

Balancing Nature & Management: Humans and the Recovery of Coastal Dunes

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RCOAST

a data company for coastal resilience

OUR MISSION

management **decisions** + **nature** makes for
a difficult relationship with our coasts

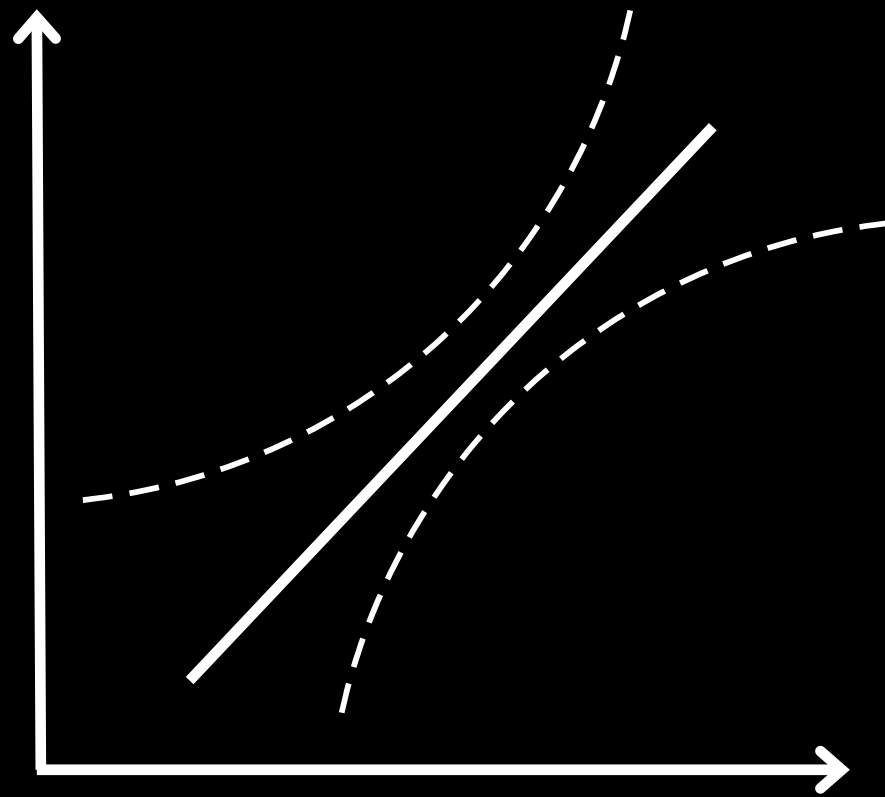
RODANTHE



Wave-induced
dune scarping

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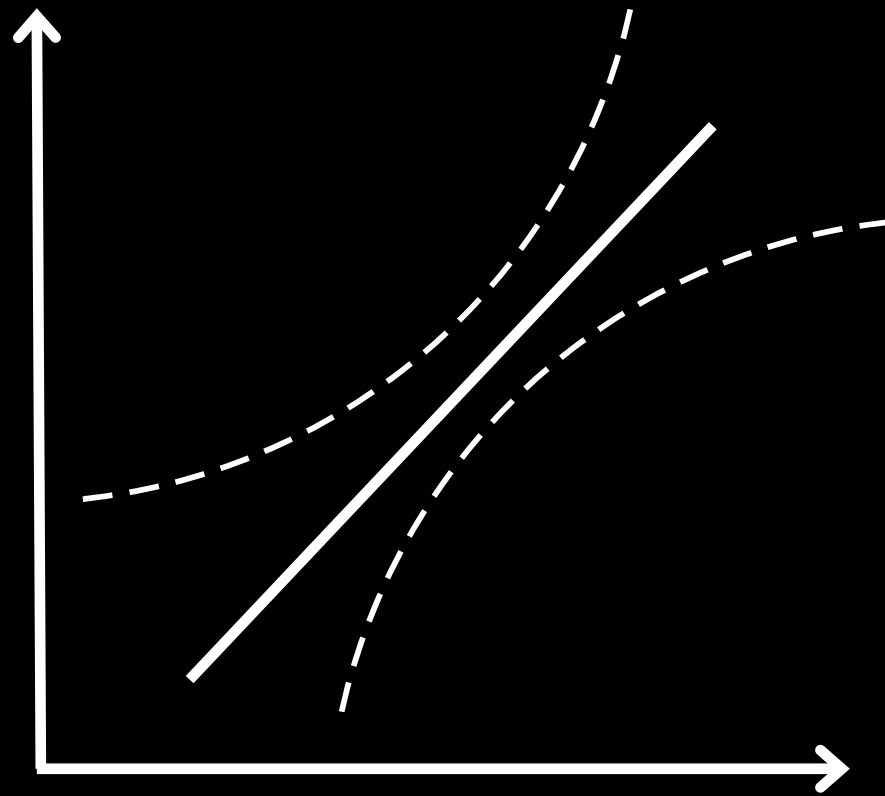
OUR MISSION



