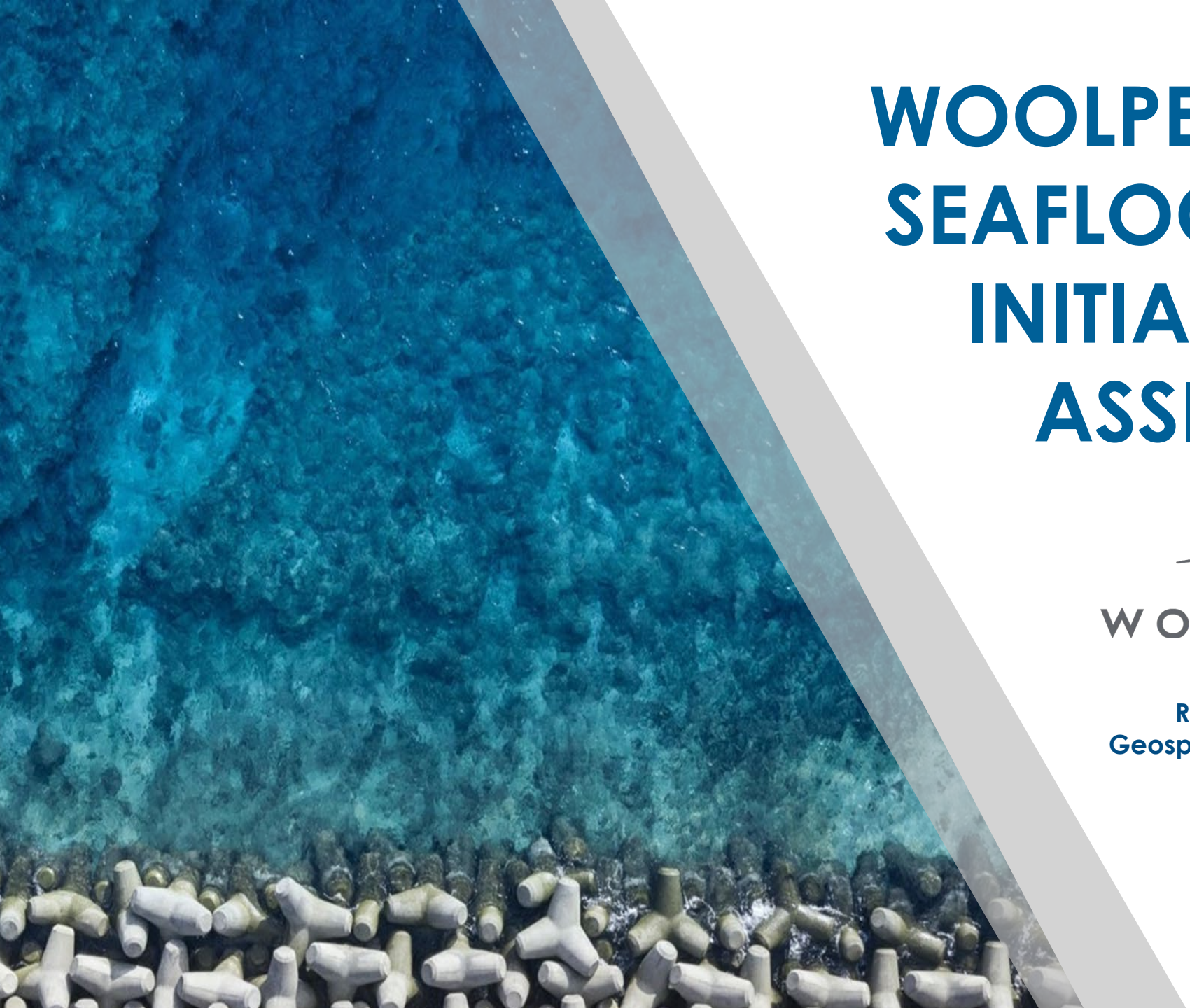


WOOLPERT'S FLORIDA SEAFLOOR MAPPING INITIATIVE (FSMI) ASSIGNMENT

WOOLPERT

Rick Householder,
Geospatial Program Director

WOOLPERT AT A GLANCE

1911

Founded in
Dayton, Ohio

35+

Offices Worldwide

2000+

Global
Employees

WOOLPERT GEOSPATIAL

By the Numbers

$70M
Invested in Lidar Technology

1200+
Geospatial Professionals

114
Years of Geospatial Experience

2000+
LiDAR Projects

1000+
Completed International Mapping Projects

50+
Countries Worked In

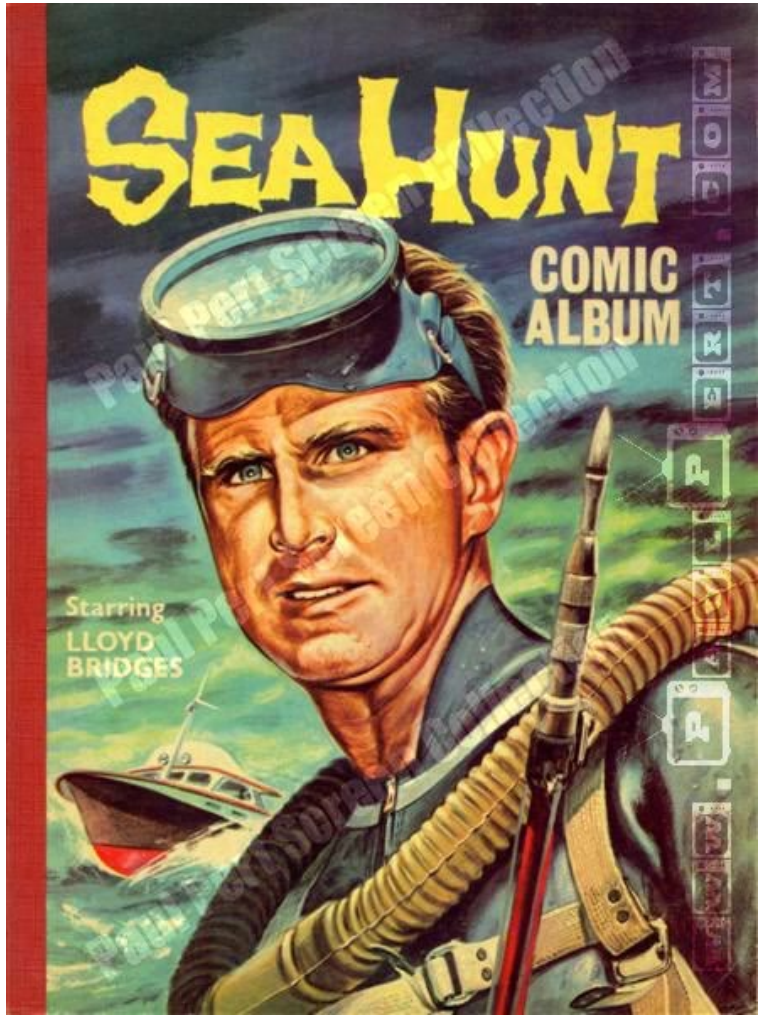
1M+
Square Kilometers Collected Annually

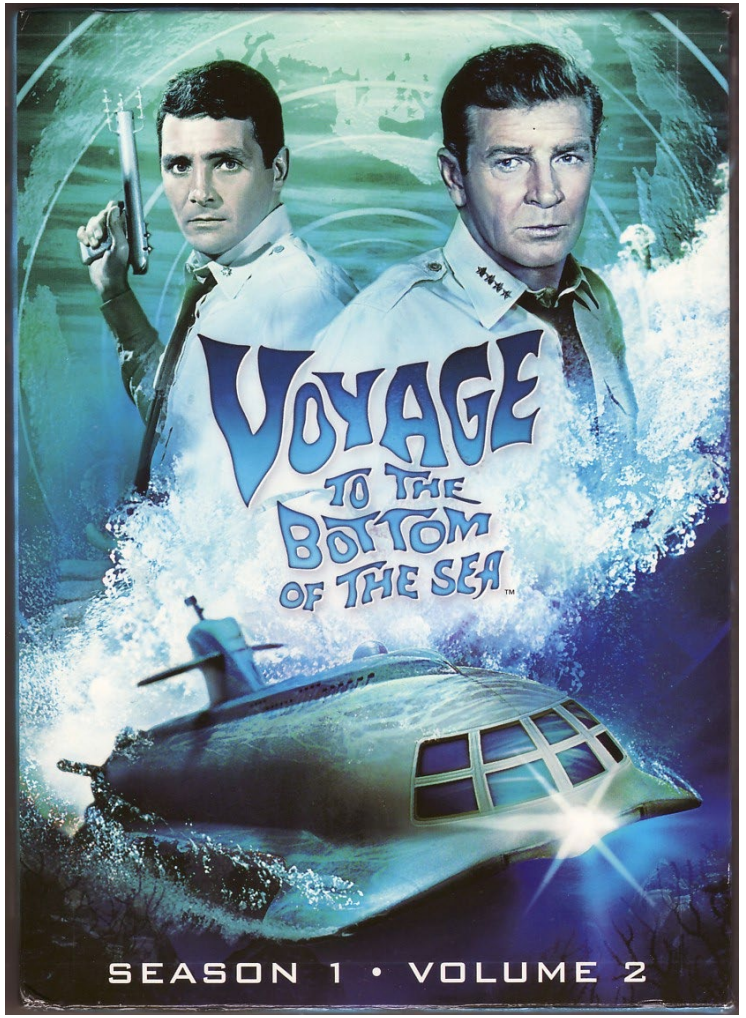
15+
Aircraft in Fleet

30+
Sensors in Use

WOOLPERT GEOSPATIAL CAPABILITIES

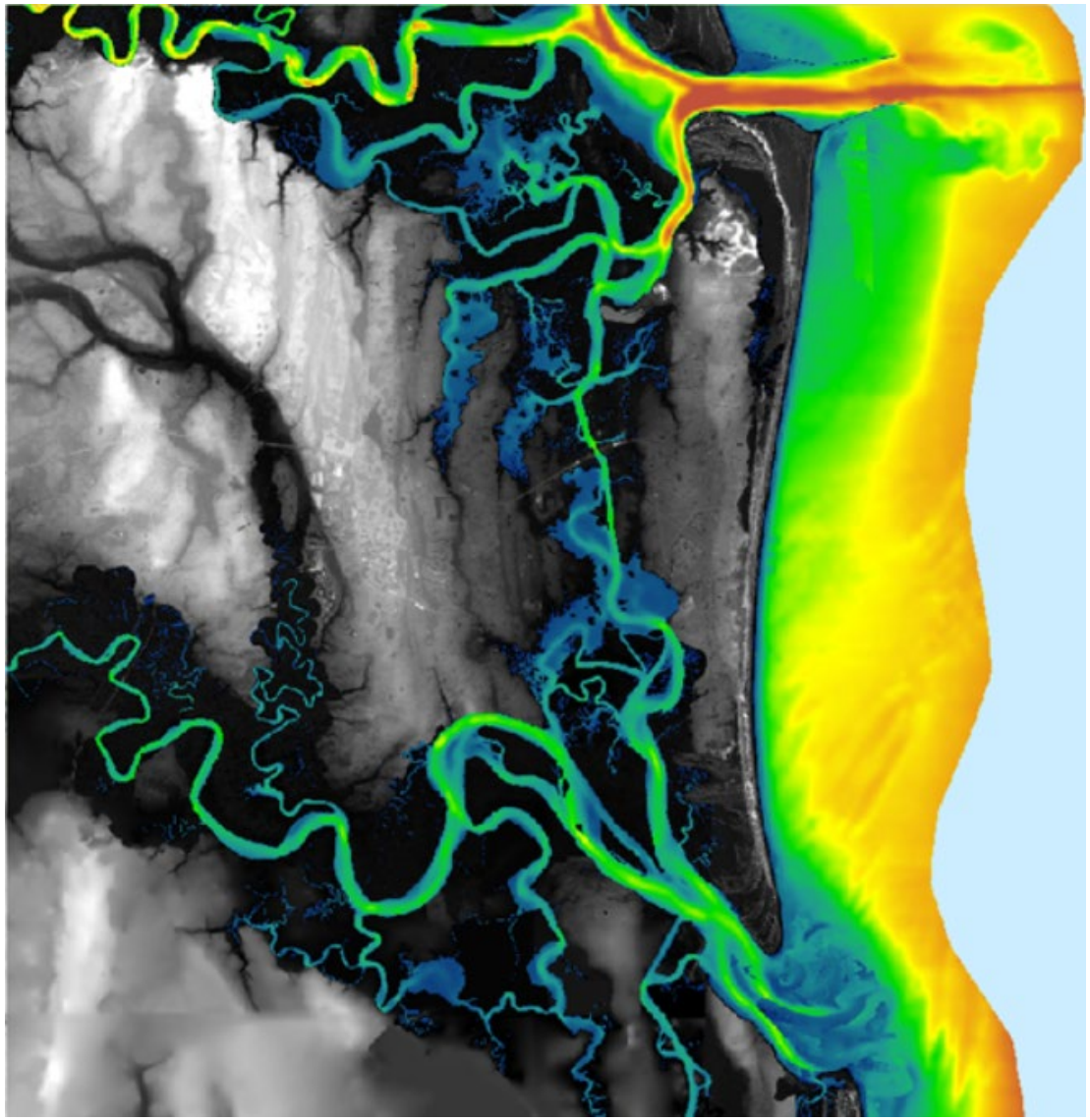
What is the Florida Seafloor Mapping Initiative (FSMI)?





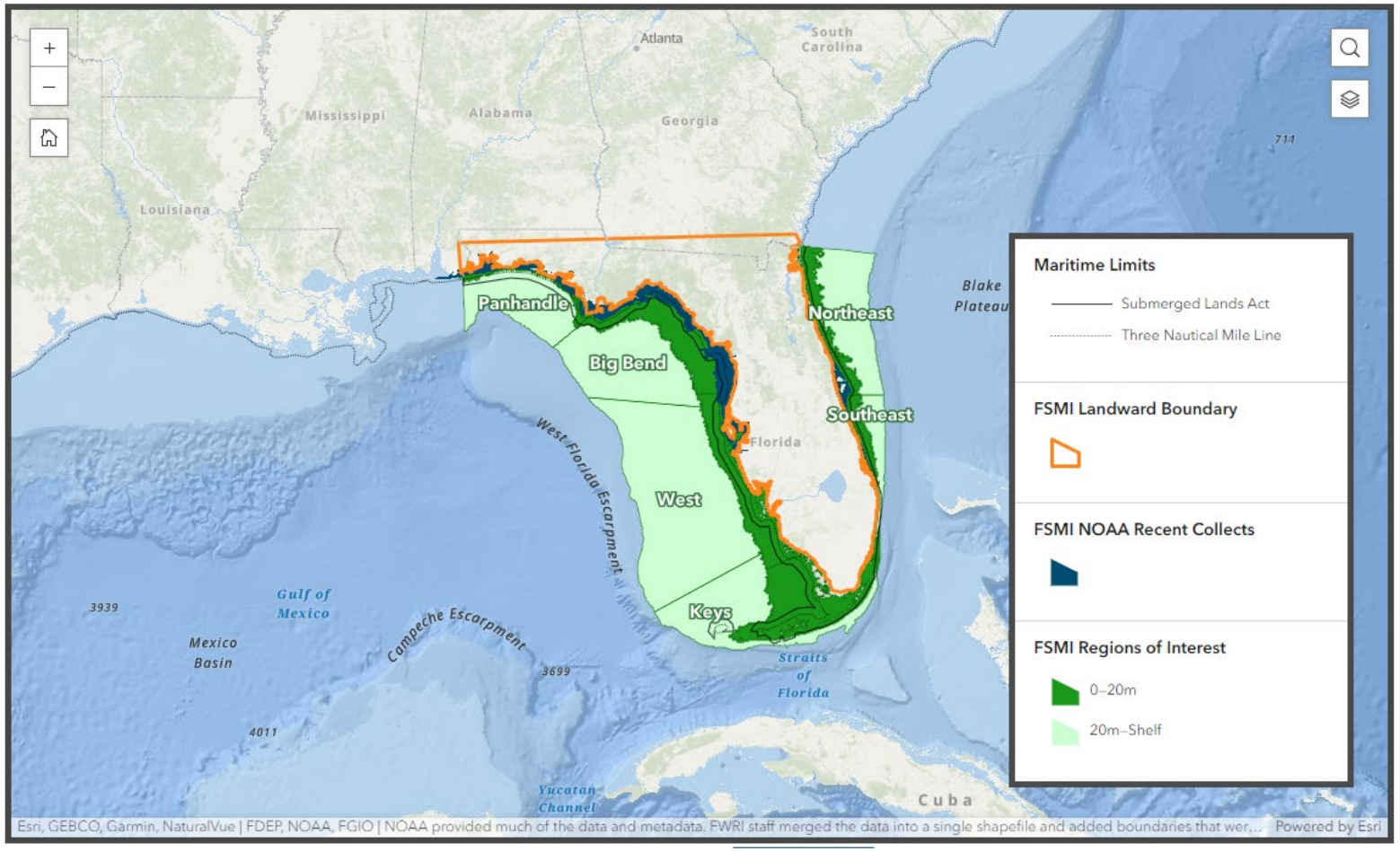
Florida Seafloor Mapping Initiative

Overview



- $100 million in general revenue funds have been provided to the department to capture statewide bathymetric lidar.
- Two possible types collected: **topo bathymetric lidar** can image to a depth of 20 meters and **multibeam sonar** can capture deeper bathymetry from 20-200 meters.
- DEP's Office of Resilience and Coastal Protection will coordinate with federal partners to maximize funds and guide data acquisition.
- As partners, DEP and the Florida Geographic Information Office (GIO) will provide timelines and anticipated schedules on respective program webpages.
- Once acquired and processed, DEP will provide in a public portal the derived products, such as digital elevation models and bathymetric maps.

What is the Florida Seafloor Mapping Initiative (FSMI)?



High-resolution seafloor data are critical for:

Understanding coastal vulnerability and hurricane impacts

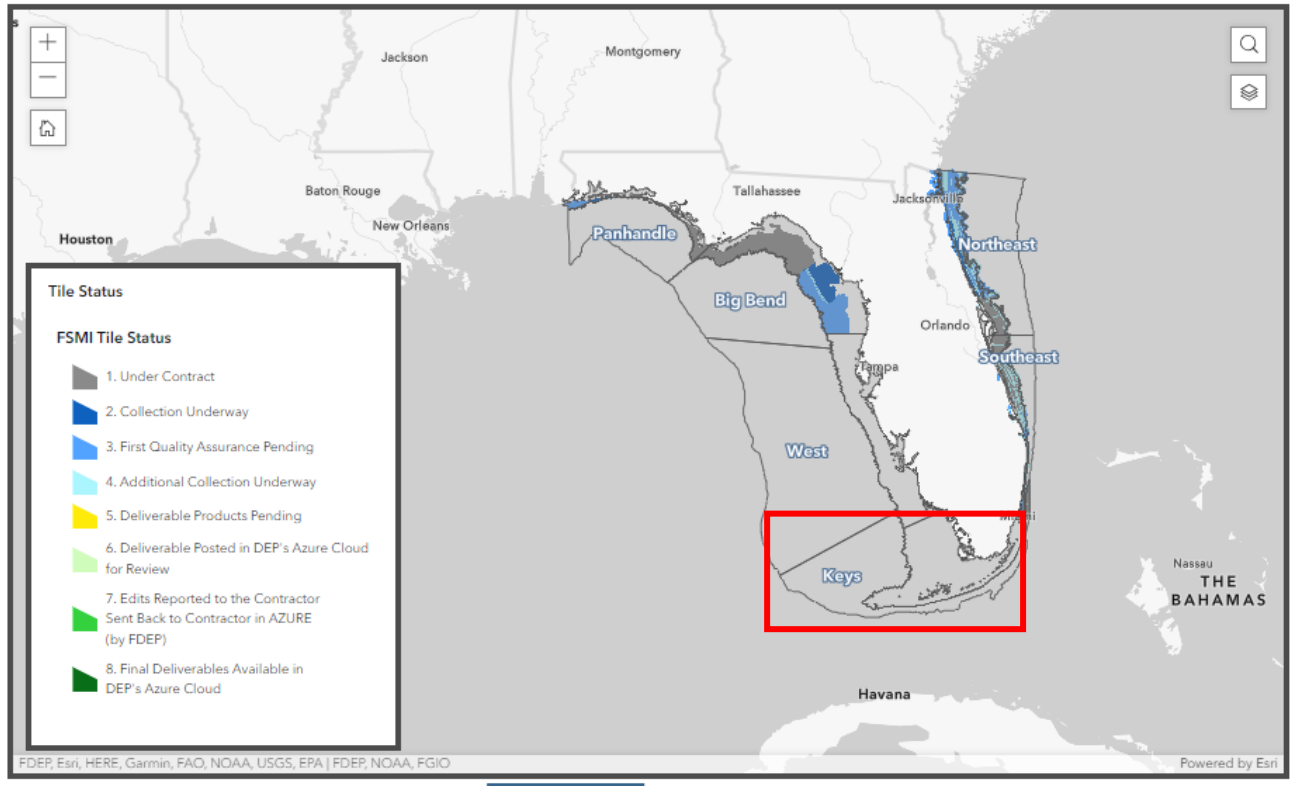
Locating natural resources

Assessing the health of fishery populations

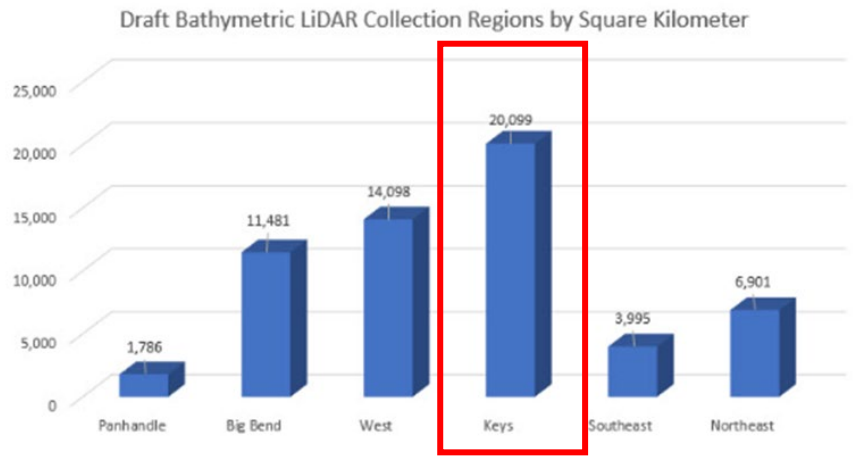
Evaluating performance of restoration projects

