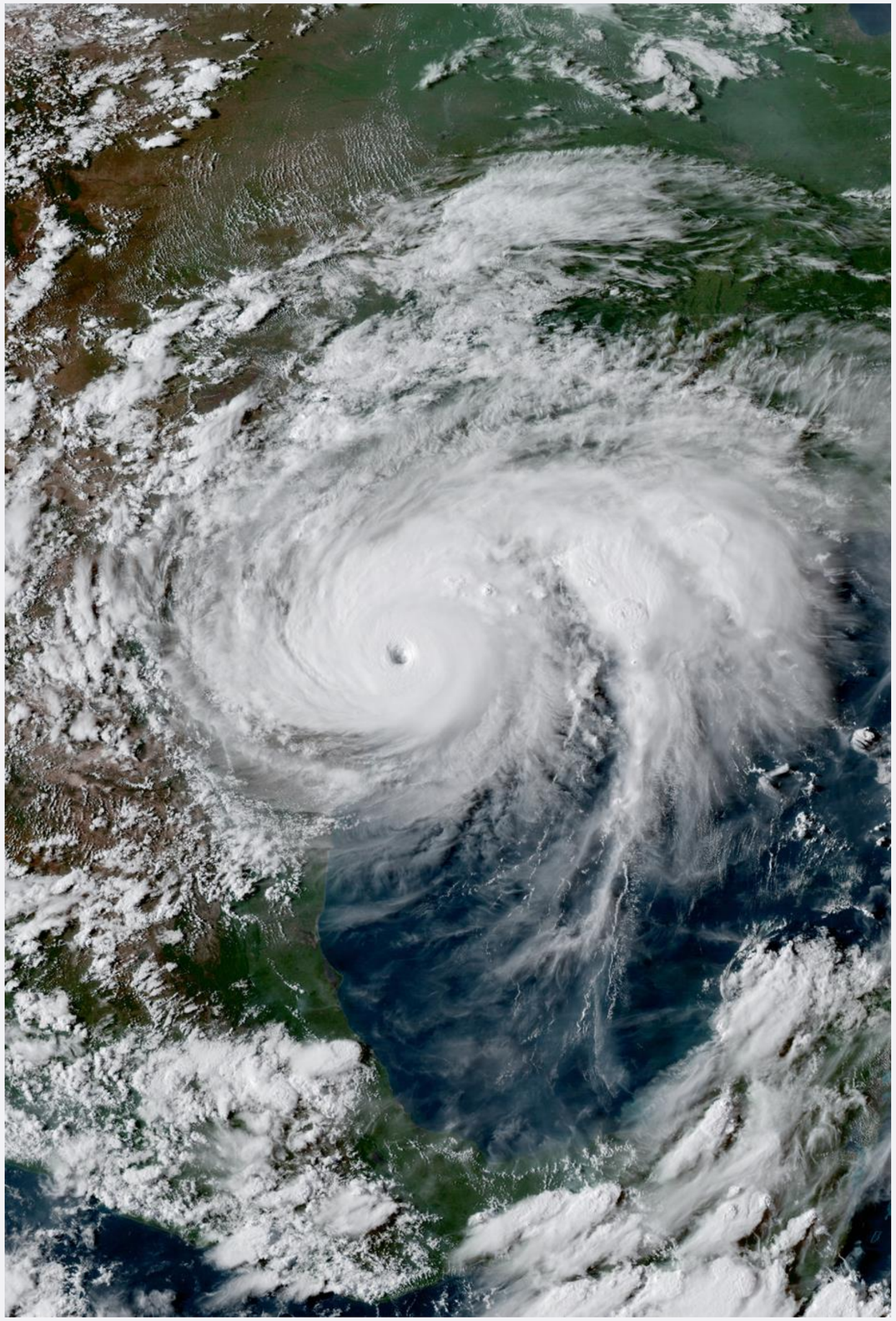