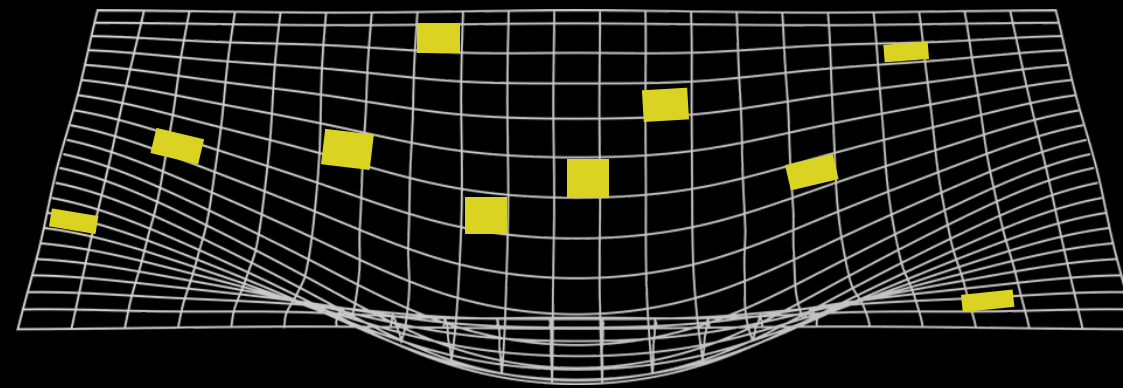
Modeling coastal
change is hard

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OUR MISSION



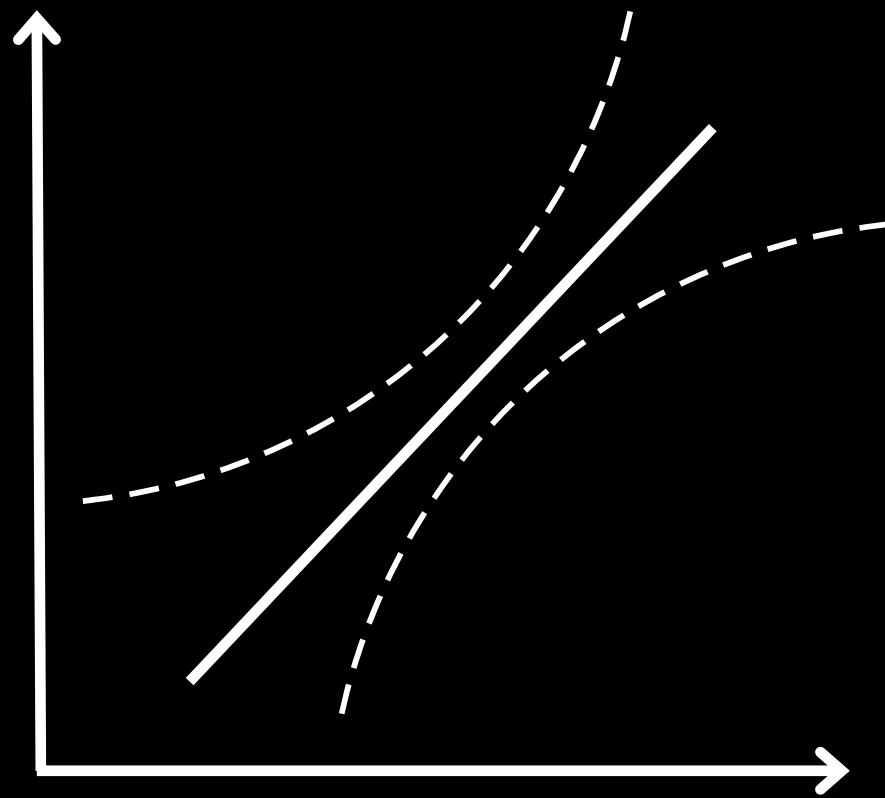
Modeling coastal
change is hard



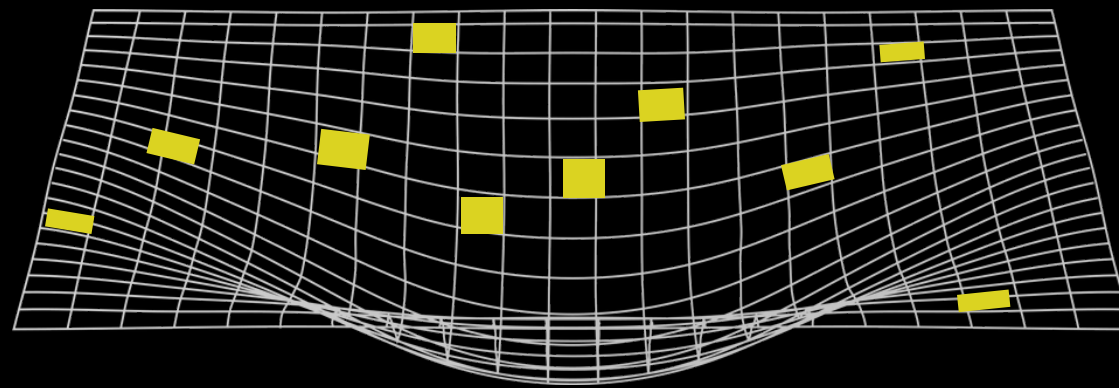
2D & 3D predictions