Seafloor mapping could also have **substantial economic benefits** for Florida. The predicted return on investment (ROI) is 5.1:1, or **$28 million** annually. (FGS)

Woolpert Bathy Lidar Award



- Awarded Region 3 by the FDEP in late October 2023
- Original project area over 20,000 square kilometers and over 7,000 square kilometers of potential supplemental deep areas
- Teaming with NV5 to meet the State's September 25 Deadline



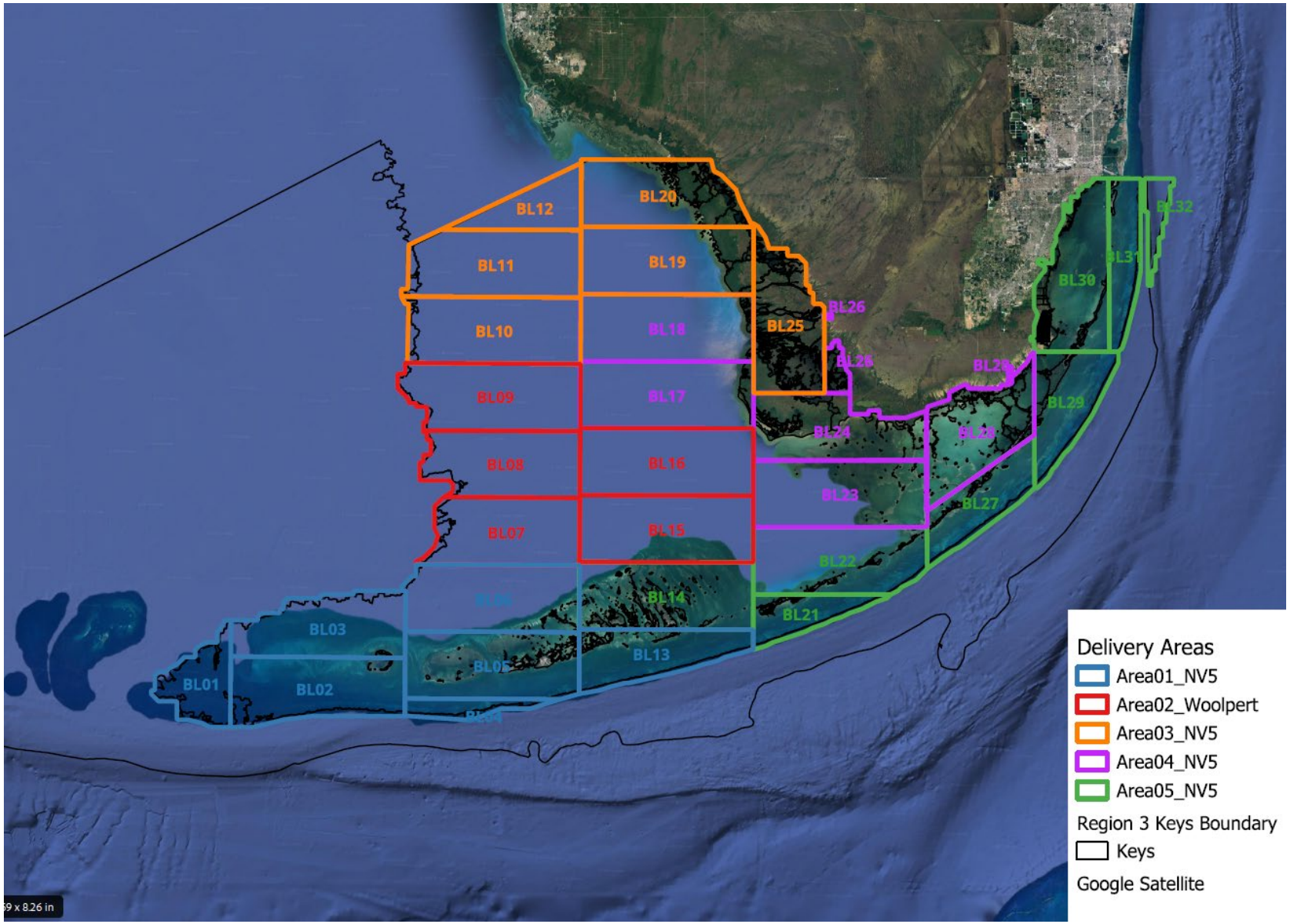
WOOLPERT

NV5

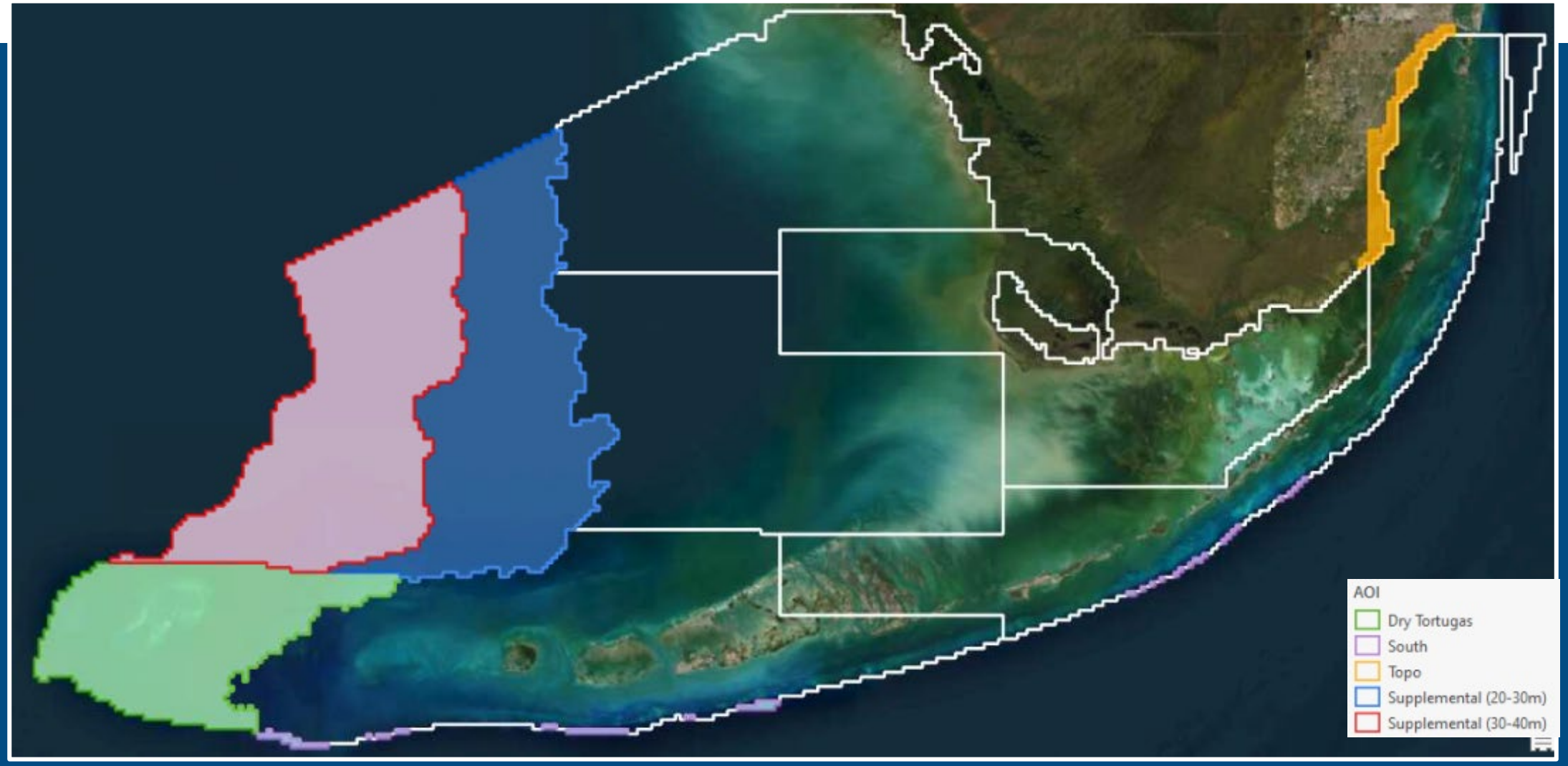
Original Region 3 *AOI*

- Region 3 broken into **5 Delivery Area**s, each approximately 20% of the project delivery by area and corresponding FDEP's contract delivery schedule

- Woolpert will acquire all topobathymetric lidar data in **Area 02**. Woolpert will process and deliver all topobathymetric lidar data in Areas 02, 03, 04 and 05



FSMI Supplemental Areas



Topographic - Bathymetric LiDAR

Light Detection and Ranging (LiDAR)

Emitting thousands of pulses of light and measures return time of the pulse

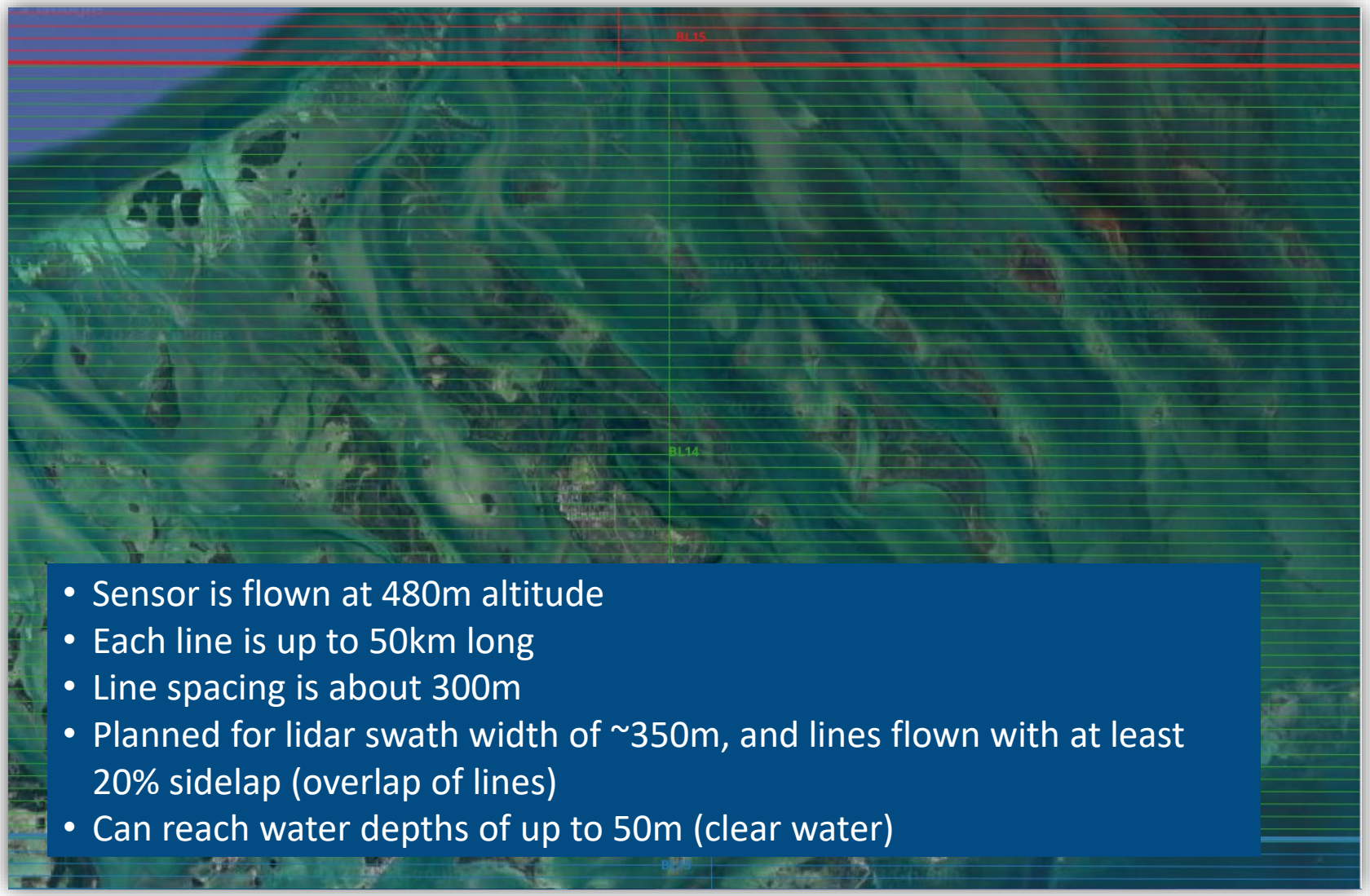
- Near Infrared (NIR) @1064nm measures land elevations
- Green @ 532 nm measures water depth
- Creates a highly accurate 3D map of land and subsurface features

Topo-bathy Lidar Aerial Assets

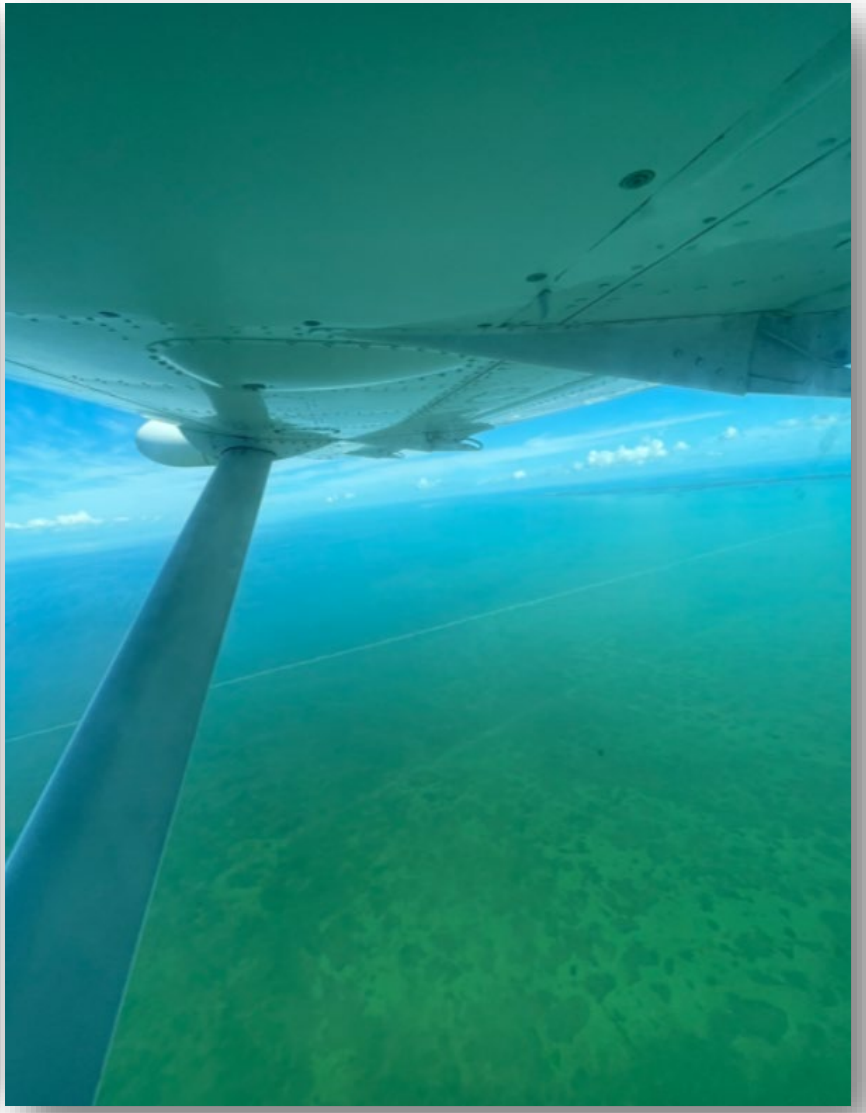
- Team operates a total of 5 aircraft and 5 sensors
- Leica Chiroptera and HawkEye models 4x & 5x topographic and bathymetric Lidar sensors

LASER CHARACTERISATION	
Deep bathymetric capability	40,000 points/second green, digital full waveform capture
Shallow bathymetric capability	140,000 points/second green, digital full waveform capture
Topographic capability	Up to 500,000 points/second infrared
Operation altitude	Bathymetry 400 – 600 m AGL Topography up to 1,600 m AGL
Depth range [1]	Deep bathymetry Dmax = 4/k Shallow bathymetry Dmax = 2.7/k
Scanner pattern	Oblique scanner
Field of view	±14° front/back, ±20° left/right
Swath width	70% of AGL
Point density [2]	Deep bathymetry: >1 pts/m² Shallow bathymetry: >5 pts/m² Topography: >10 pts/m²
Bathymetric elevation accuracy [2, 3]	Shallow: 0.15 m (2σ) Deep: $\sqrt{0.3^2 + (0.013 \cdot \text{depth})^2}$ m (2σ)
Topographic accuracy [2, 3, 4]	Elevation accuracy: <5 cm (1σ) Horizontal accuracy: 10 cm (1σ)
OPTICAL CHARACTERISATION	
Q/A camera	5 MP, 2,448 x 2,050 pixels, 1 frame per second (fps), RGB
Leica RCD30 medium format camera (Optional)	80 MP, 10,320 x 7,752 pixels, 1 frame per second (fps), RGBN
PHYSICAL & OPERATION INTERFACE	
GNSS/IMU	Novatel SPAN with LCI-100C IMU (non-export restricted)
Mission planning	Leica MissionPro
Flight navigation	Leica FlightPro
Post-processing	Novatel Inertial Explorer – GNSS/IMU processing software LiDAR Survey Studio™ Leica HxMap Image processing
Storage capacity	> 1 sortie recording in ruggedised removable SSD
Operation temperature	0 °C to +35 °C
Storage temperature	-10 °C to +50 °C
Power consumption	2 x 50A @ 28 V DC
Internal battery module	Battery supports GNSS/IMU unit operation up to 30 min without external power

Acquisition/Flight Plan

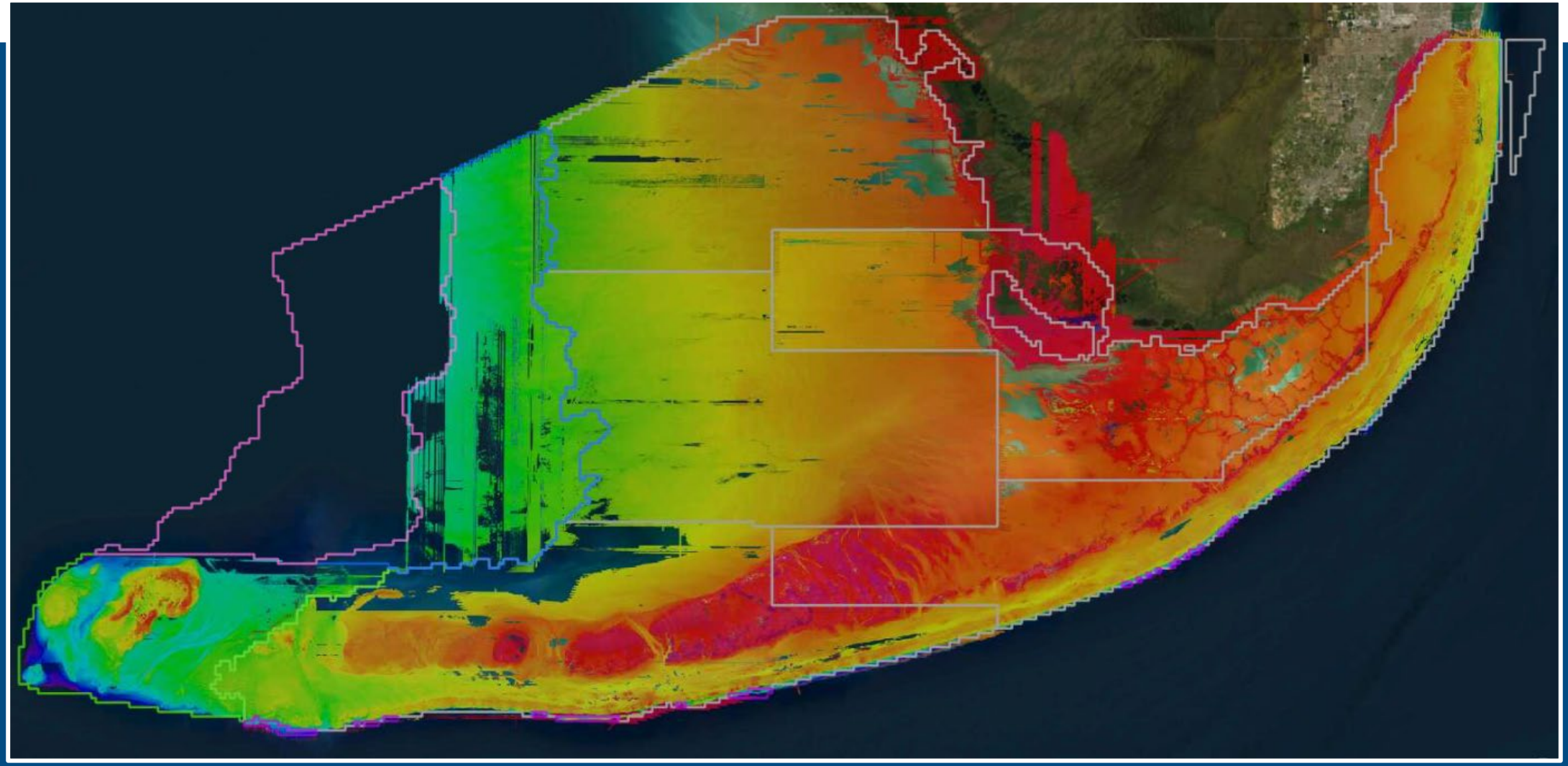


- Sensor is flown at 480m altitude
- Each line is up to 50km long
- Line spacing is about 300m
- Planned for lidar swath width of ~350m, and lines flown with at least 20% sidelap (overlap of lines)
- Can reach water depths of up to 50m (clear water)