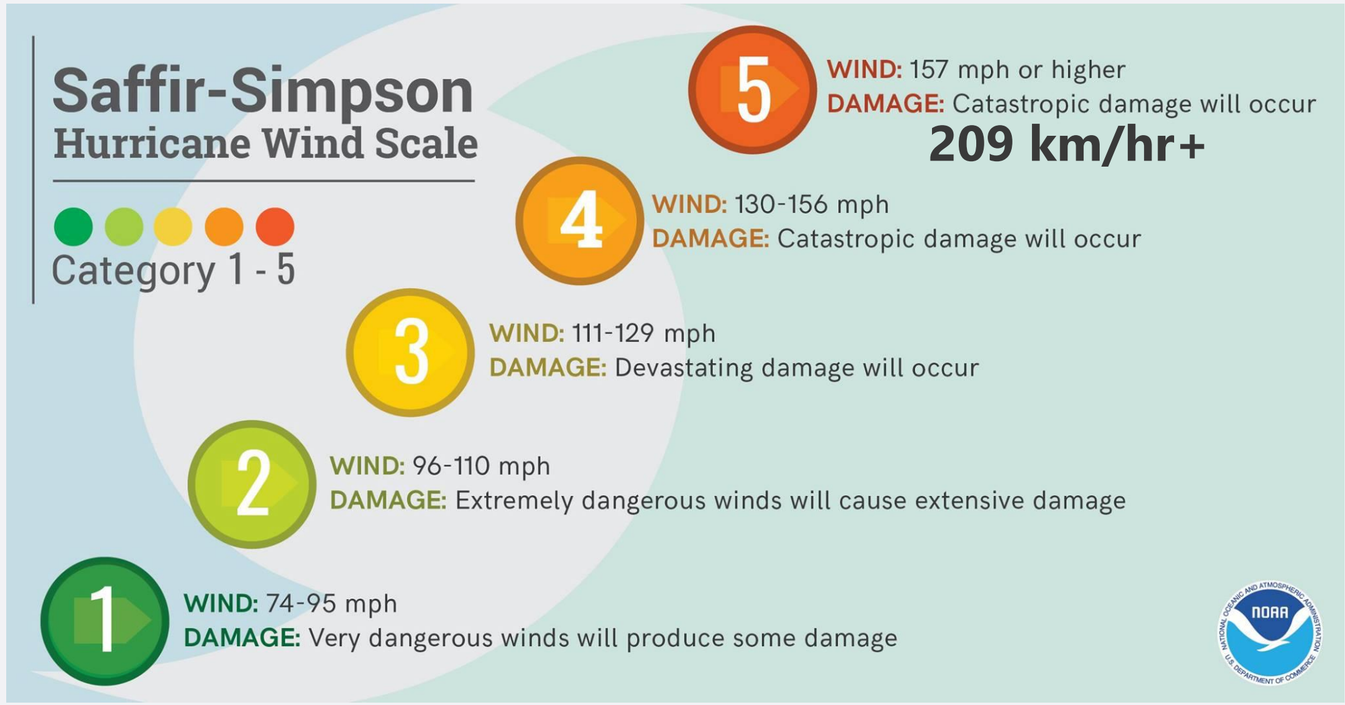
Hurricane Harvey