over a 4D problem

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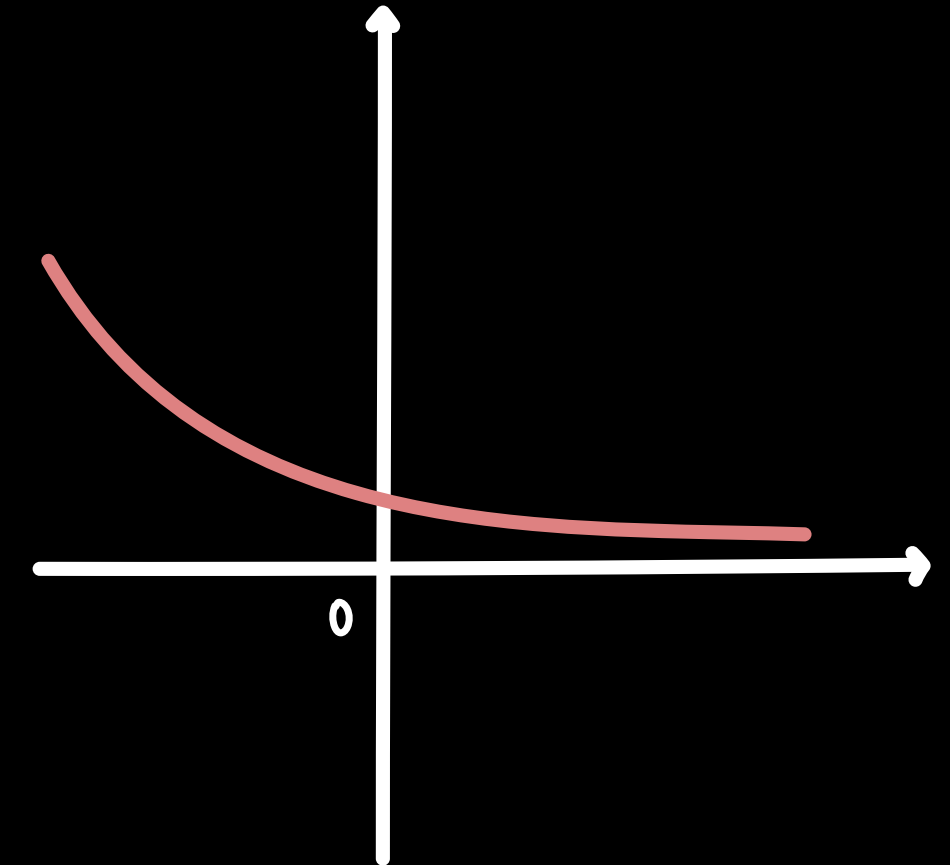
OUR MISSION



Modeling coastal
change is hard



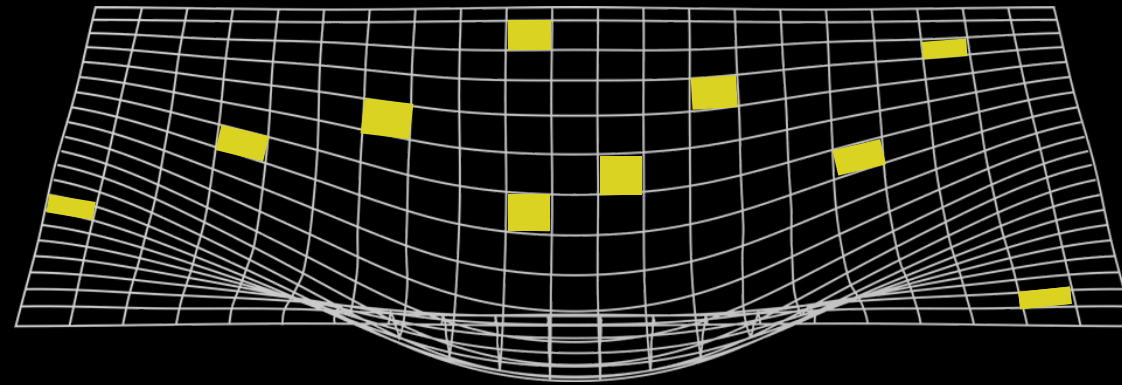
2D & 3D predictions
over a 4D problem



Collecting data is
expensive
(time & money)