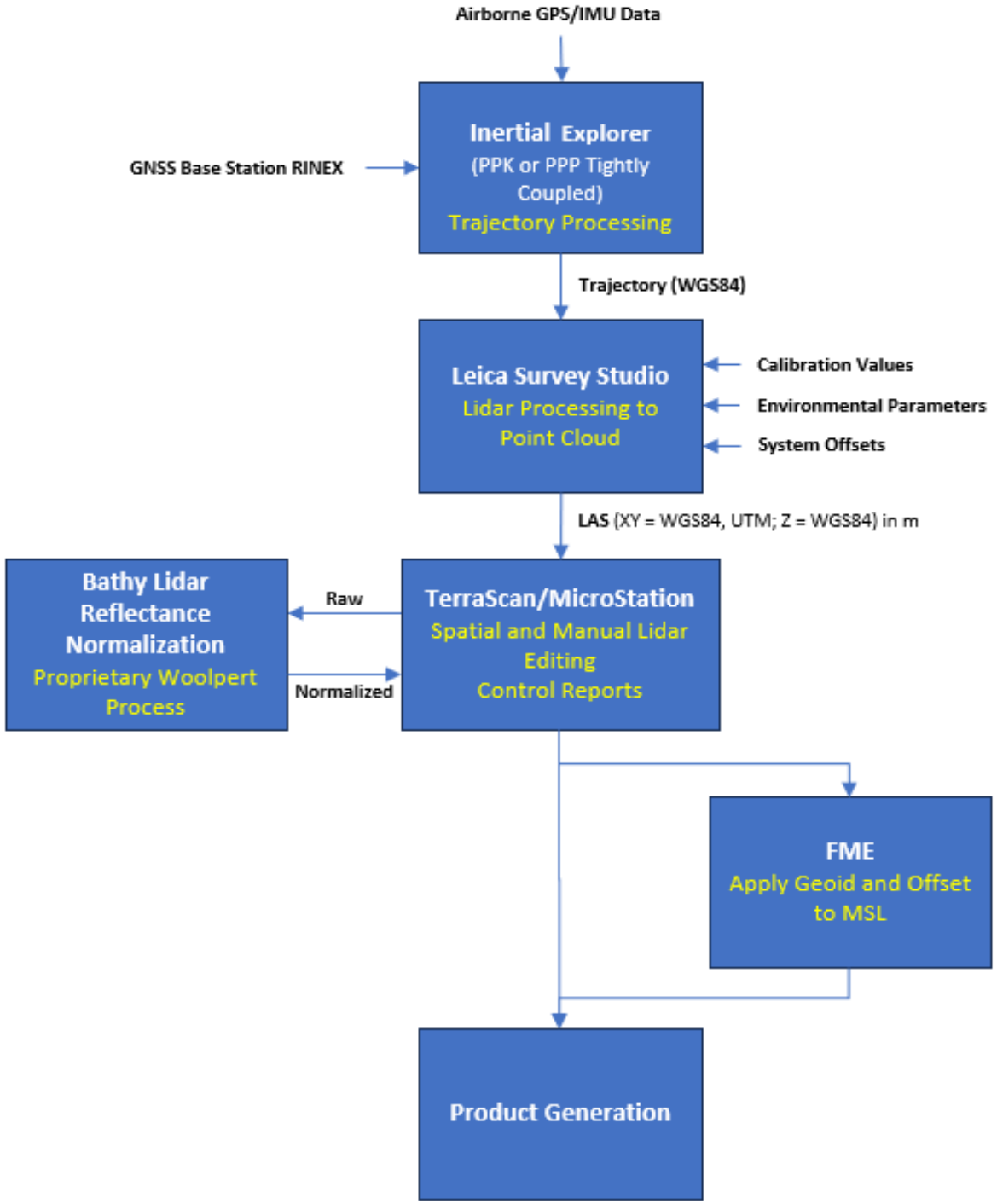
Region 3 Data Coverage

Initial coverage as of Winter 25



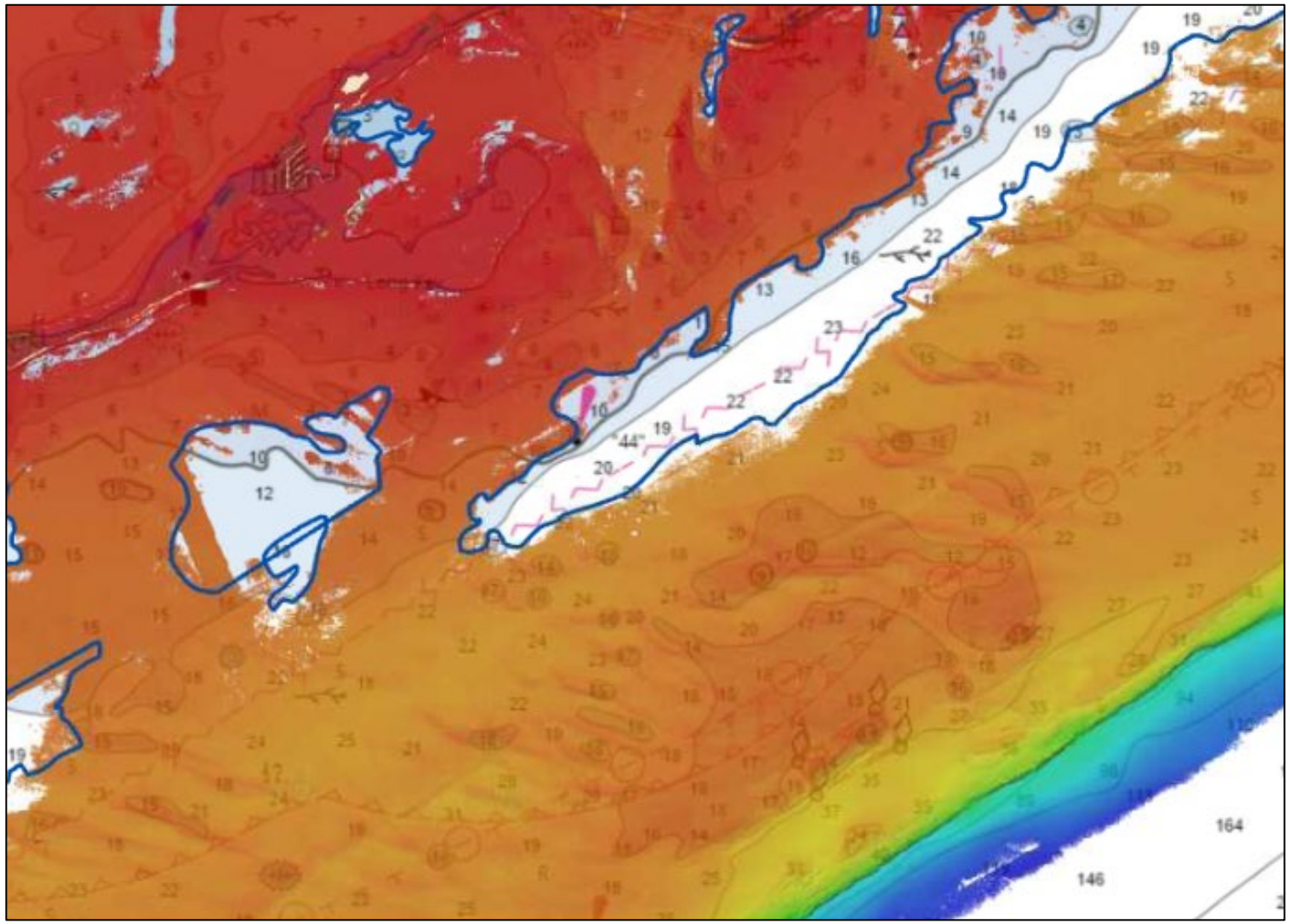
Region 3

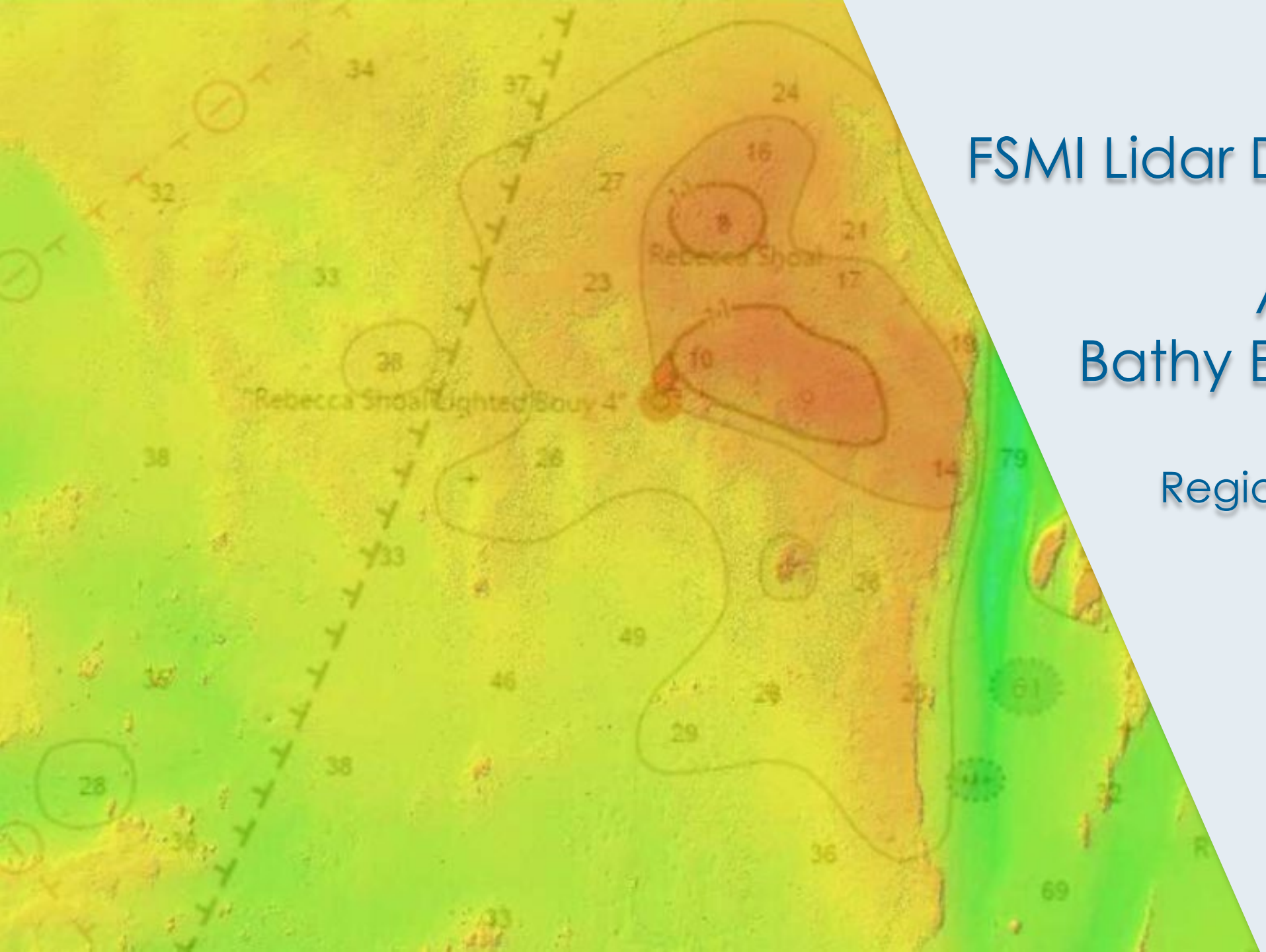
Lidar Data Processing



Void Polygon Workflow

- Gaps in topo-bathymetric coverage are identified from 5m raster datasets
- Void polygons are generated
- A determination to refly is made based on environmental conditions and number of flights already made over the void
- The example blue void polygons are ones that will be reflown