August 25, 2017





Made landfall near Rockport, Texas as a Category 4 Hurricane with sustained winds of 209 km/hr

~70 Billion USD → ~490 Billion Yuan in damage

Study Site: Newport Pass (Before Harvey)

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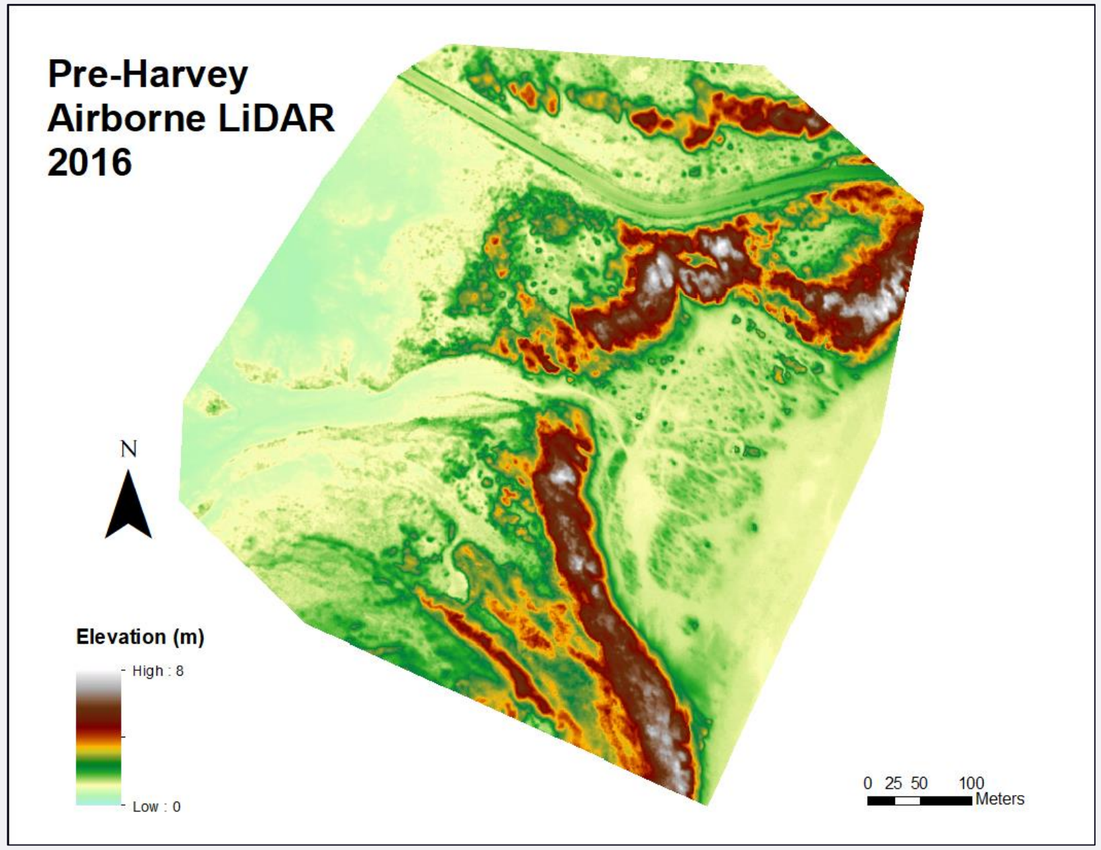
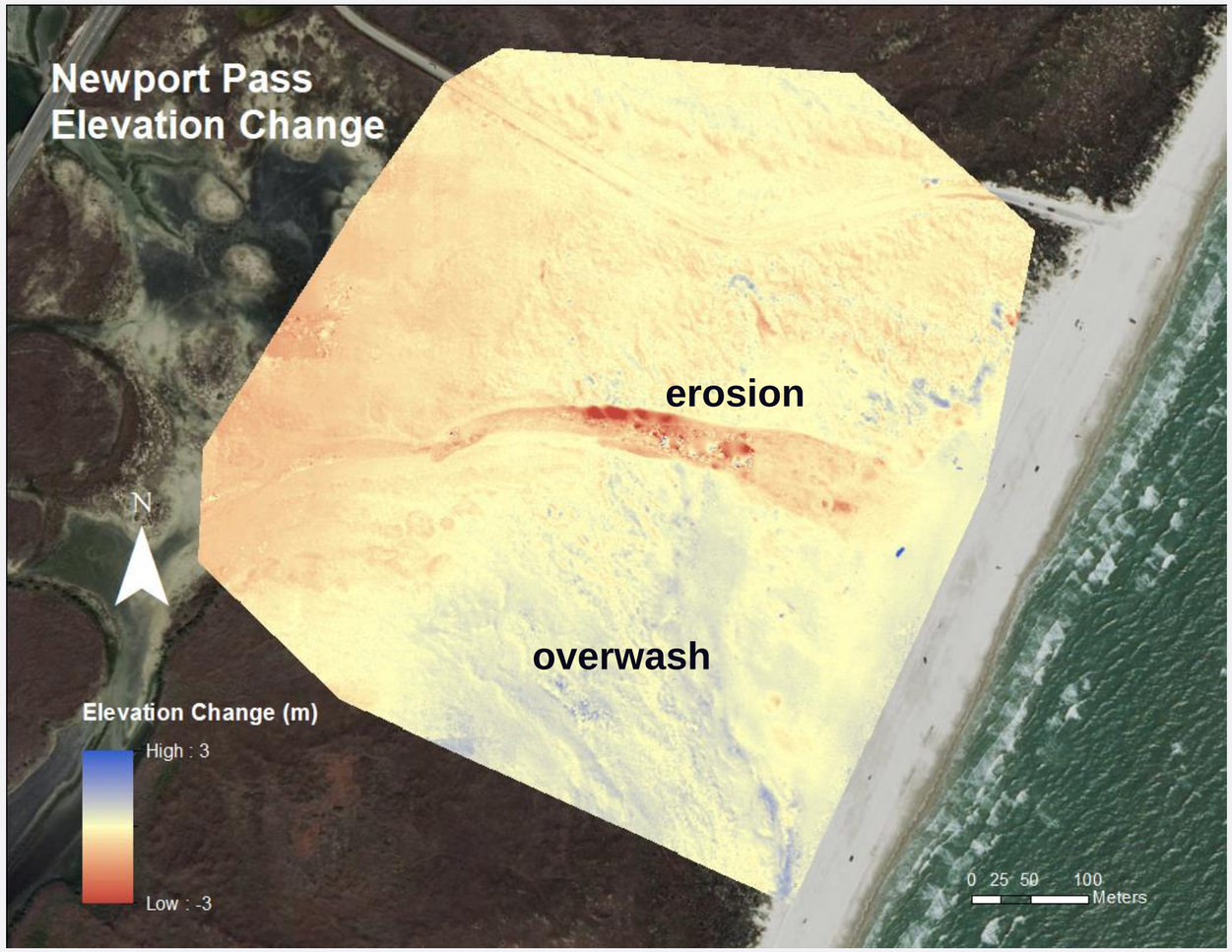
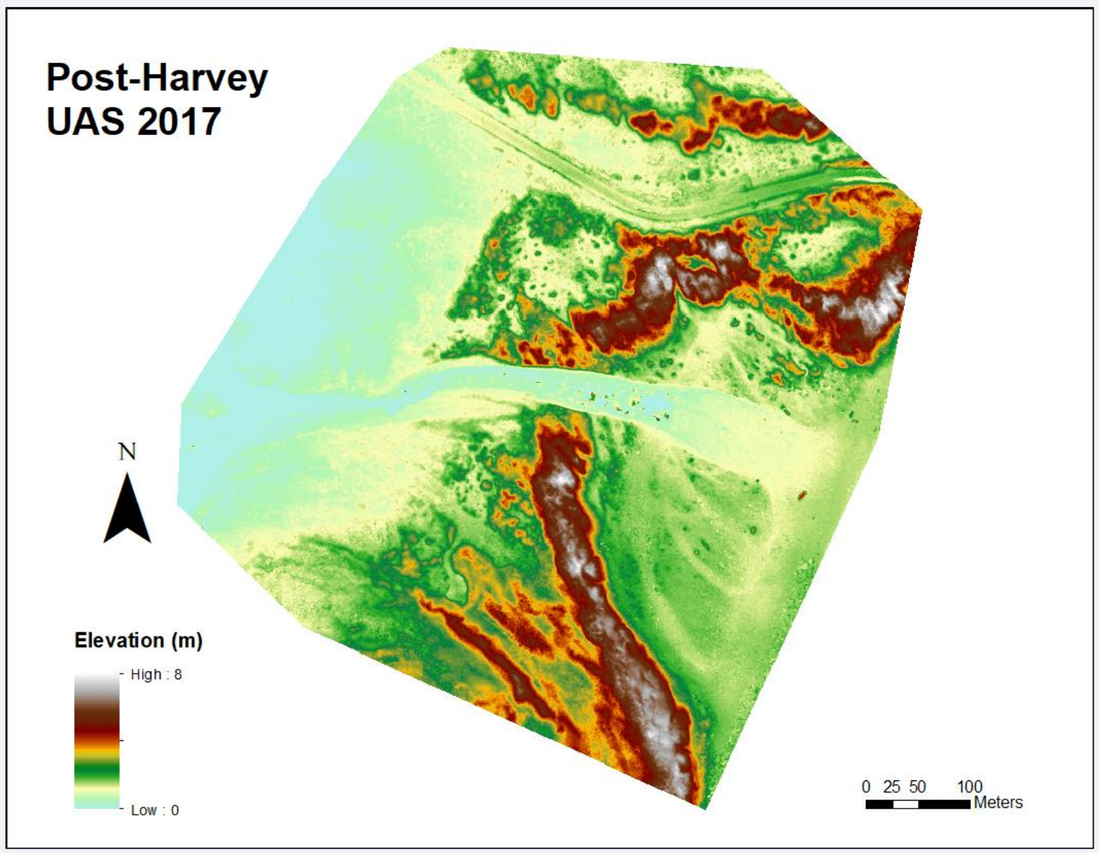
Measuring Elevation Change