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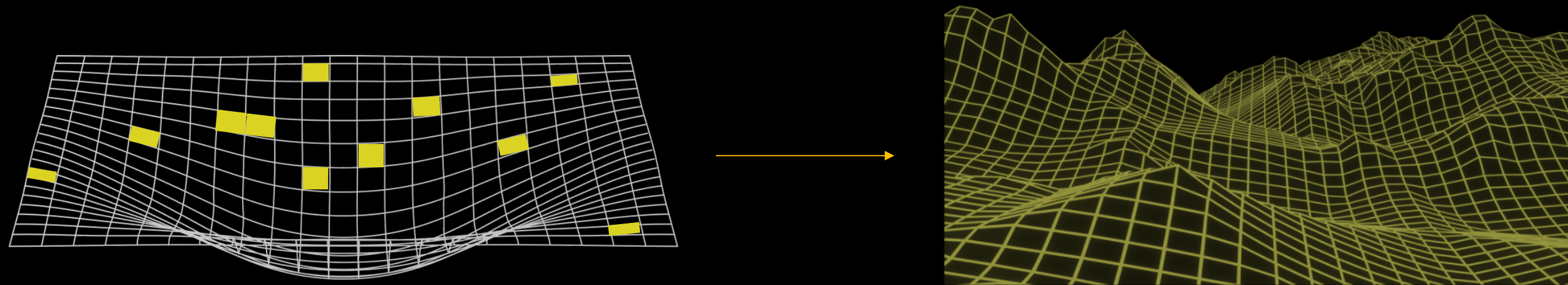
What mitigation works, and where?

OUR MISSION

to **build** a **3D** Mitigation **Library** of
what **mitigation** works and where

OUR MISSION

to **build** a **3D** Mitigation **Library** of
what **mitigation** works and where