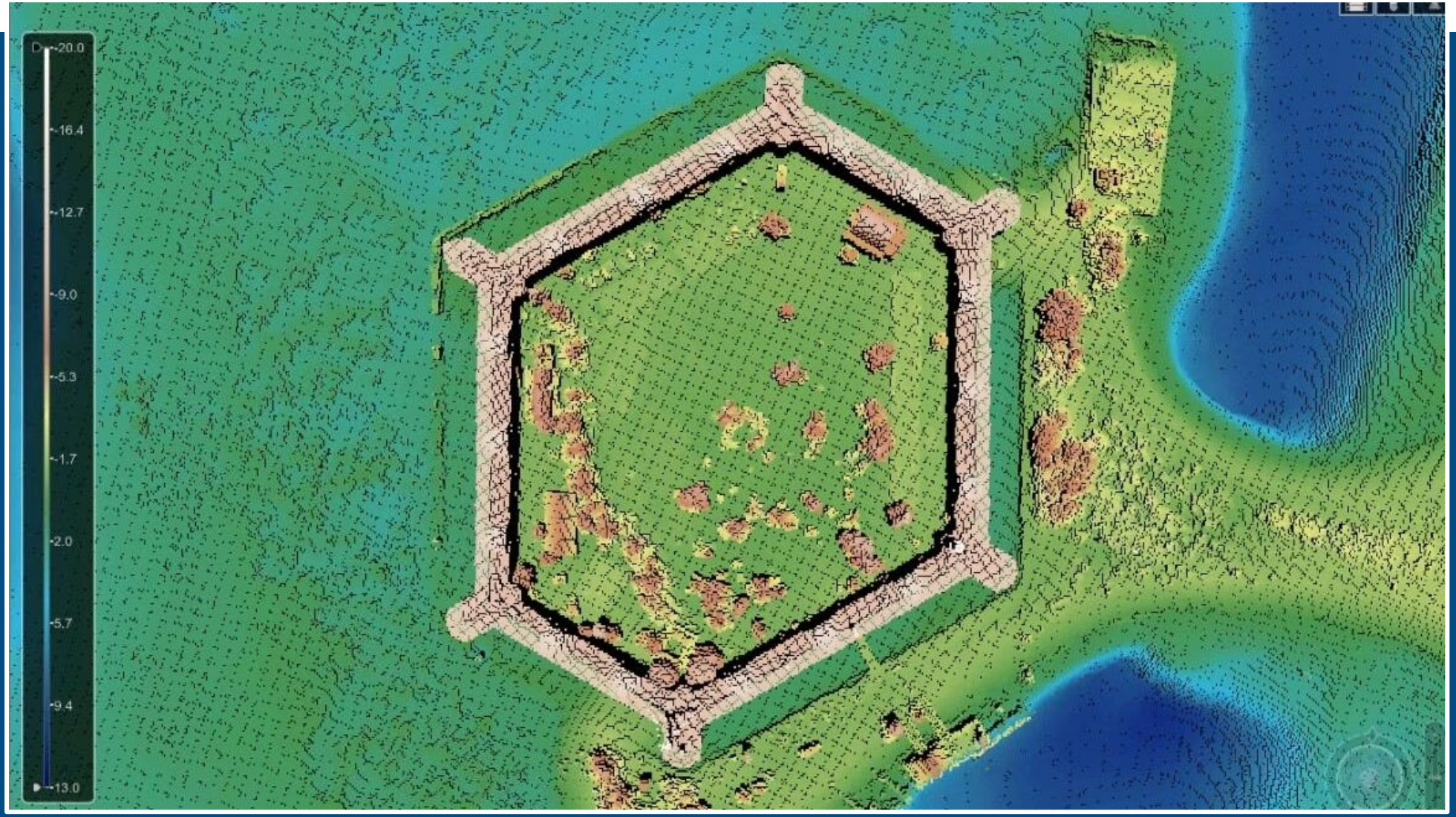
FSMI Lidar Data Examples

AKA
Bathy Eye Candy

Region 3 - Keys

Fort Jefferson

Dry Tortugas

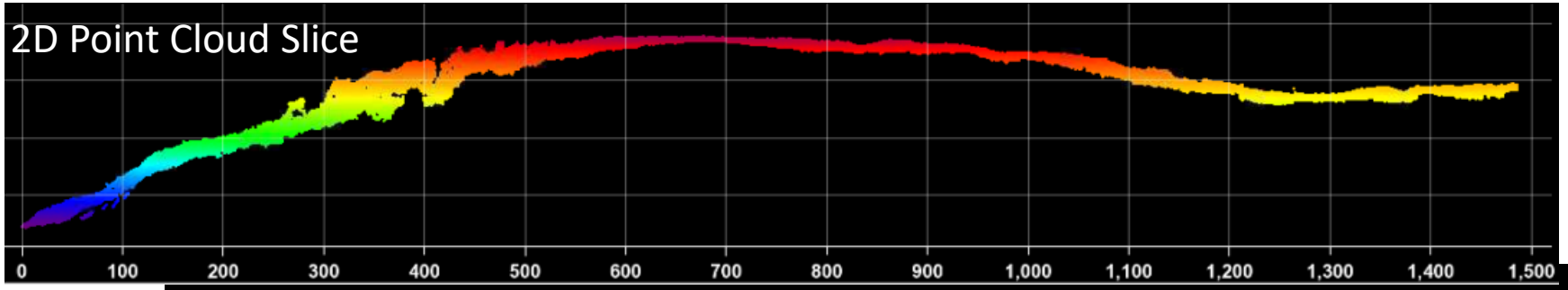


Fort Jefferson

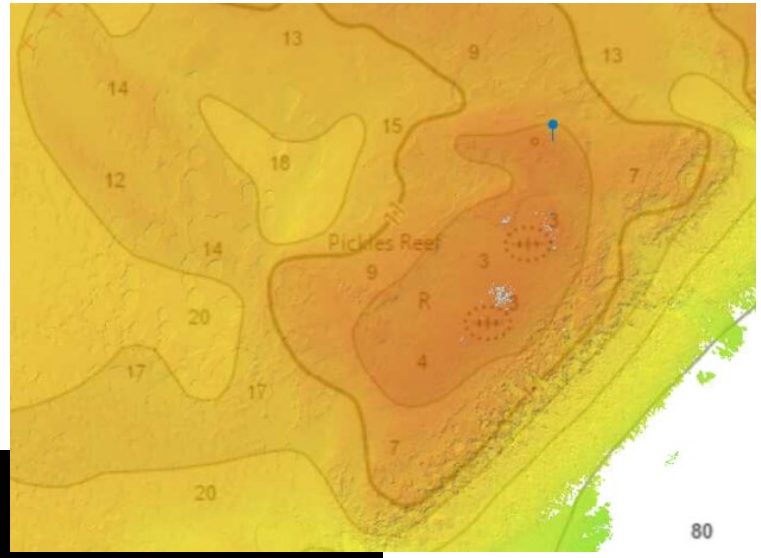
Dry Tortugas

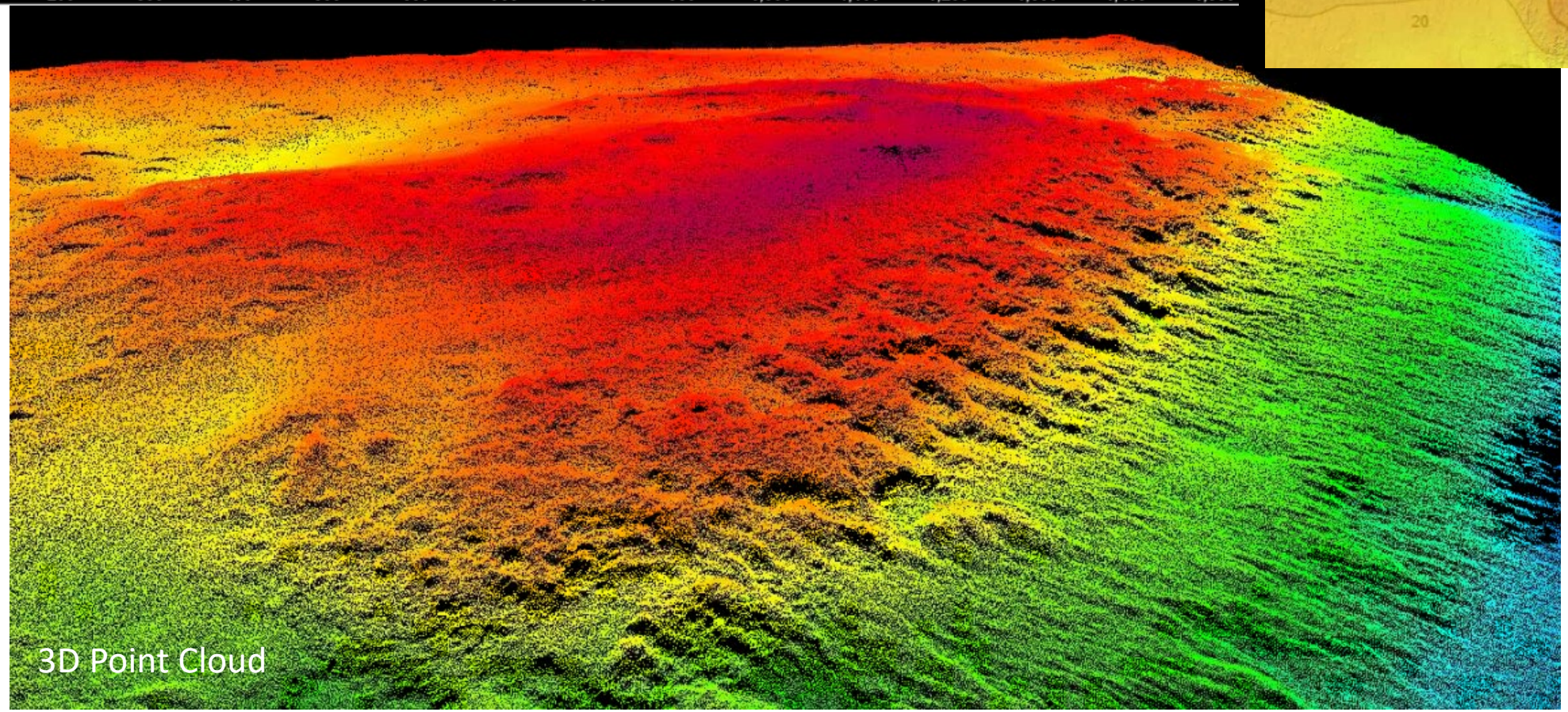
Pickles Reef

Dive spot SE of Rodriguez Key and Key Largo

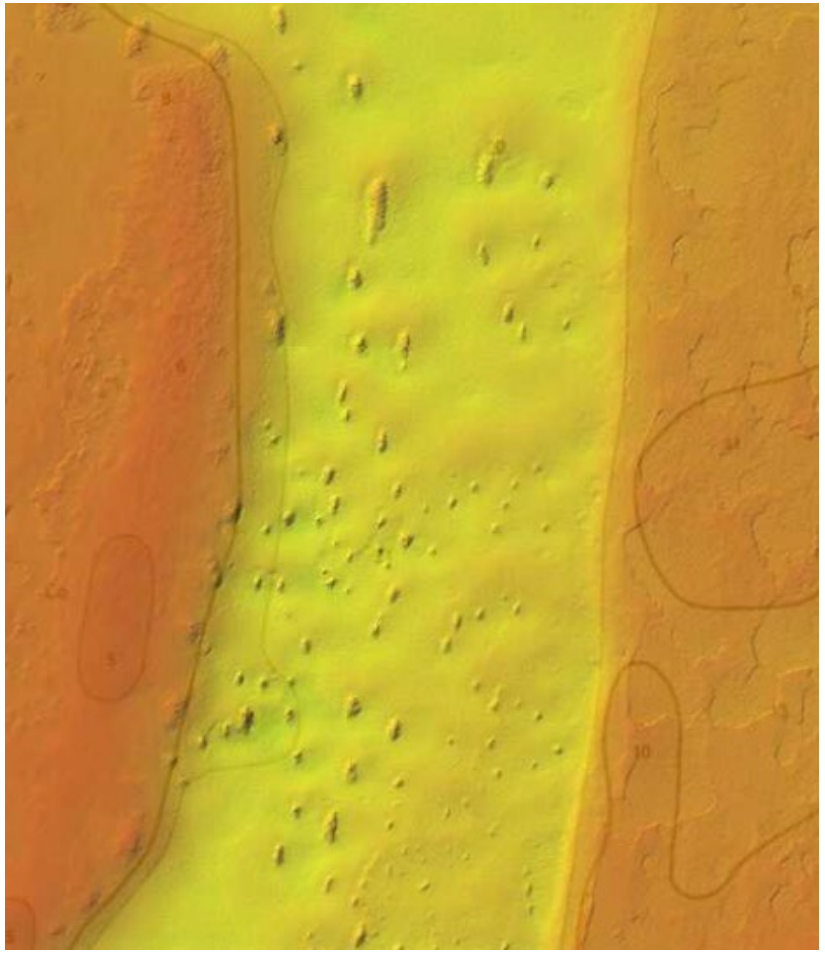


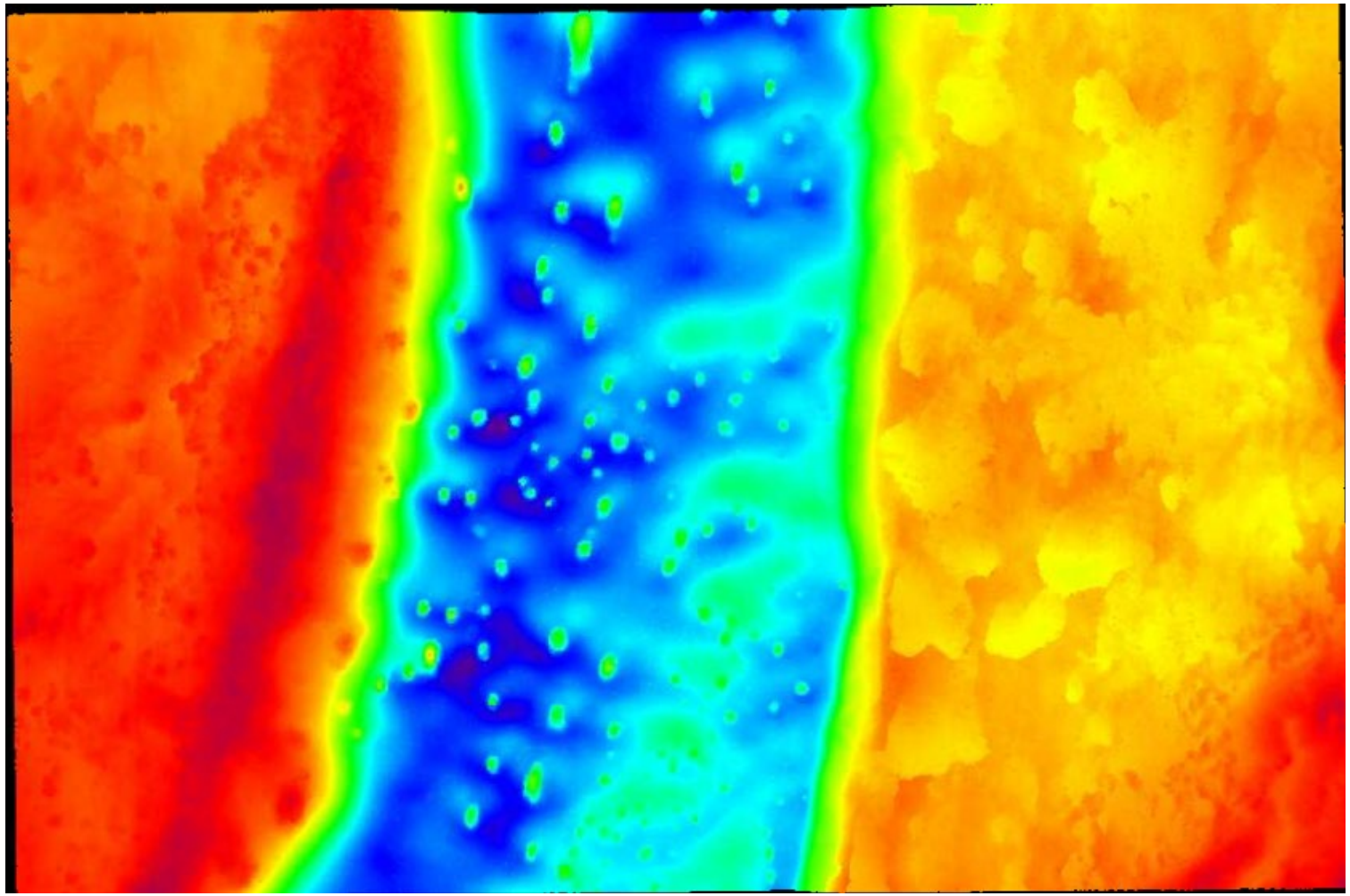
Hillshaded Grid (Plan View)

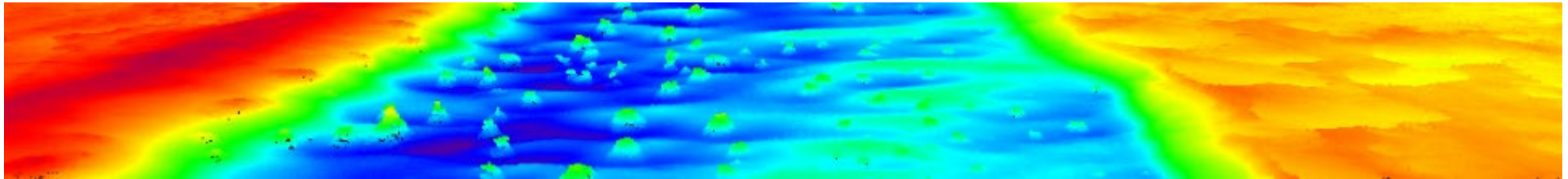




Coral mounds within channel – East of Elliott Key



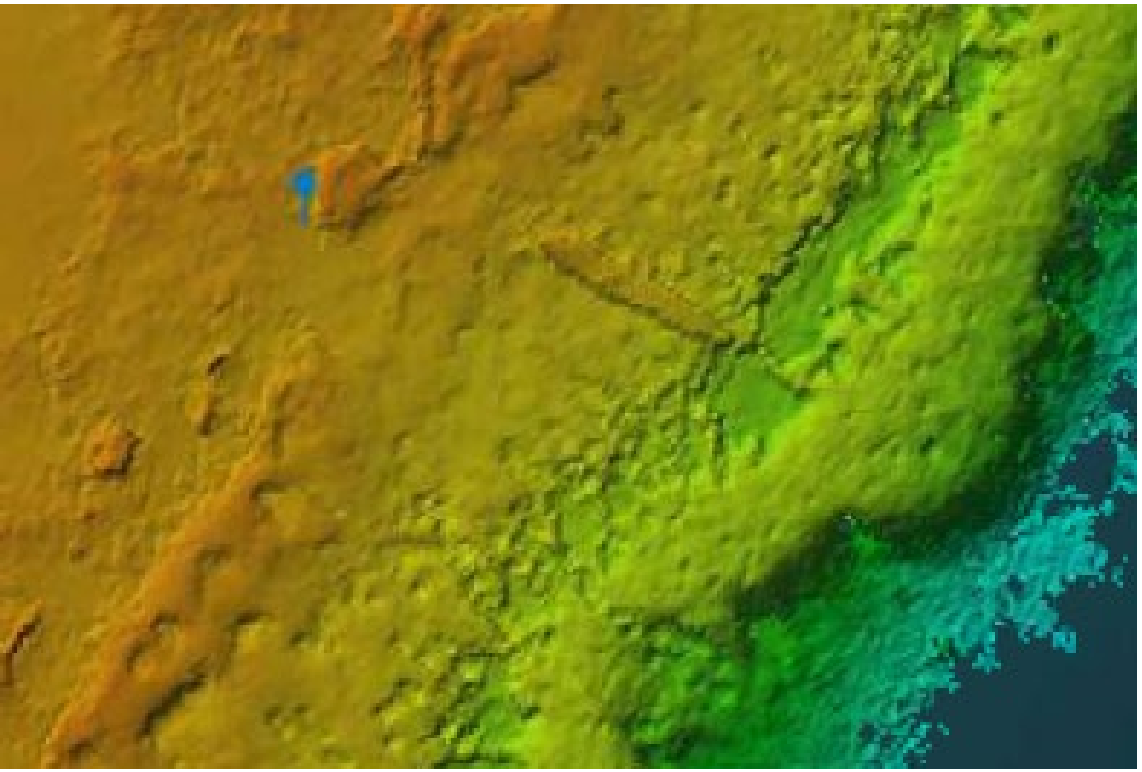


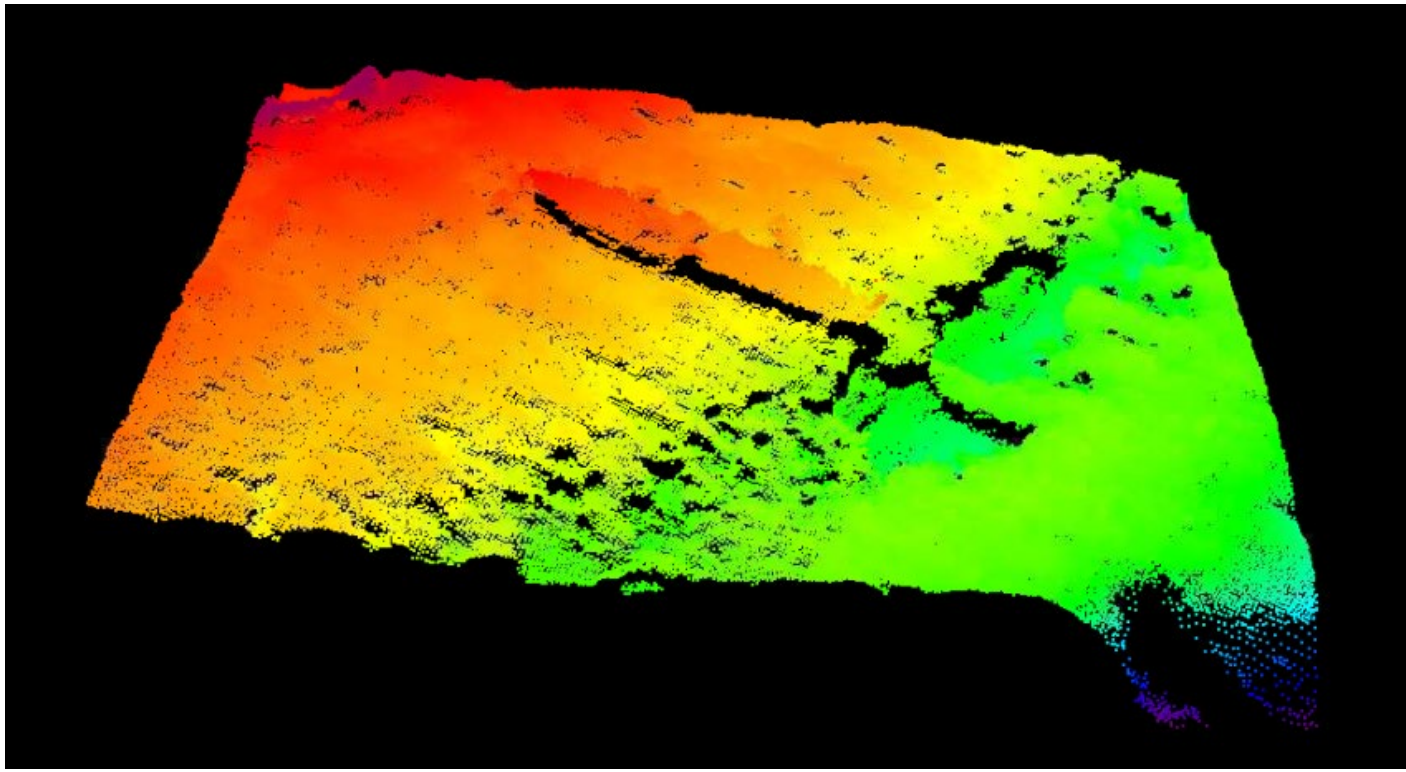


Benwood Wreck

Southeast of Key Largo

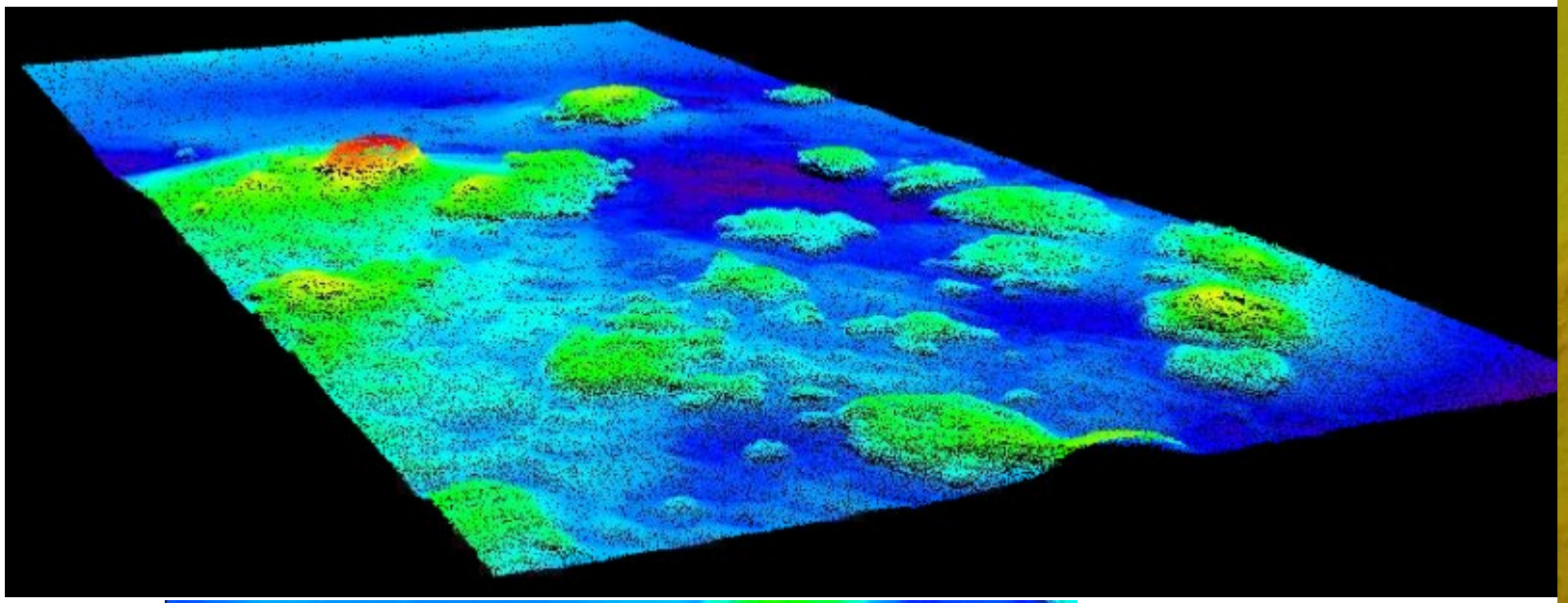
Benwood, Merchant Marine Freighter
Built in England, 1910
360 ft long, 51 ft beam
Sunk in 1942 after collision