Airborne Lidar and UAS DEM

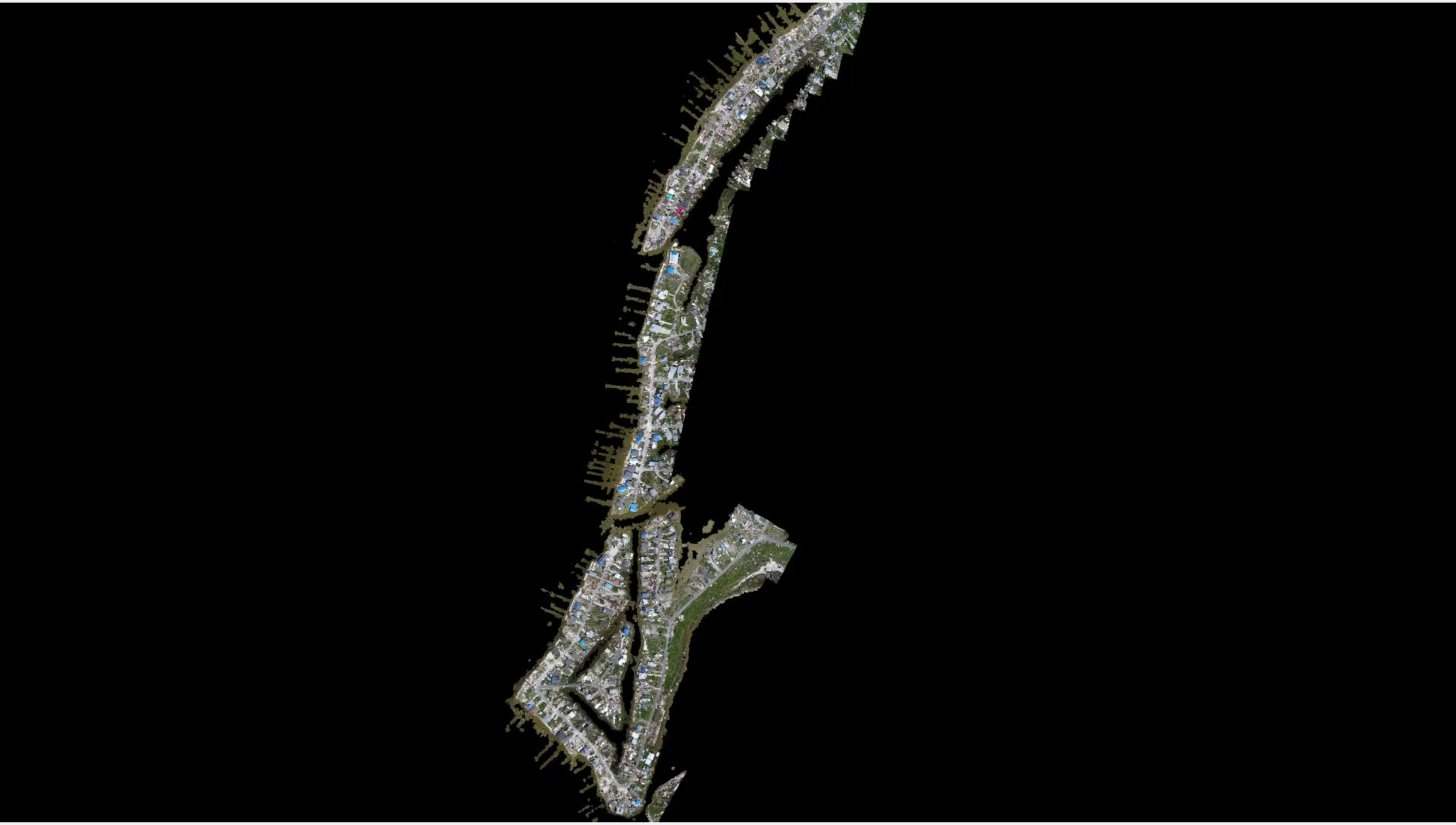






Ground Zero

Geotechnical Extreme Events Reconnaissance
Turning Disaster into Knowledge
Sponsored by the National Science Foundation



Concluding Thoughts

- **Geodetic Infrastructure**
  - GNSS stations, tidal gauges
  - Necessary to track RSLR
  - Needs to be densified
- **UAS (drones)**
  - Rapid response
  - Routine monitoring
  - Regulations and adaptation

Contact
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