OUR 3D LIBRARY



**Repeat
LiDAR &
RGB Data**



**Feature
Classification**



**Volumetric
Change
Detection**



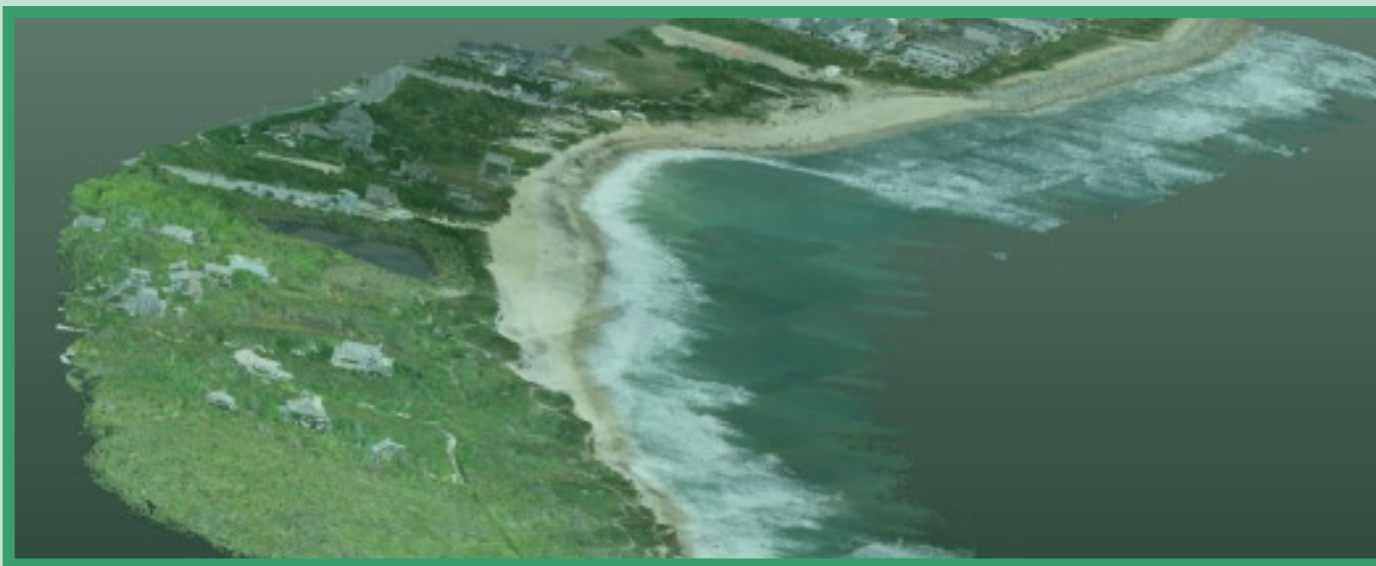
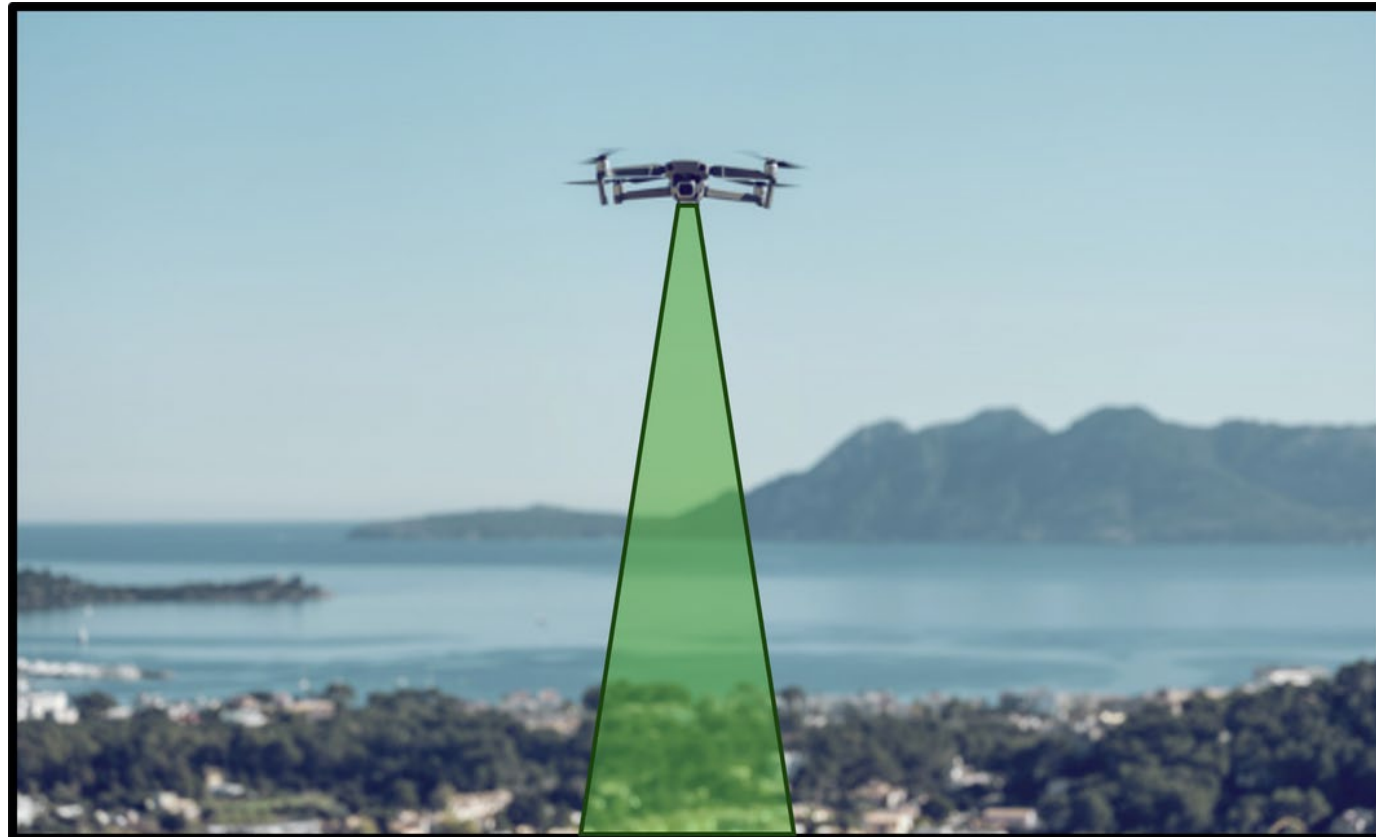
**Winds
Waves
Tides
Precip
Vegetation**