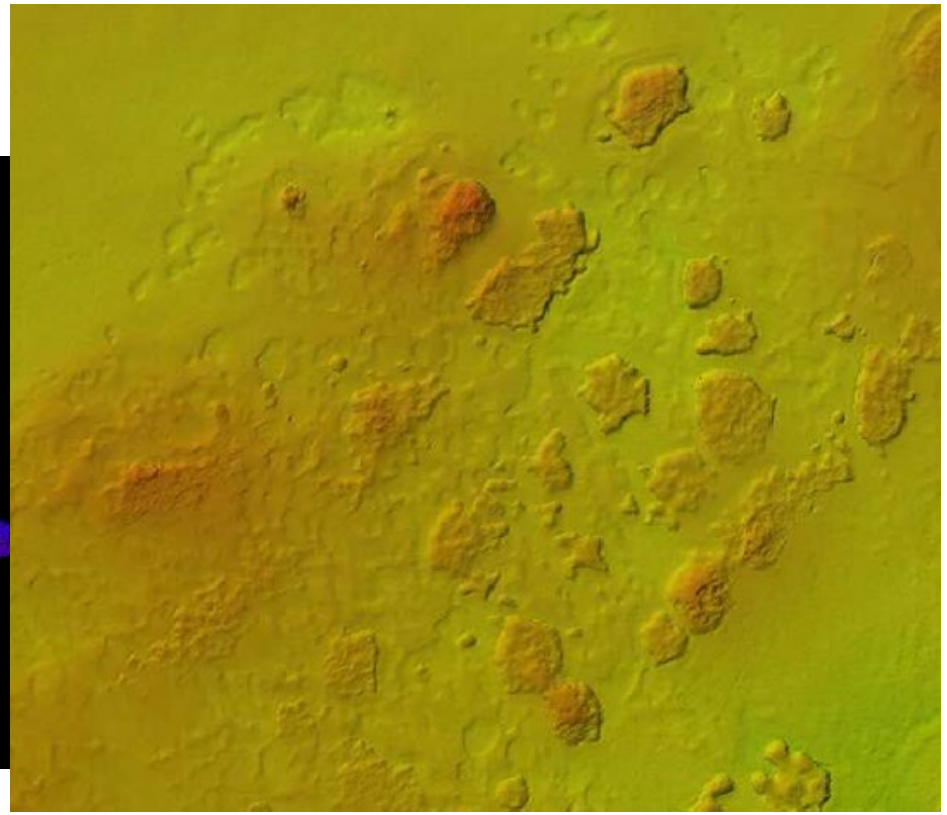


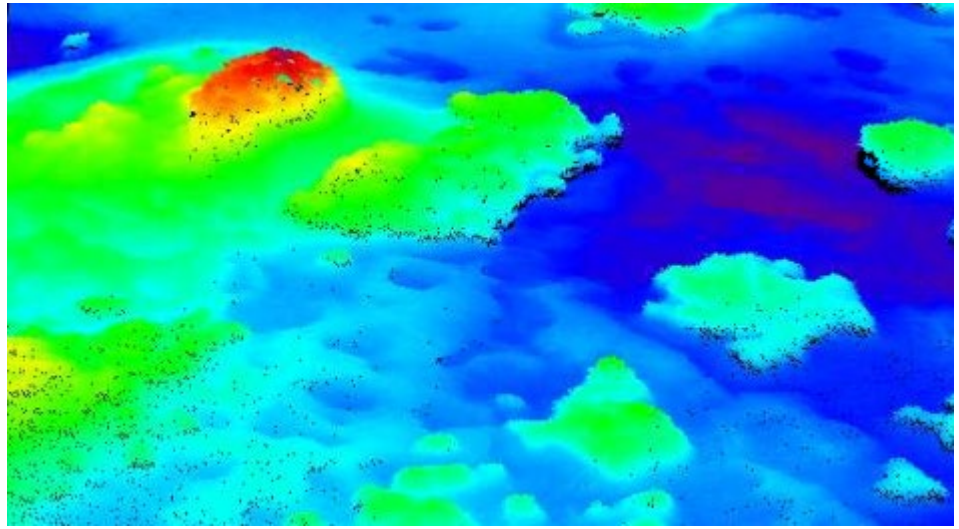


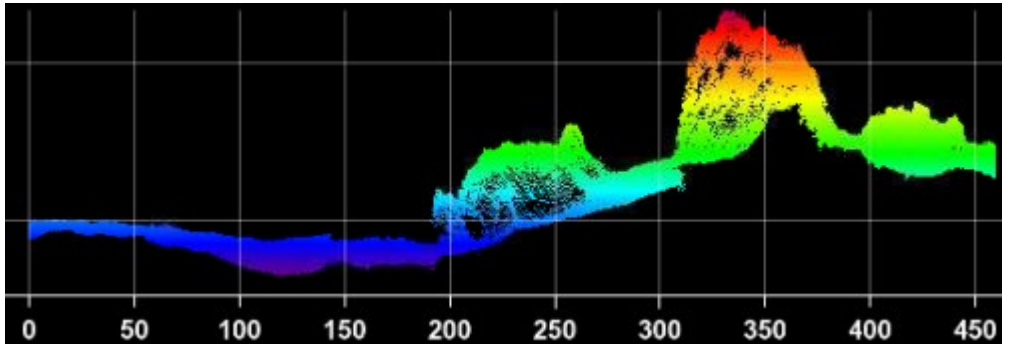
Coral Reef

Between Key Largo and Tavernier



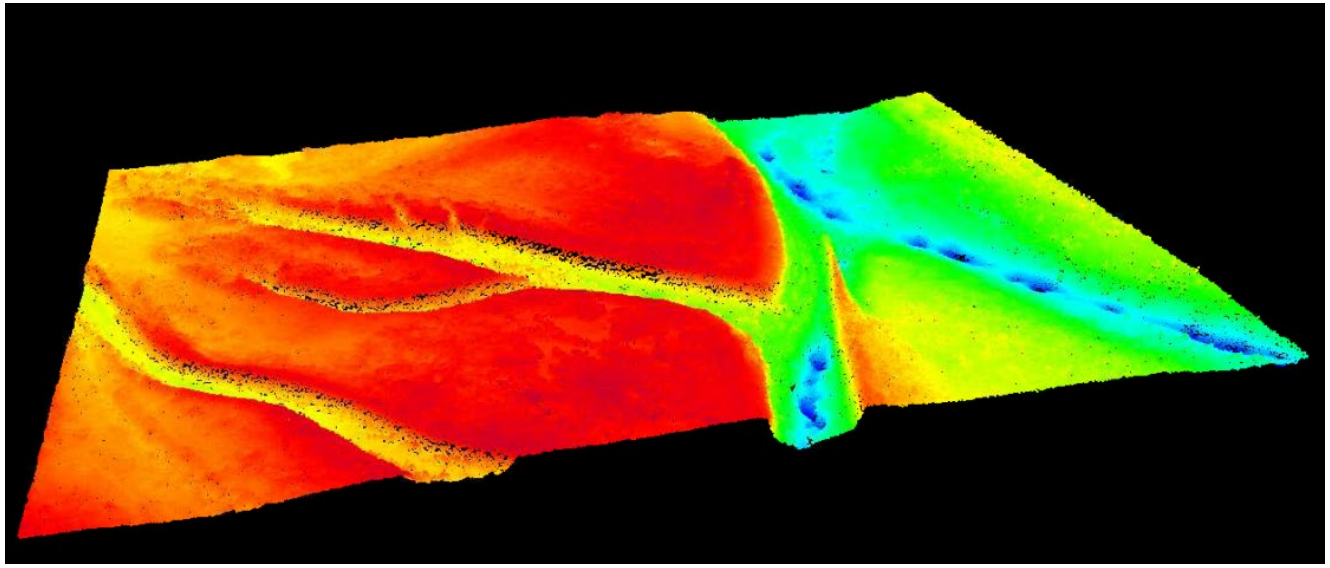


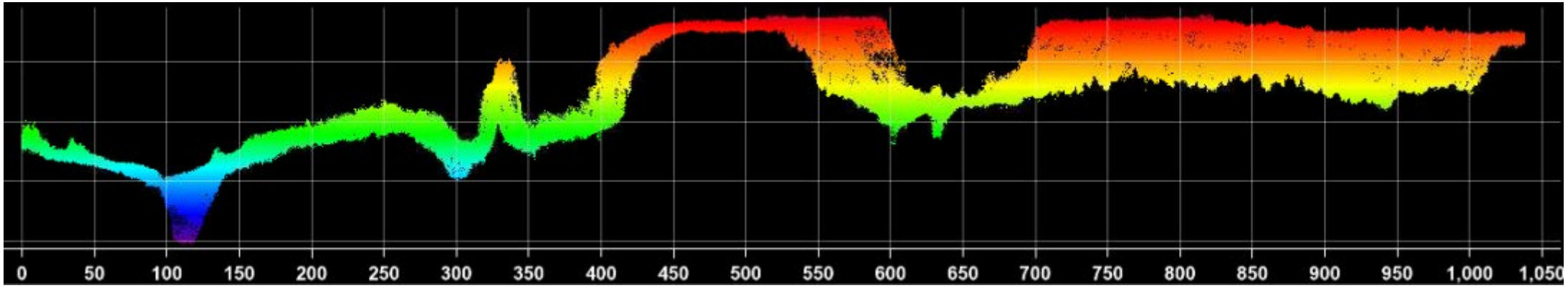




Underwater Channels

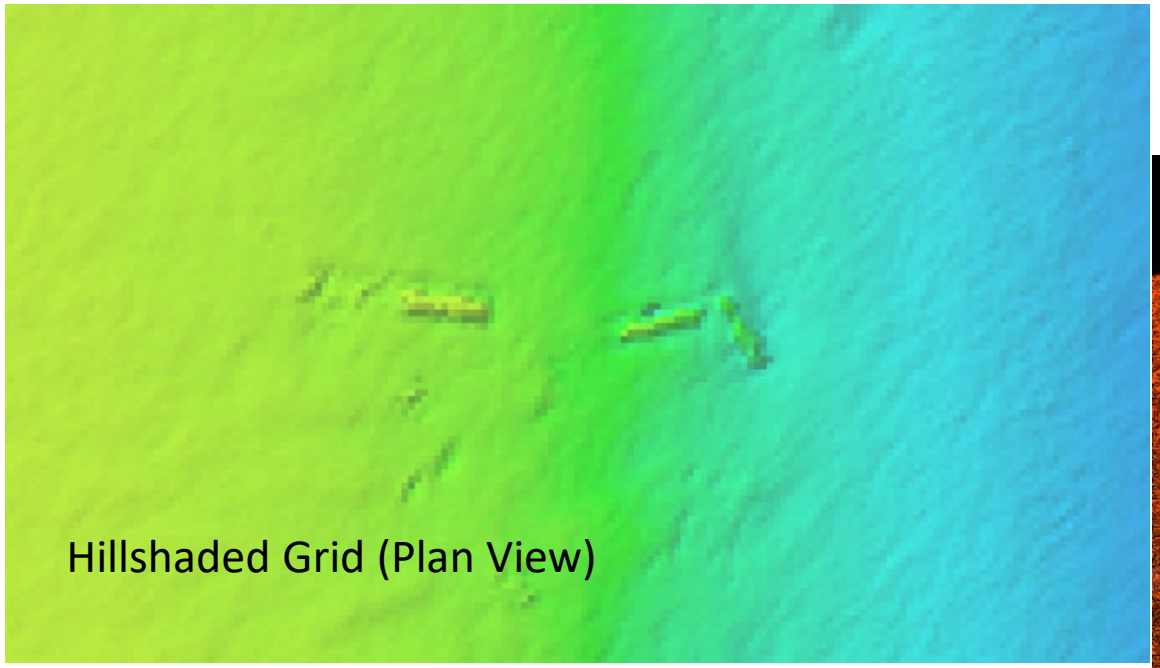
North of Big Pine Key





Barges (Artificial Reef)

Belcher Steel Barge and Hav Parker III Deck Barge East of Key Biscayne



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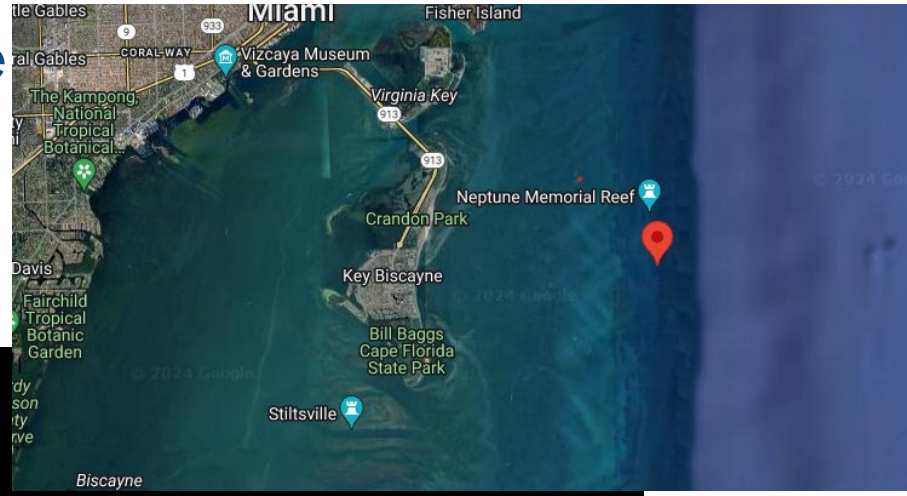
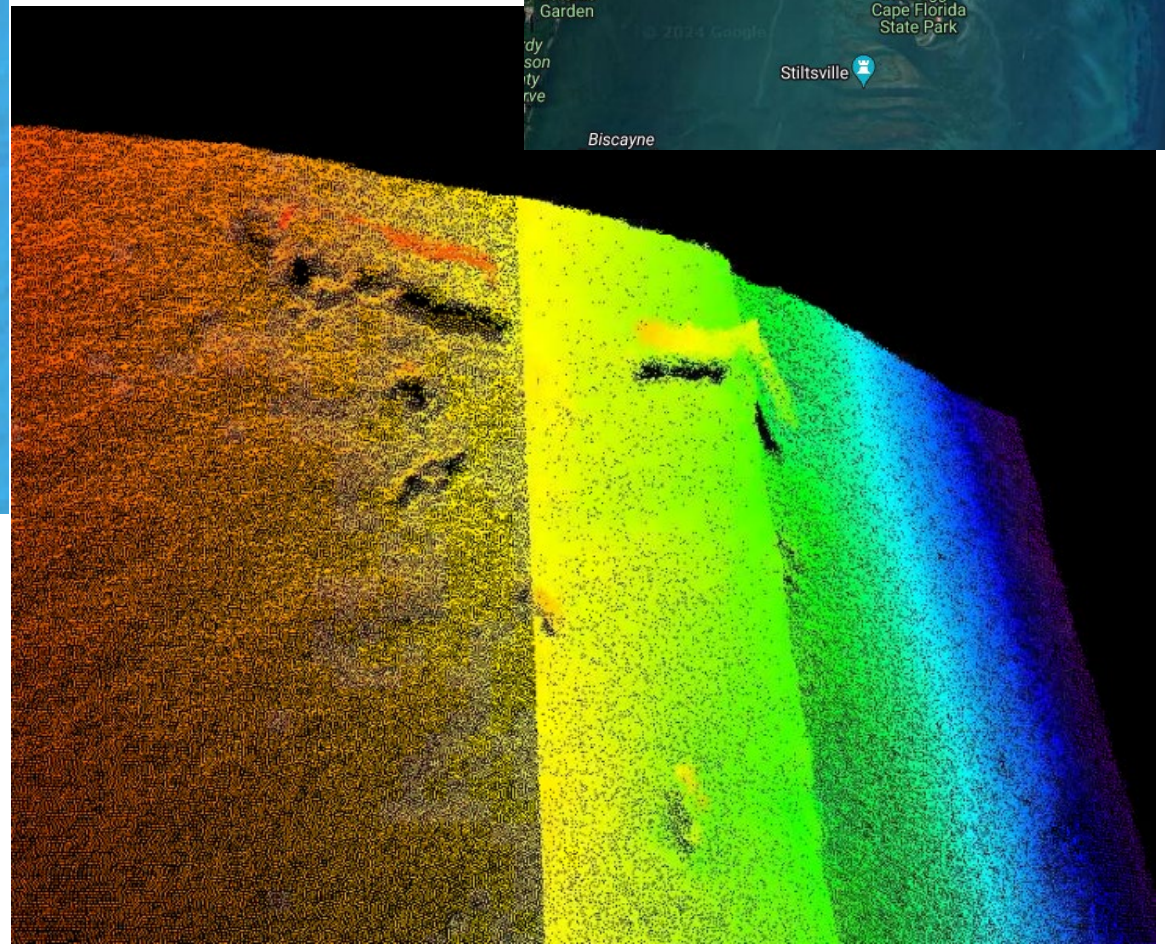
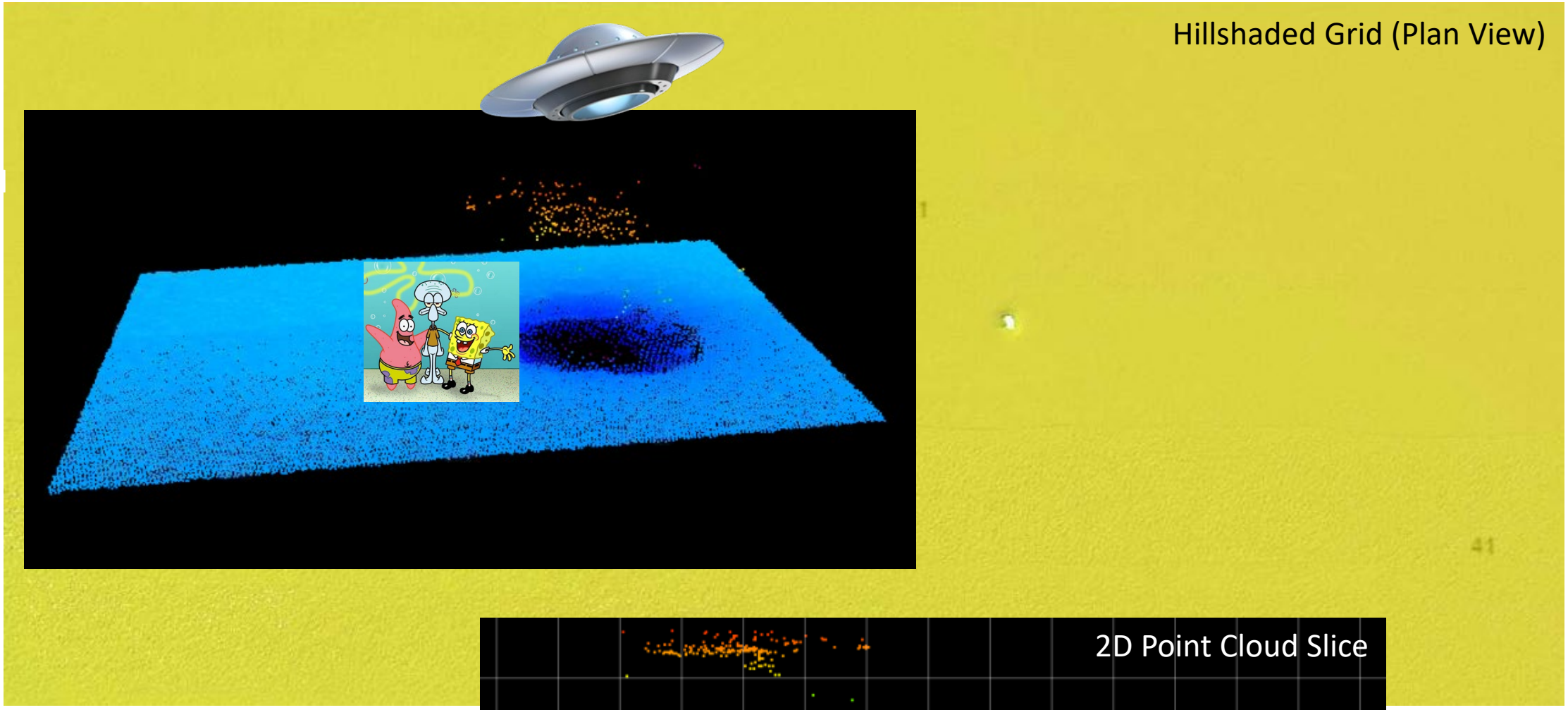
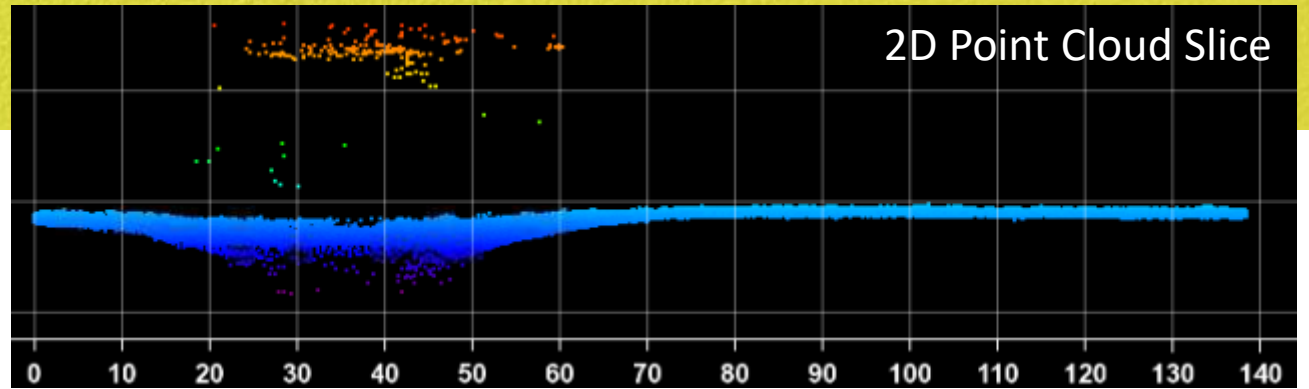




Mystery Depression

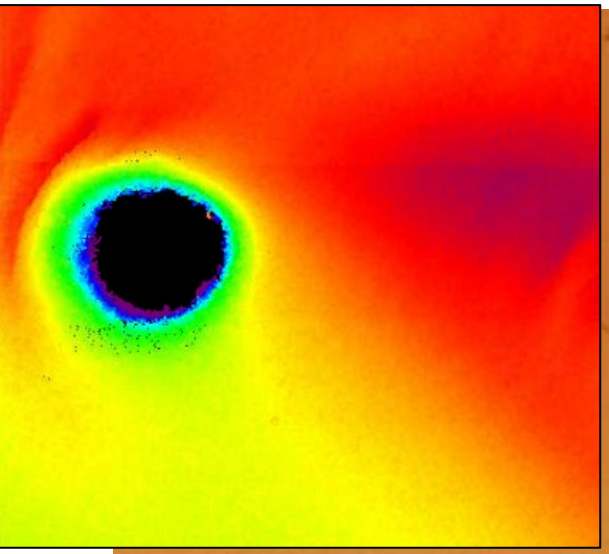




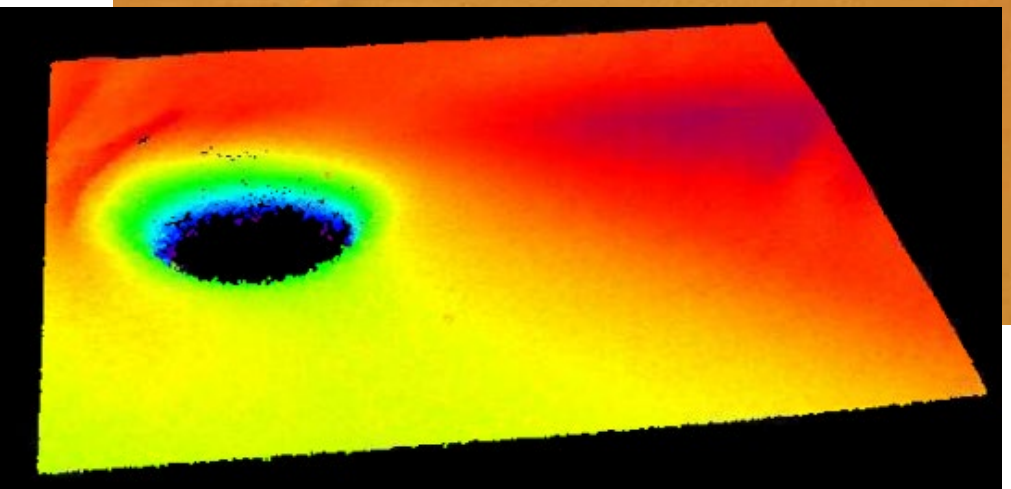
Not able to see much ‘structure’ in the water column that would indicate a wreck or obstruction on the seafloor.

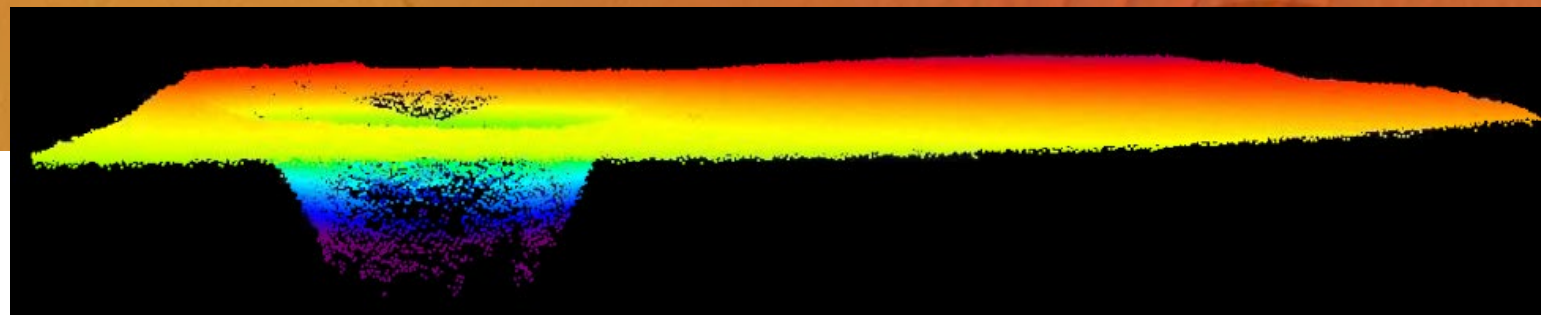
Blue Hole #2 - Submerged Sinkhole?

Area 3, Florida Shelf, GoM https://youtu.be/WHatkfXNIuw



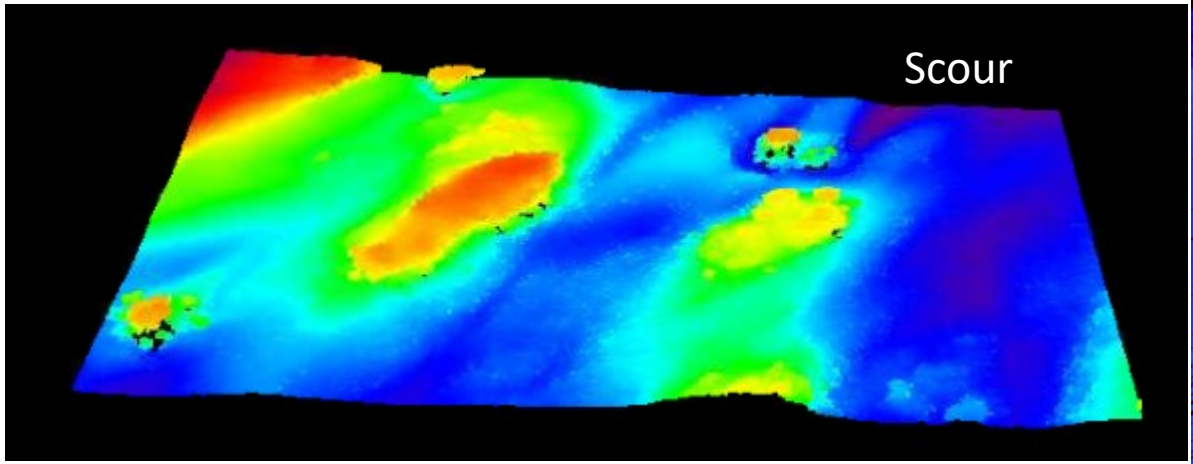
Diameter of depression is ~90m
Leaving a 60m diameter data gap