**Mitigation
Performance
Metrics**

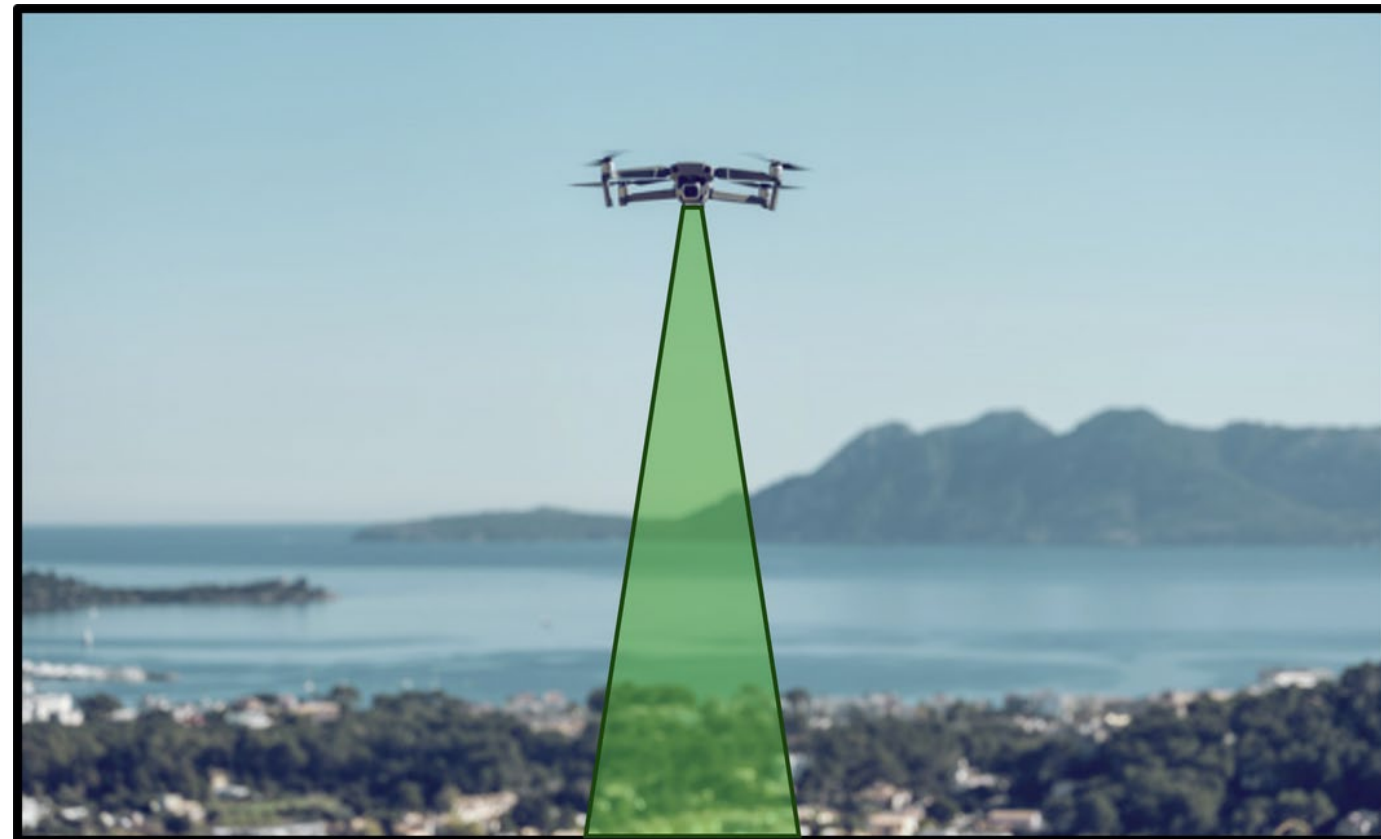
3D MITIGATION LIBRARY

we collect and analyze
data of mitigation change

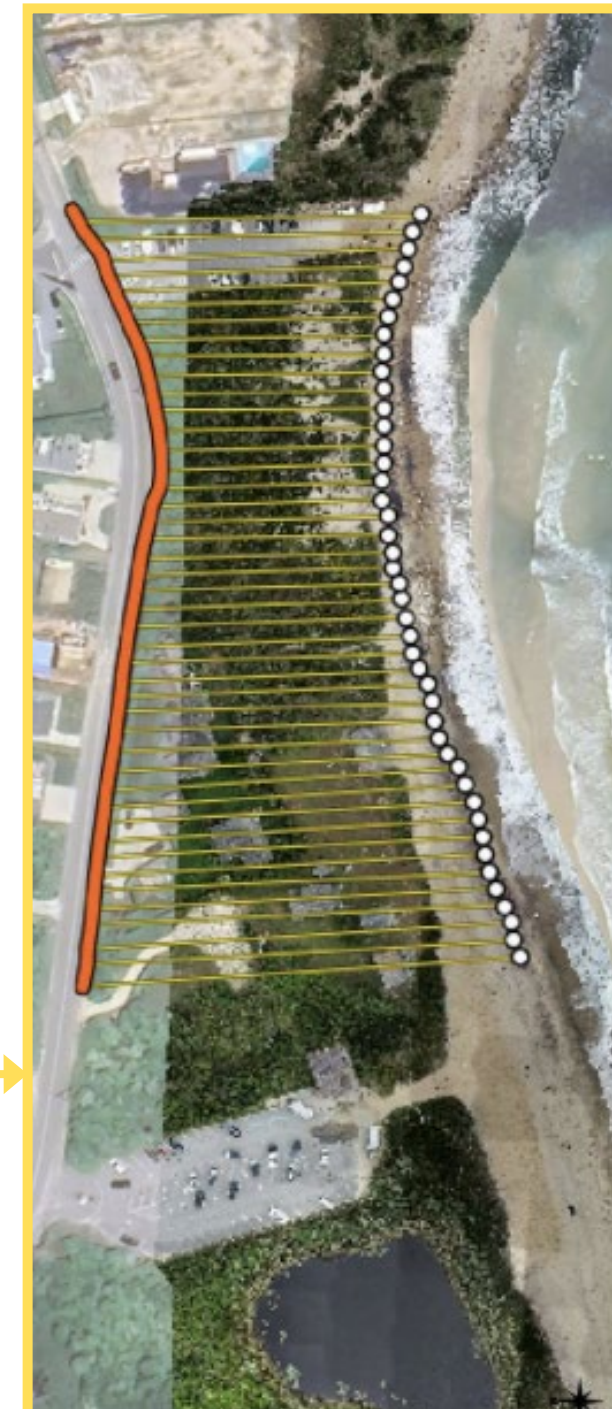


3D MITIGATION LIBRARY

we collect and analyze
data of mitigation change



we measure the performance of mitigation by
repeat scanning and continuous observation