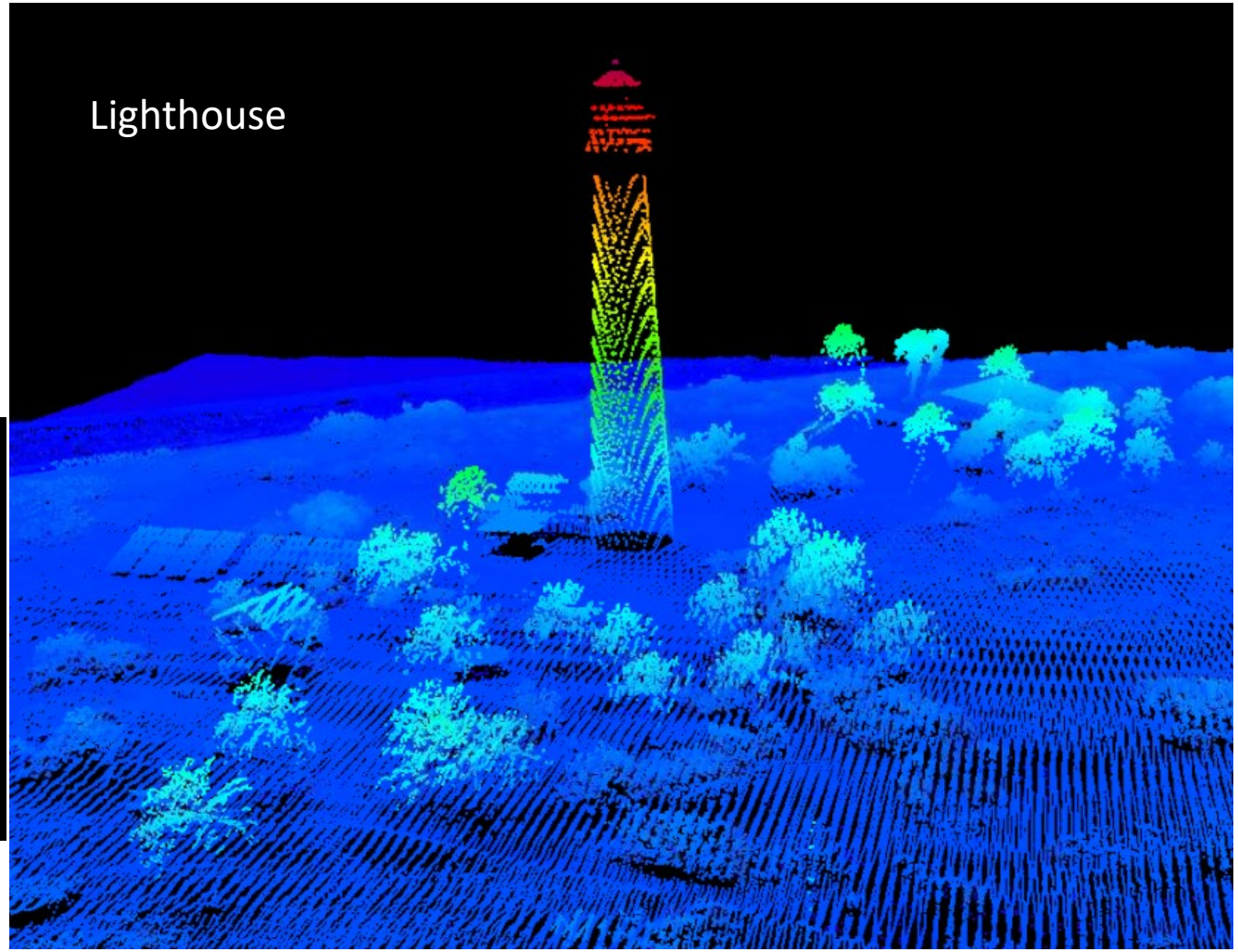




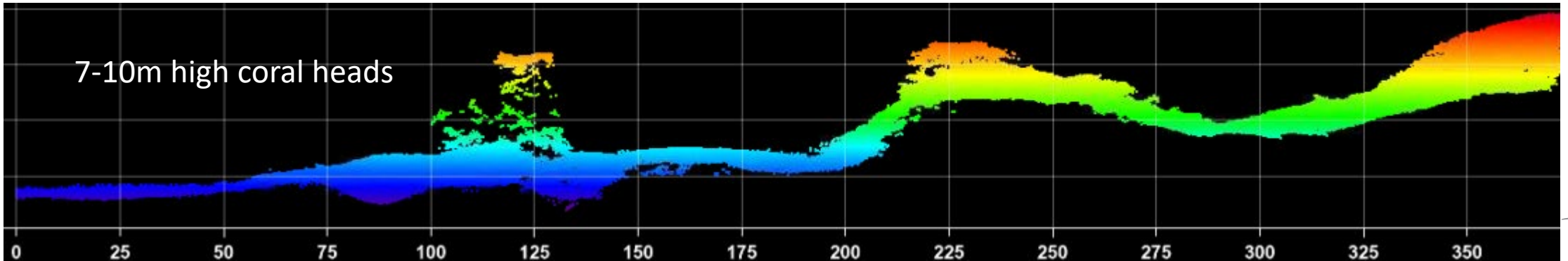
Loggerhead Key

Dry Tortugas

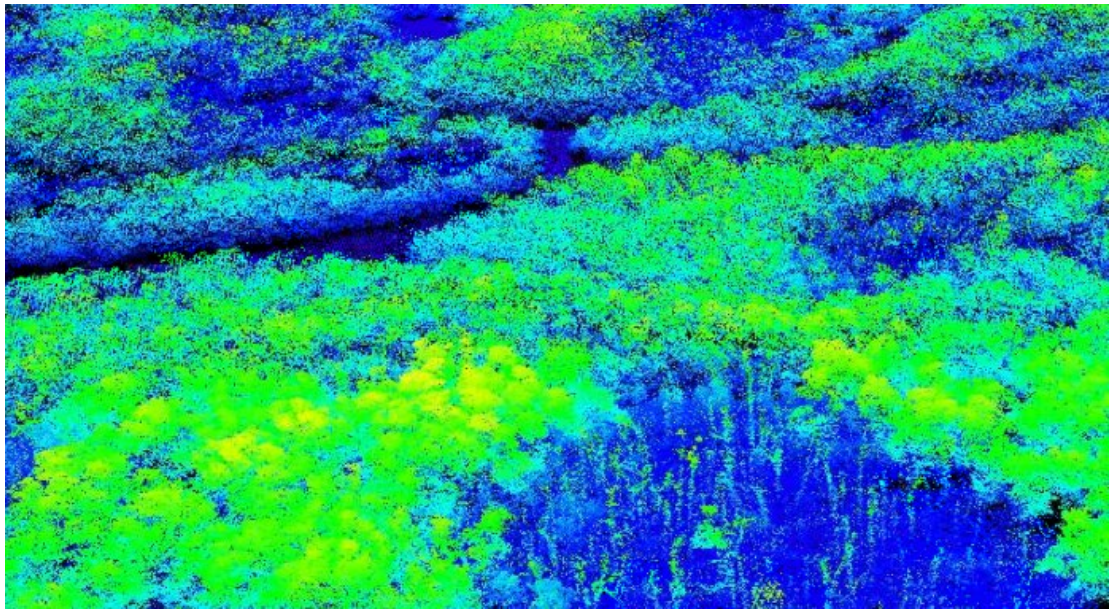


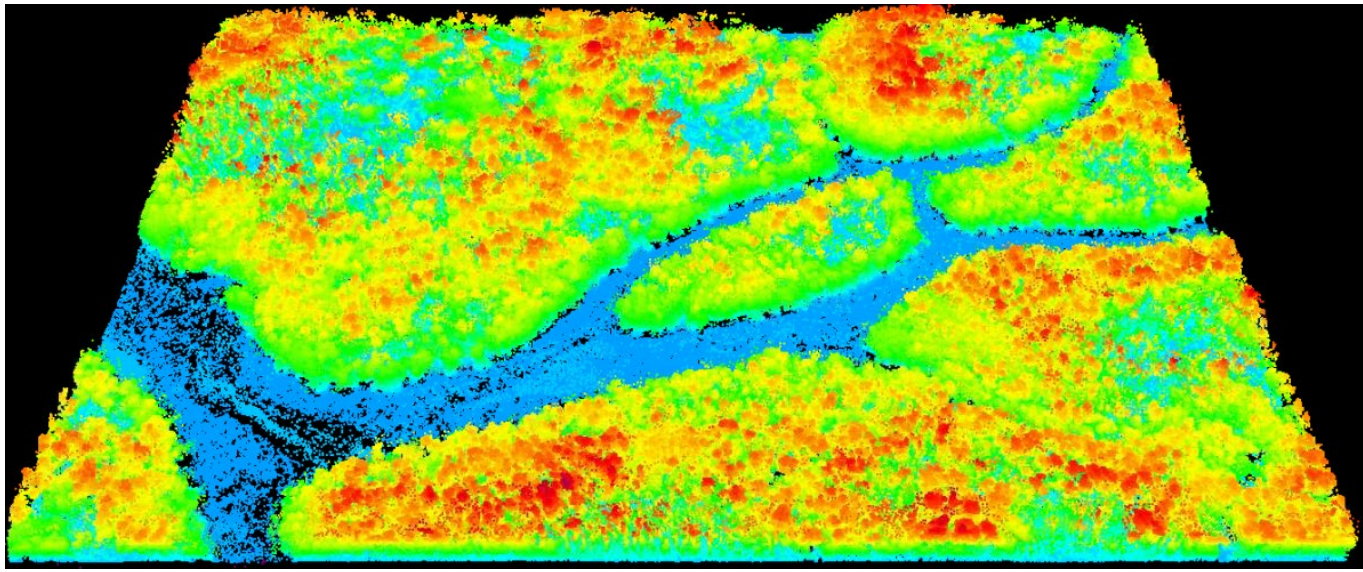


Coral heads

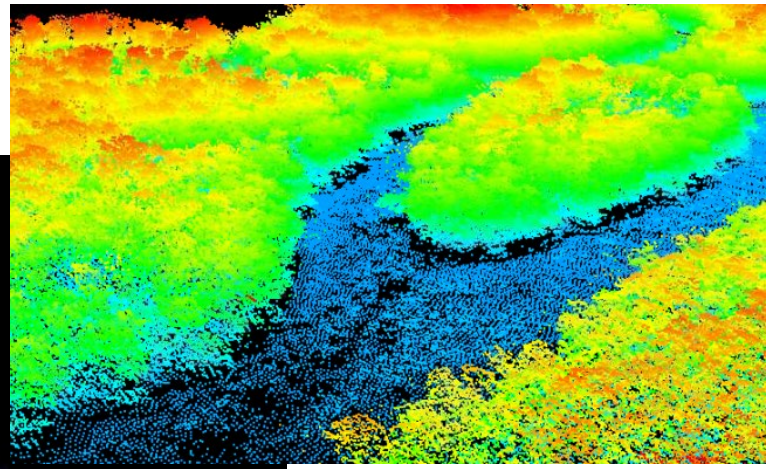


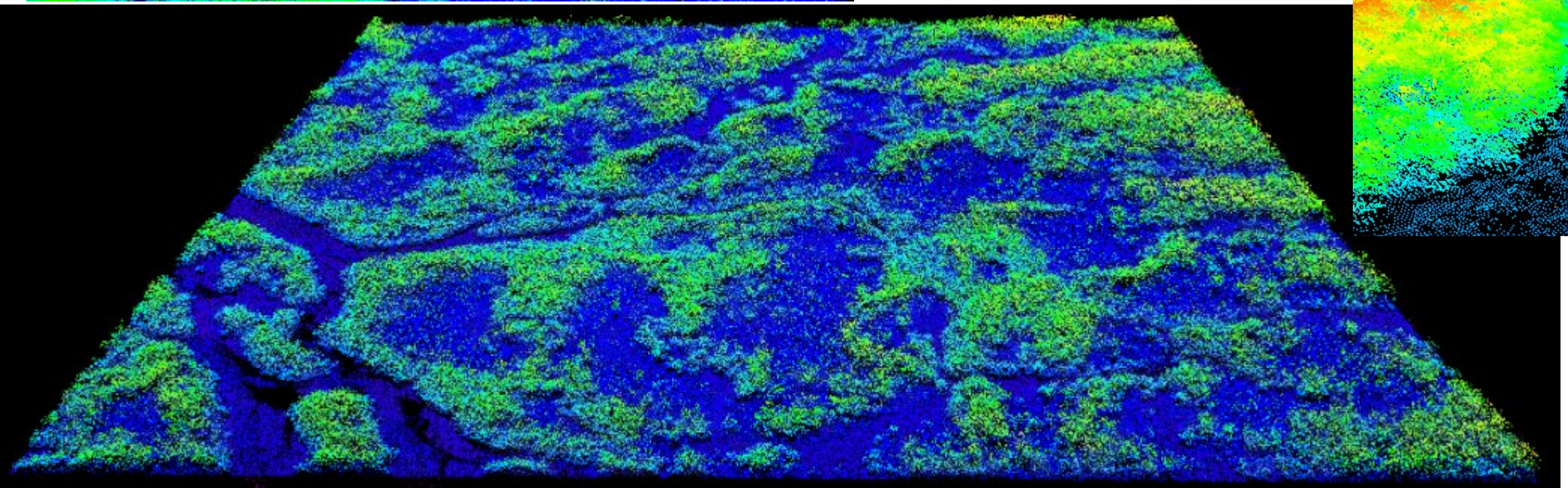
Big Sable Creek - Everglades





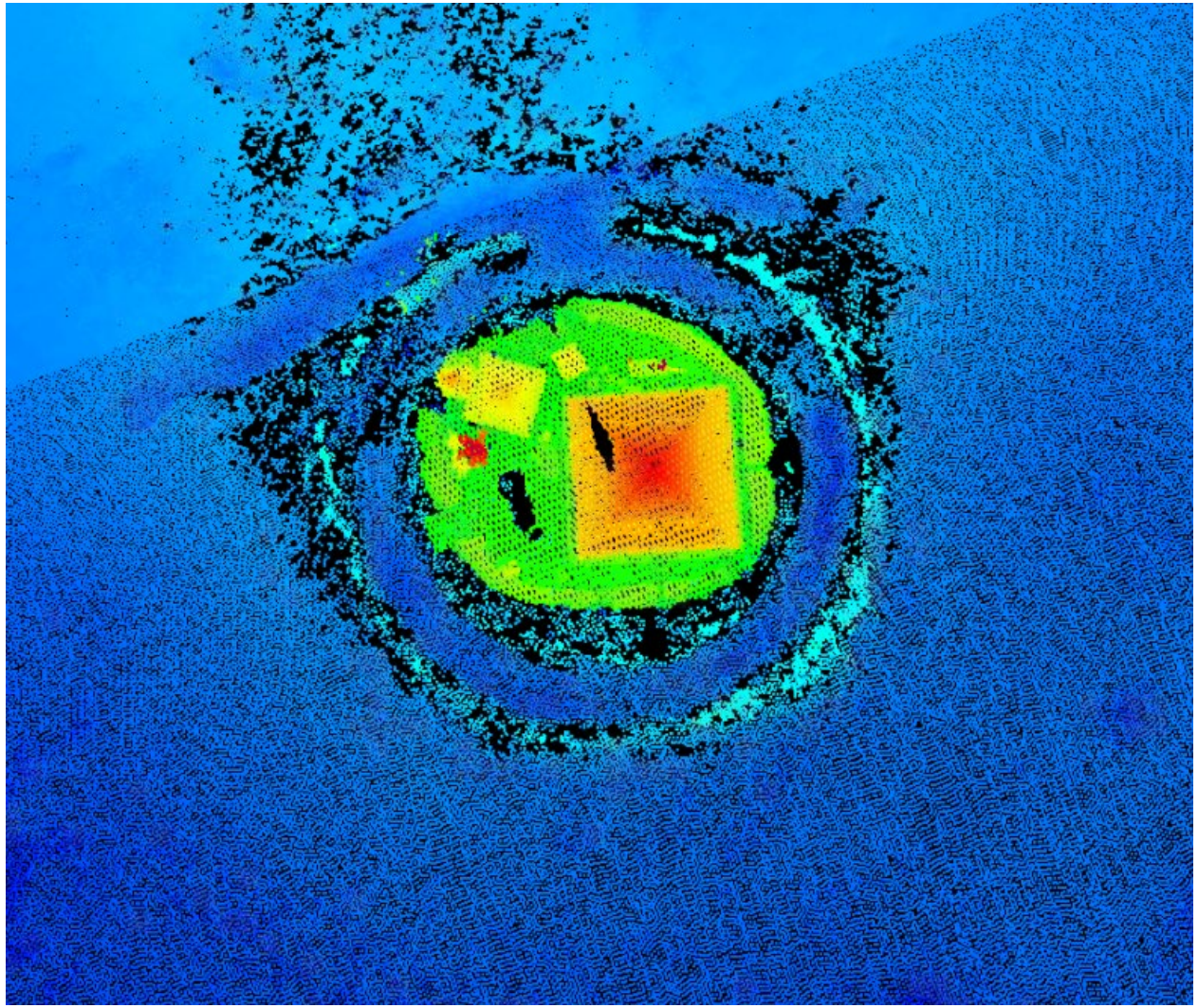
Low vegetation - mangroves

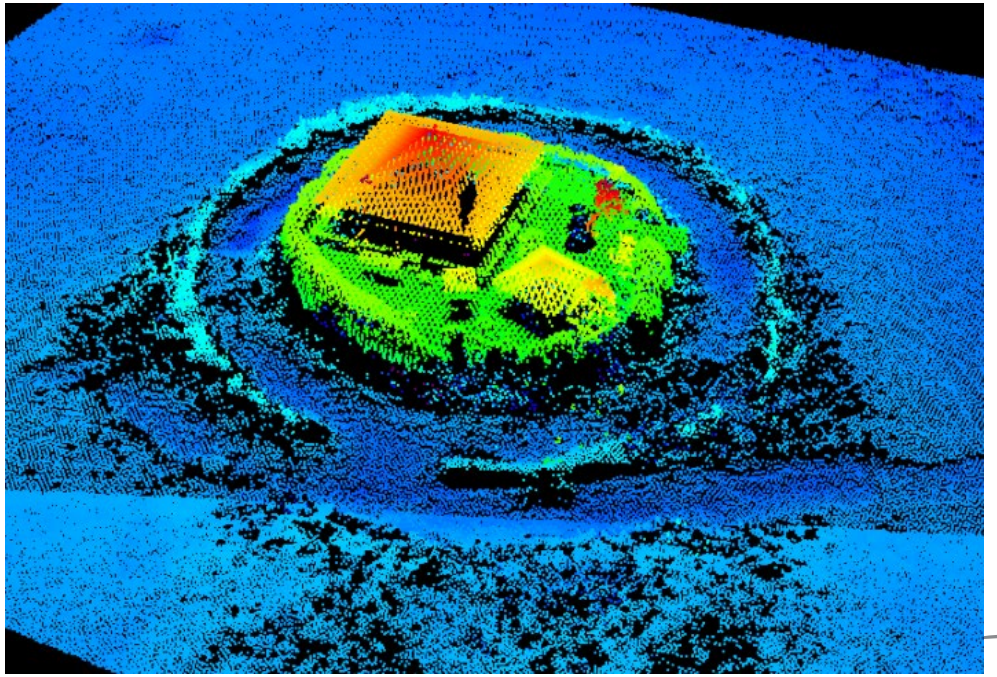




East Sister Rock

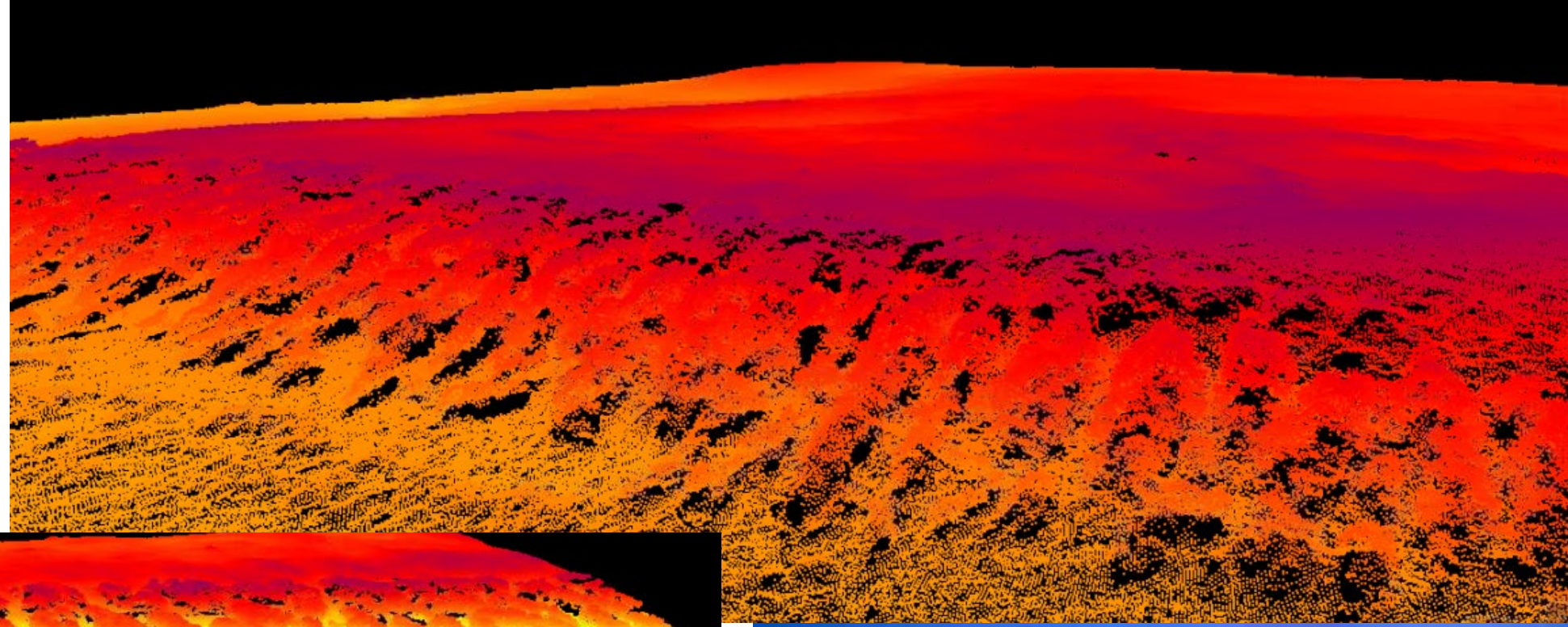
South of Marathon

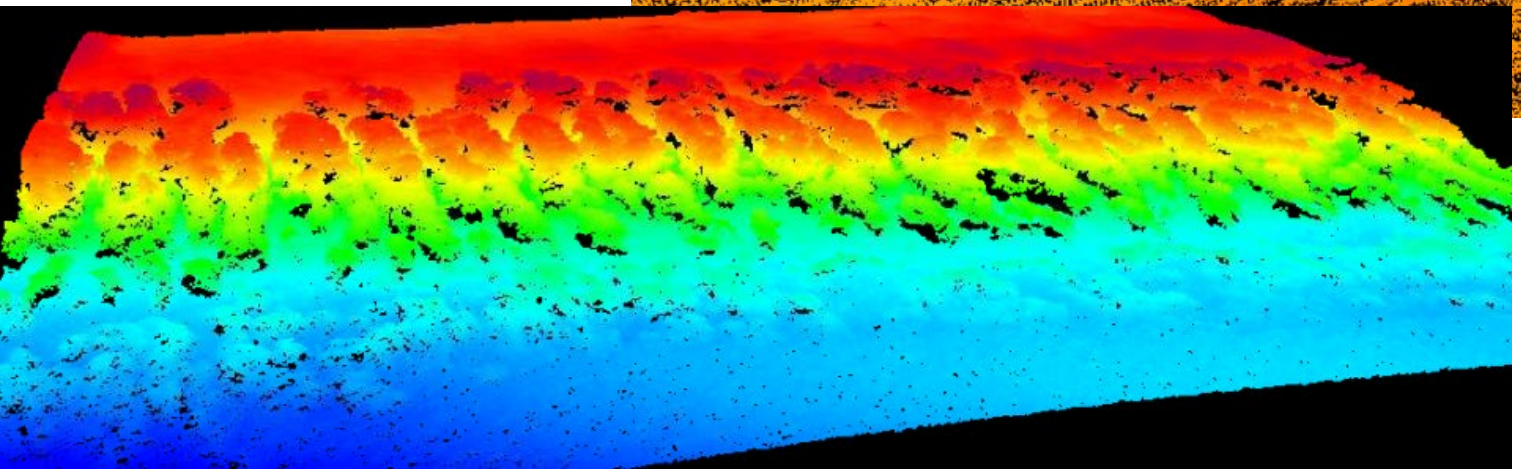


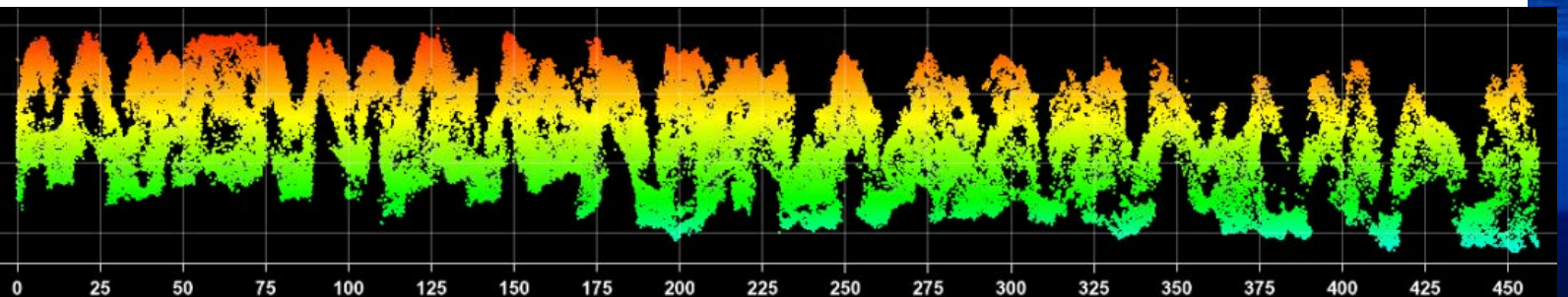


Looe Key

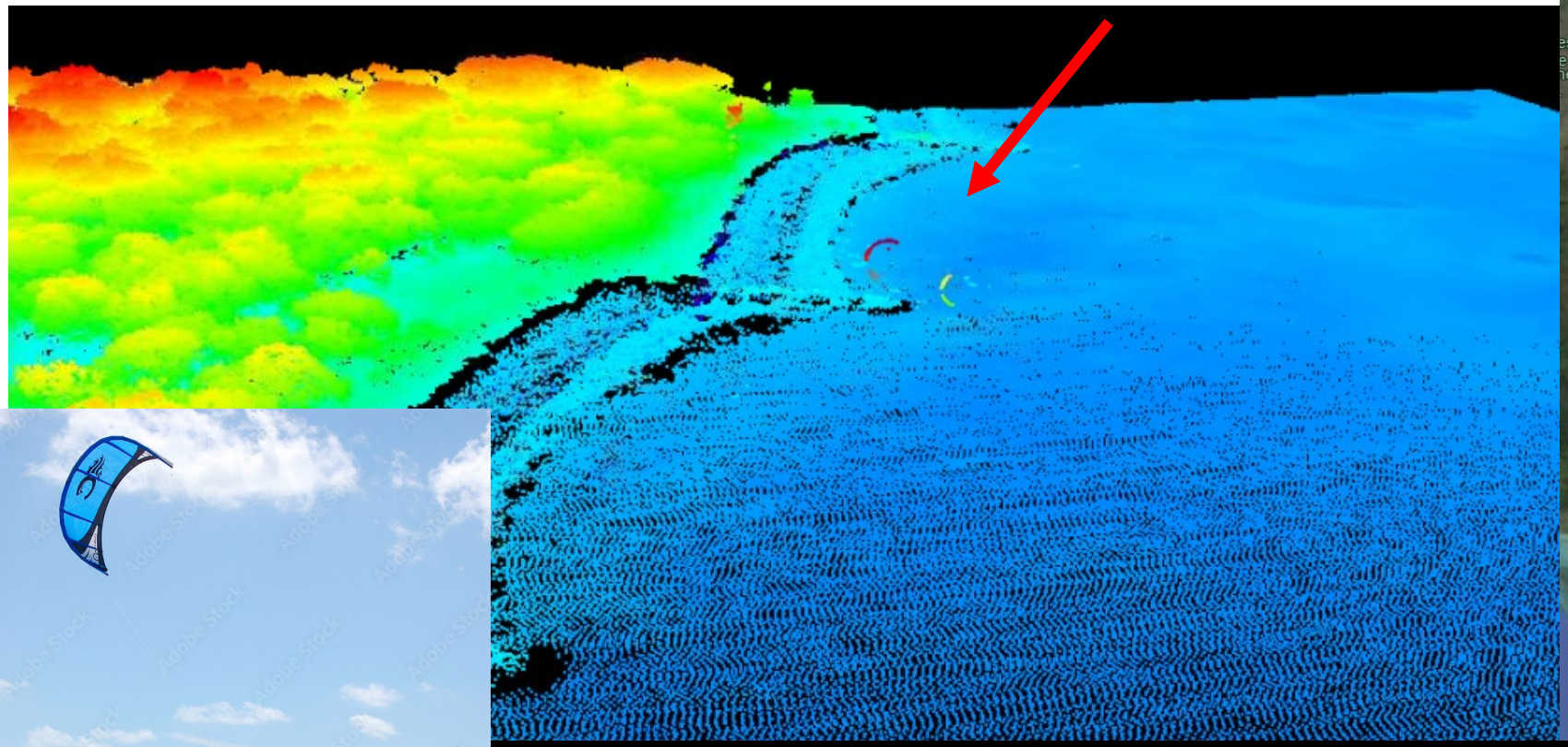
Spur and groove coral fingers, 4-6m tall

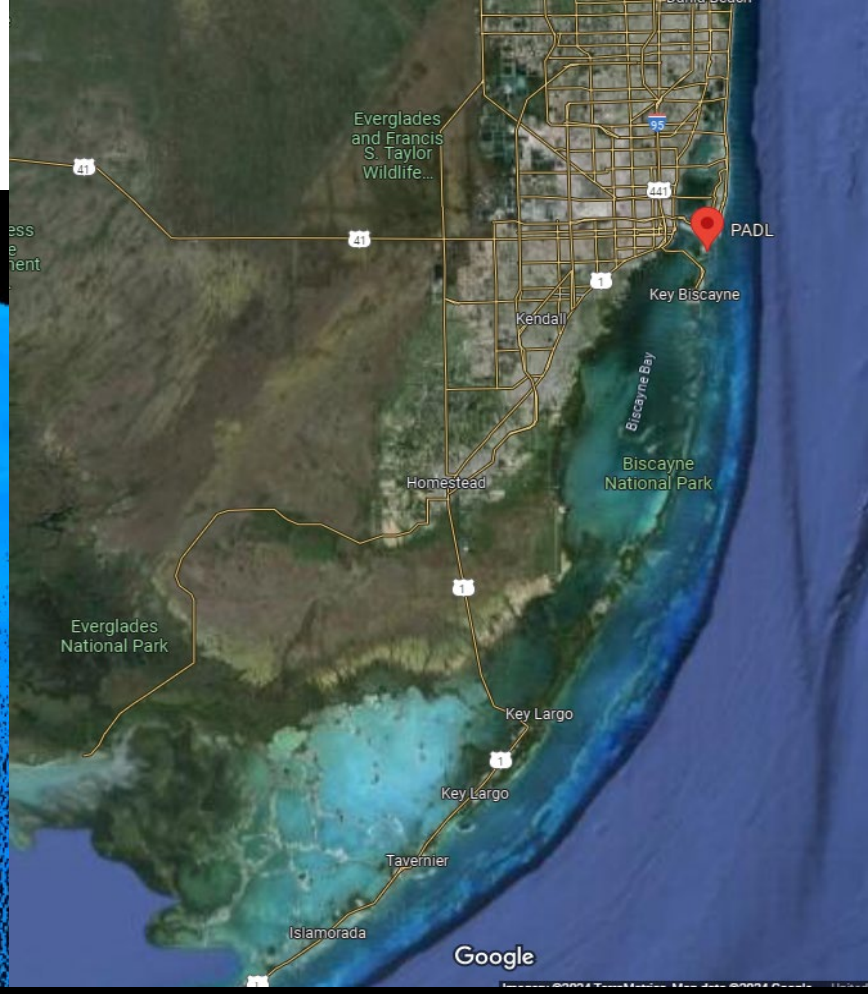






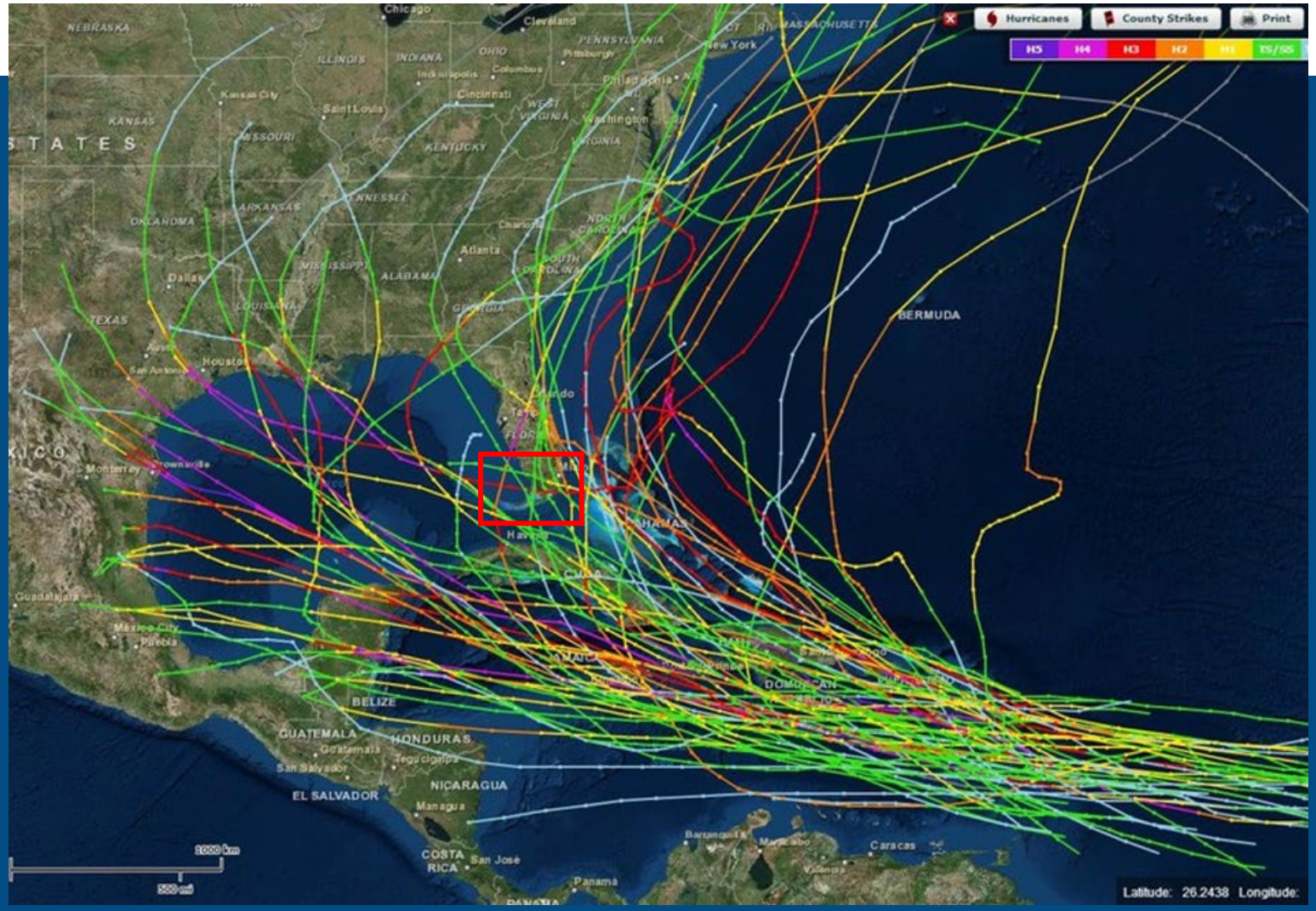
Virginia Key – Sea Wall





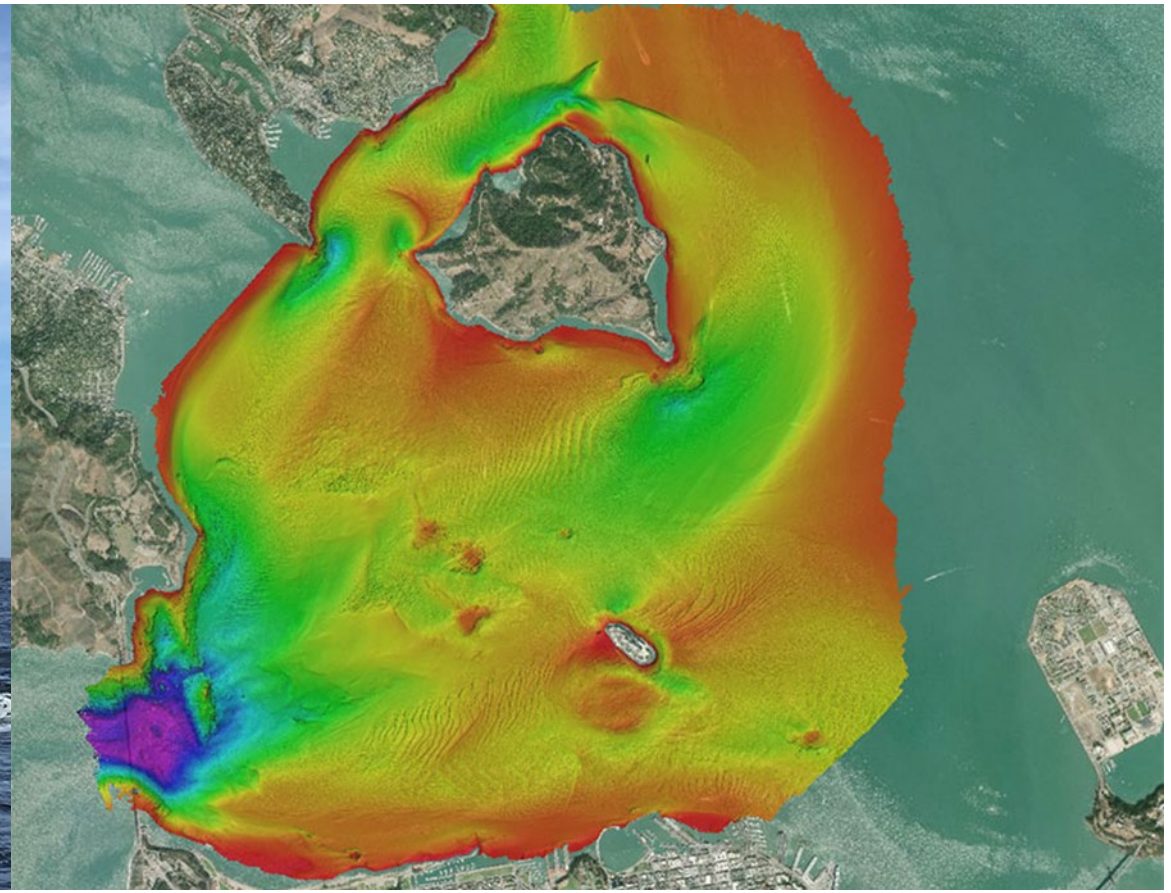
Marathon, FL

Project Obstacles

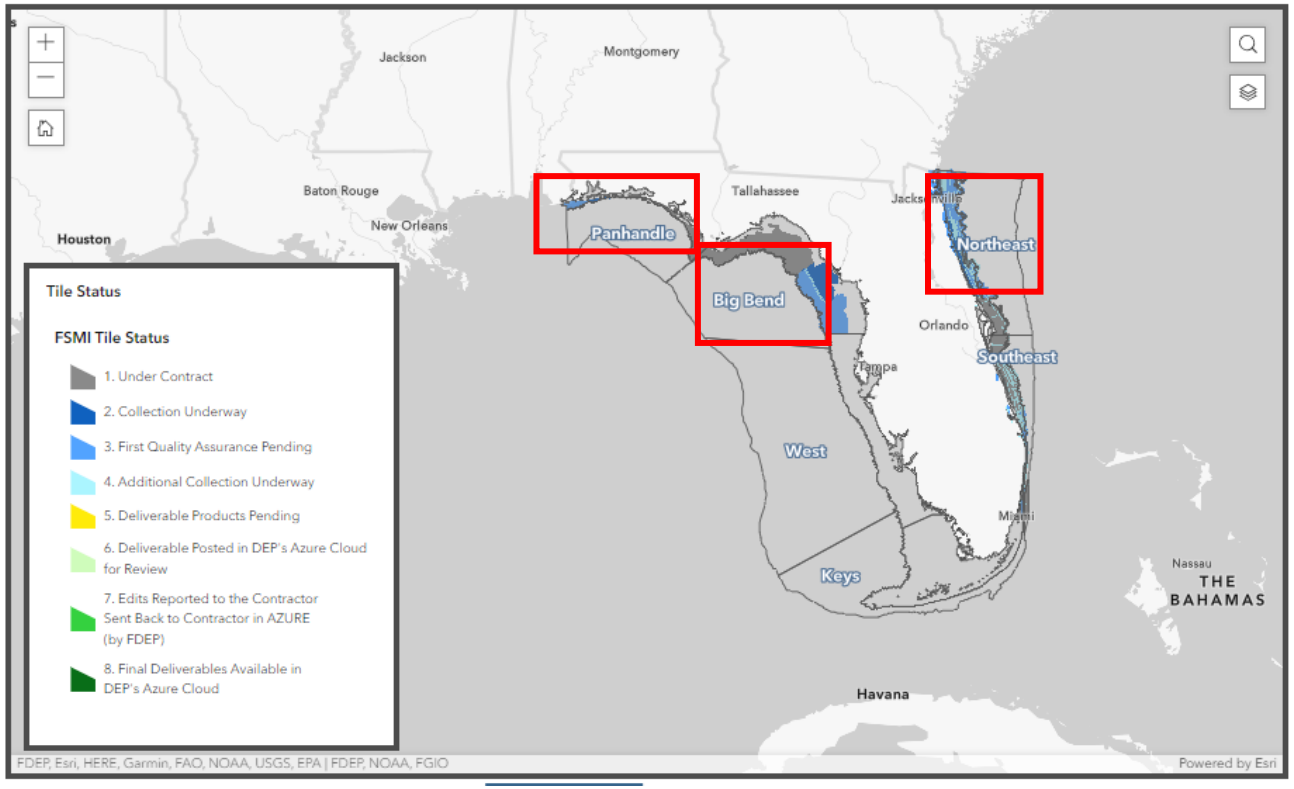


- Weather
- Mechanical Issues
- Processing Petabytes of data
- Tight Schedule
- Natural events

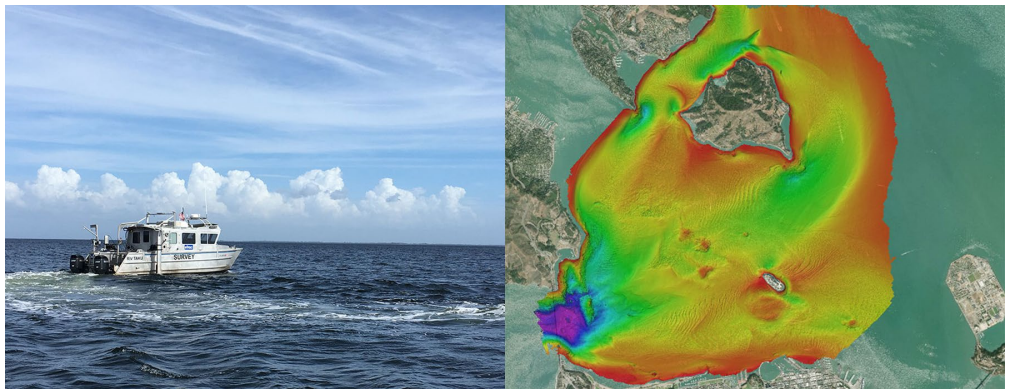
FSMI Vessel Based Phase: Multibeam Sonar Mapping with eTrac



Woolpert Sonar Award



- Awarded 3 regions, Big Bend, Panhandle and Northeast
- Partnering with NV5
- Total project area over 17,600 square kilometers



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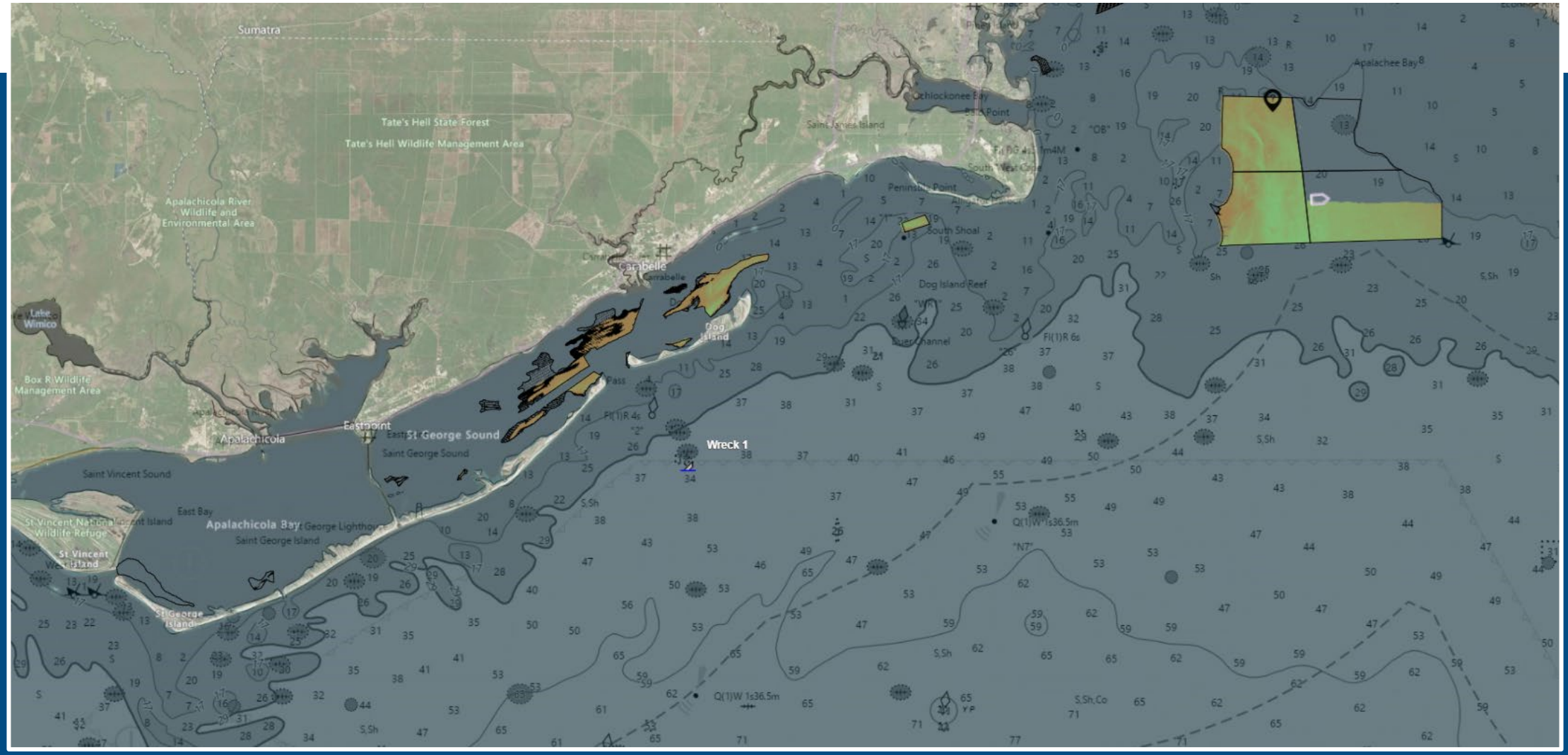
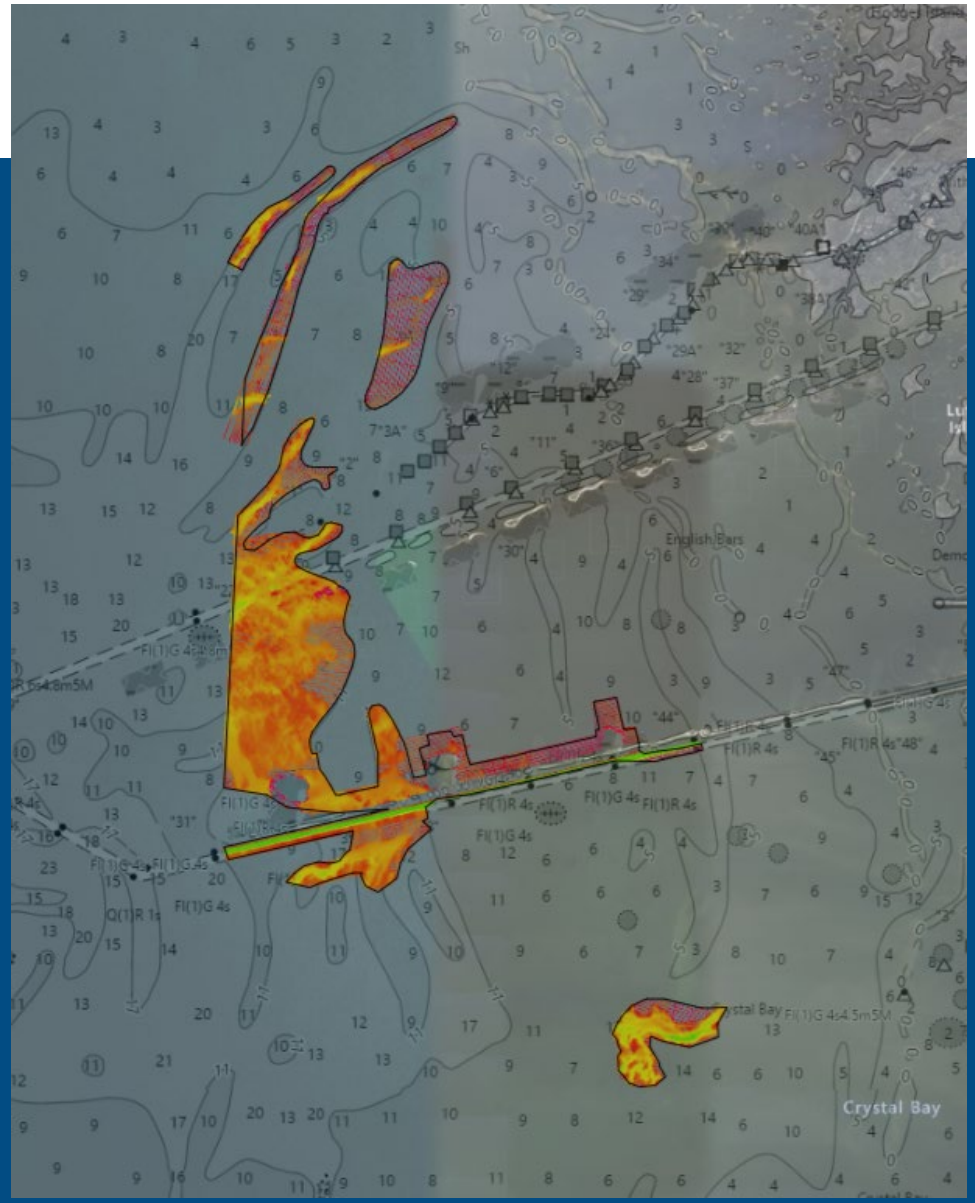
NV5

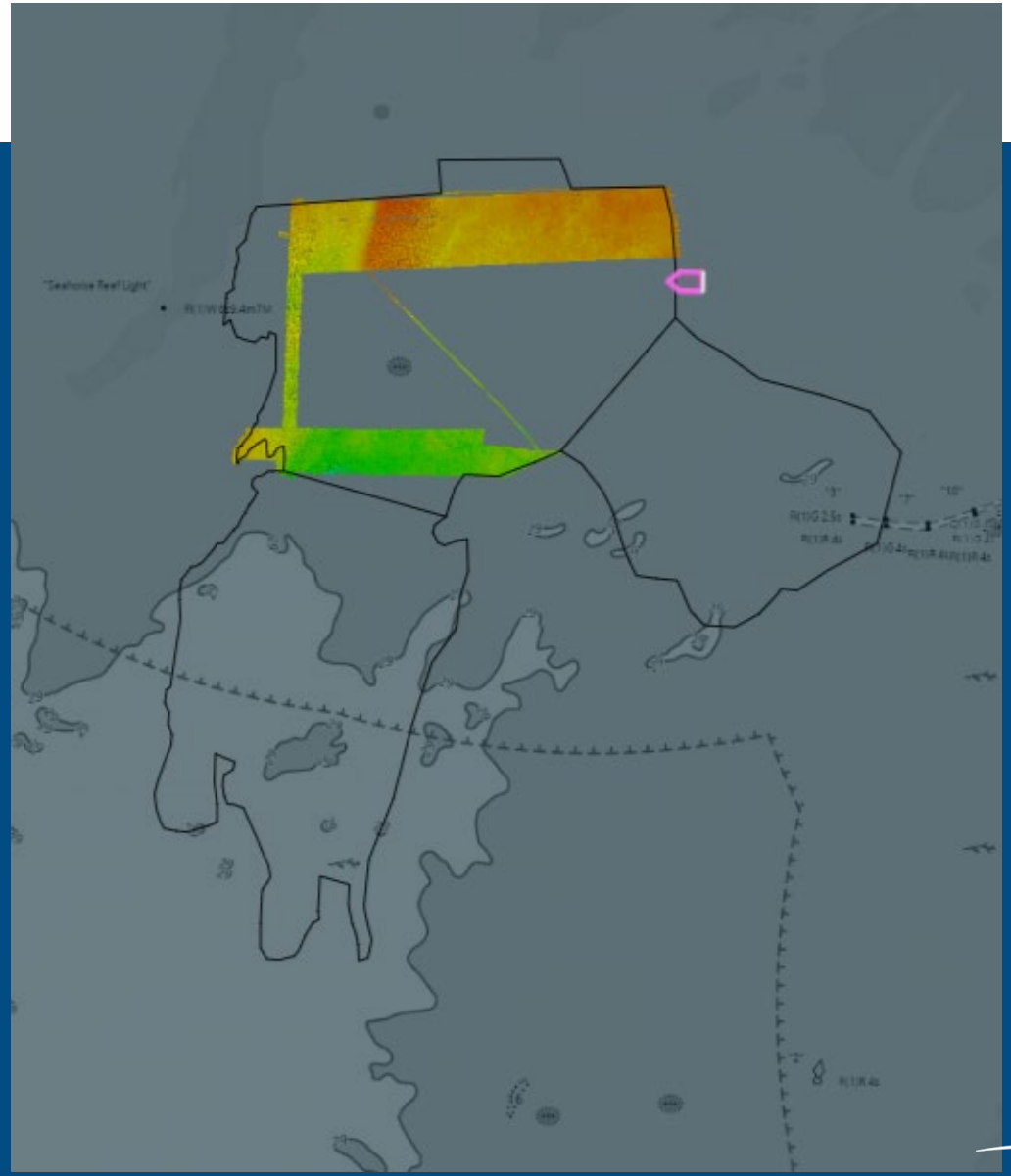
Apalachicola Bay Area



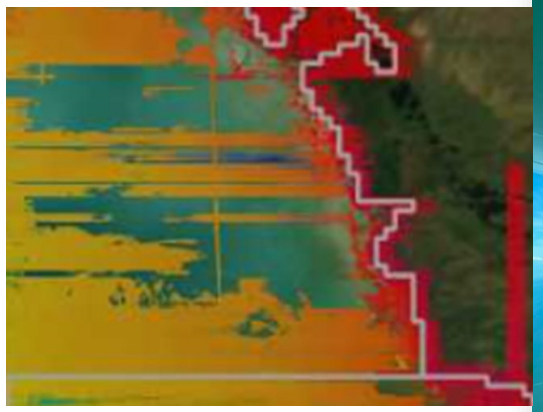
Crystal River Nearshore

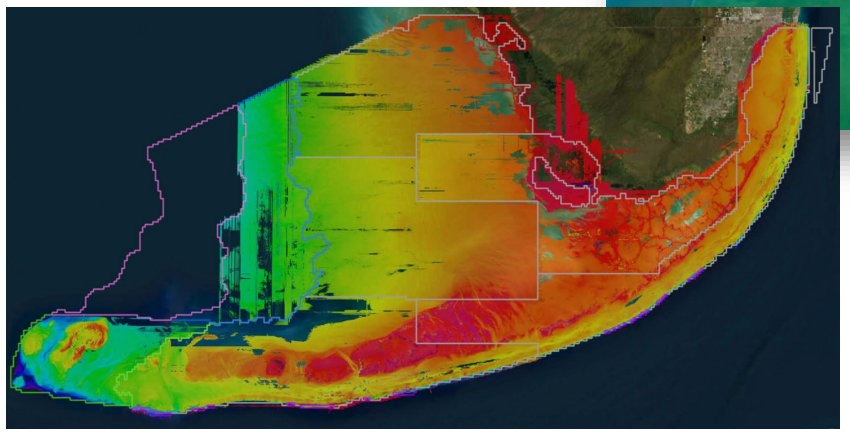


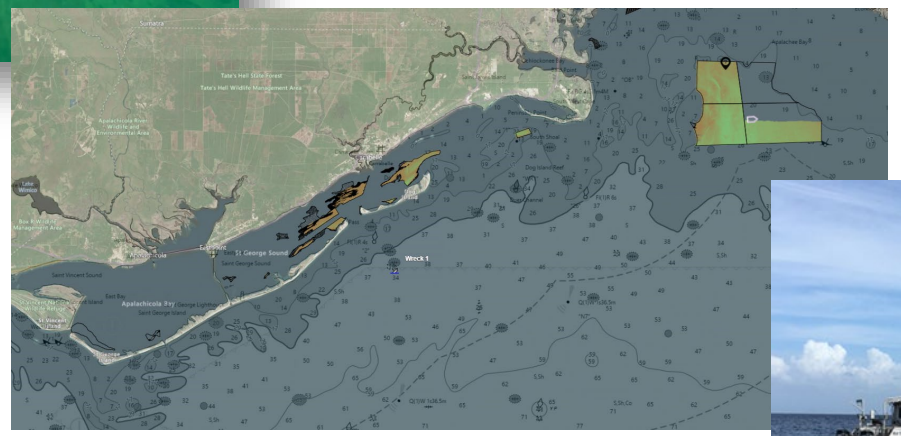
Crystal River Offshore



Woolpert FSMI Summary







- Initial acquisition for Region 3 AOI Bathy complete
- Continuing void relights through March
- Meet FDEP's new September 30th 2025 Deadline
- Sonar collect has been awarded in 3 separate Regions
- Completing work this year in Big Bend
- Northeast and Panhandle to be collected this year
- All Sonar data to be delivered Spring 2026

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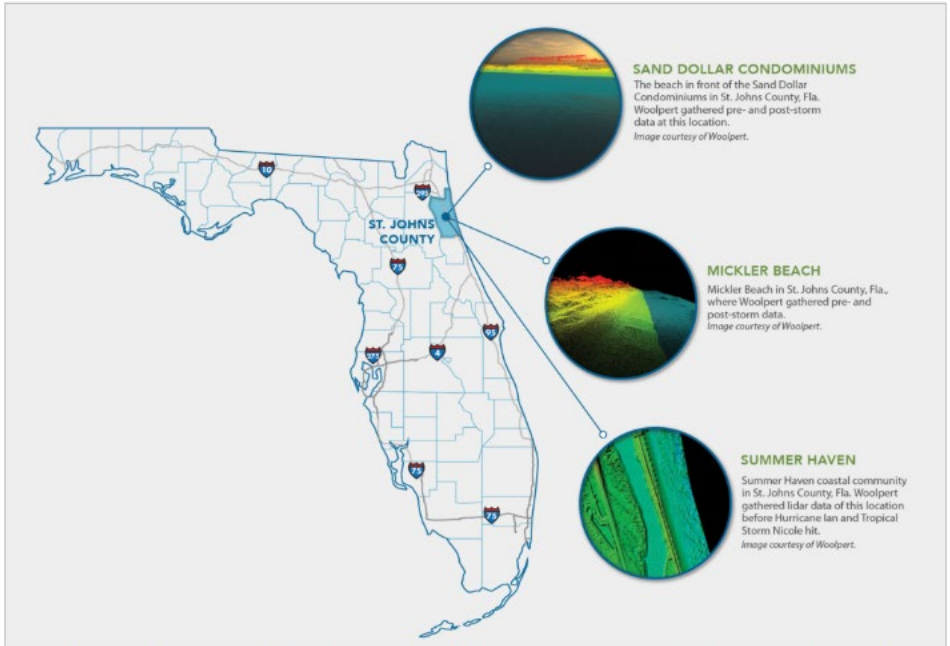
NV5

Beach Lidar Article in Lidar Magazine

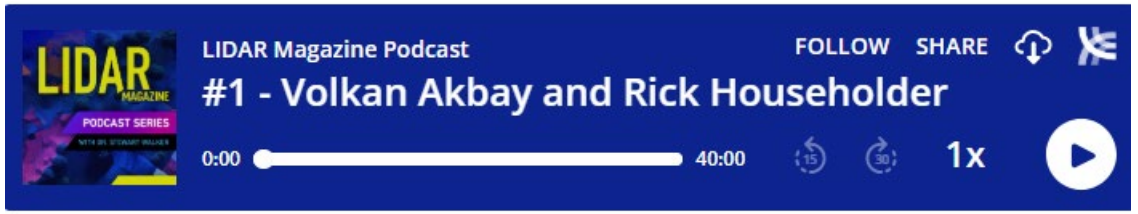
Lidar Making Waves in Florida Beach Resilience

Lidar helps coastal communities respond to and prepare for extreme hurricane seasons

Rick Householder // **Volkan Akbay** // 12.31.2023



The three sites discussed in this article are all located along the shore of St. Johns Country, on Florida's Atlantic coast.



[Lidar Making Waves in Florida Beach Resilience - LIDAR Magazine]

Questions?

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