recurring 3D Data (3 scans per year)
& continuous satellite observation

● 3D topography using
LiDAR

● wind, waves, tides,
precipitation, total water
level, vegetation

● storm frequency

● latest flood models

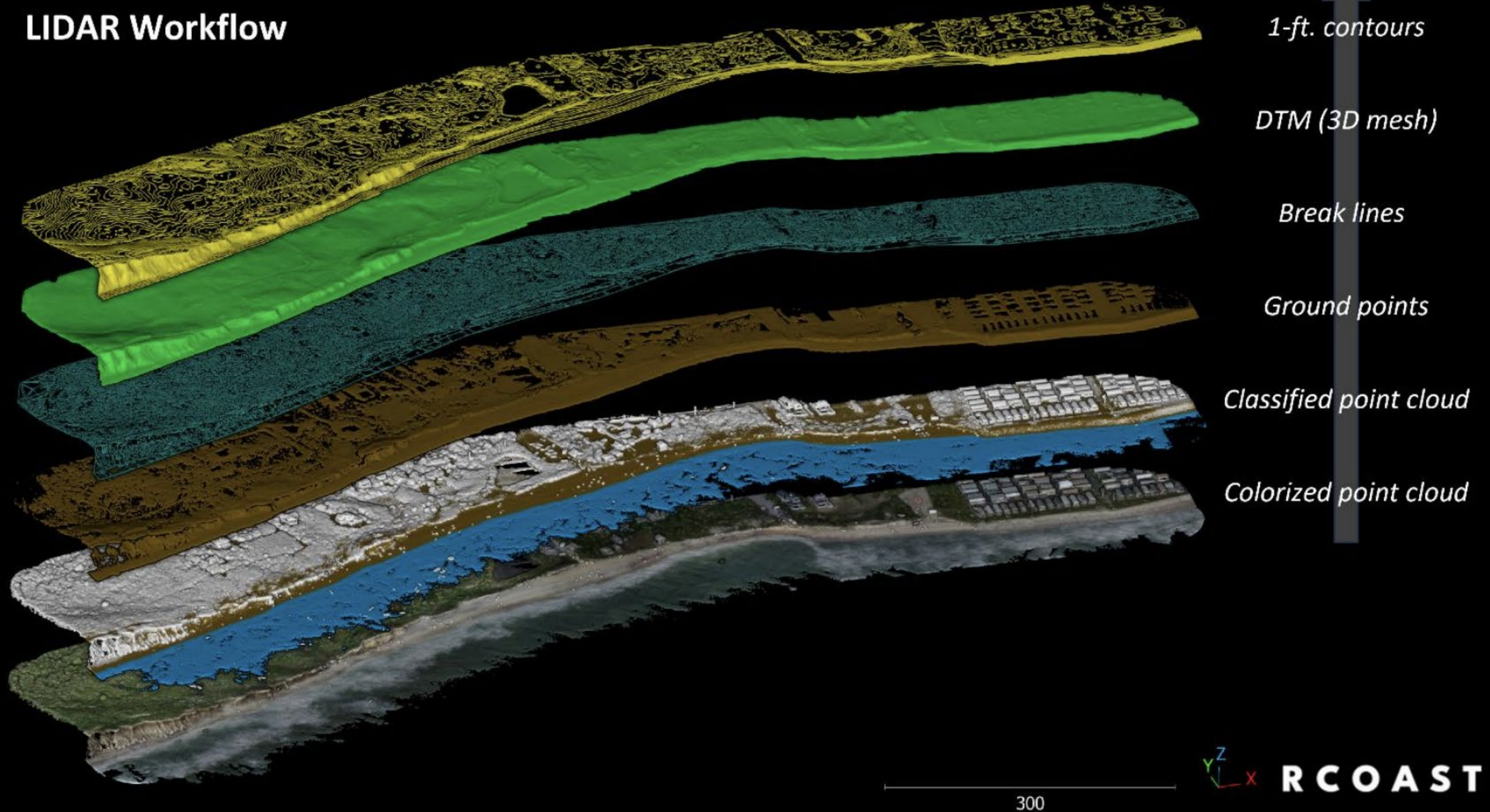
● flood history

● change over time

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LIDAR + CLASSIFICATION

LIDAR Workflow



LIDAR + CLASSIFICATION

Change Detection Analysis

Ditch Plains Beach,
Montauk, NY

2014-2024 Change Detection

2024 LIDAR

2014 LIDAR

Ground Displacement (ft)

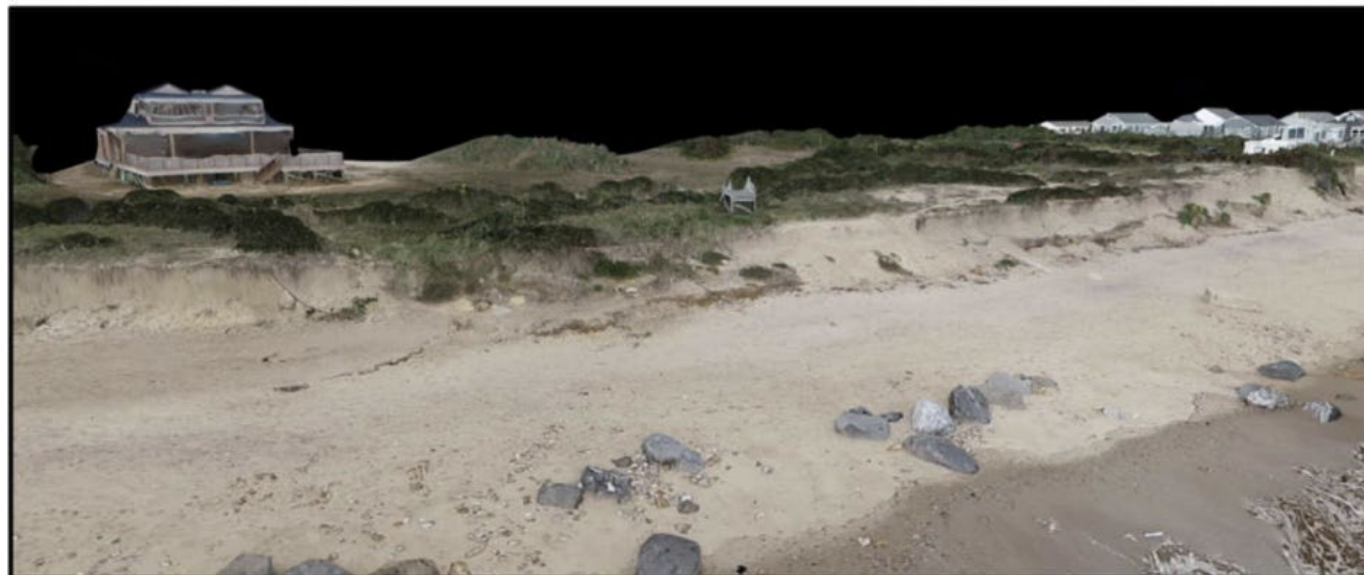
7.7
3.8
0.0
-3.0
-5.9
-8.9
-11.9
-14.8
-17.8
-20.8
-23.8

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300

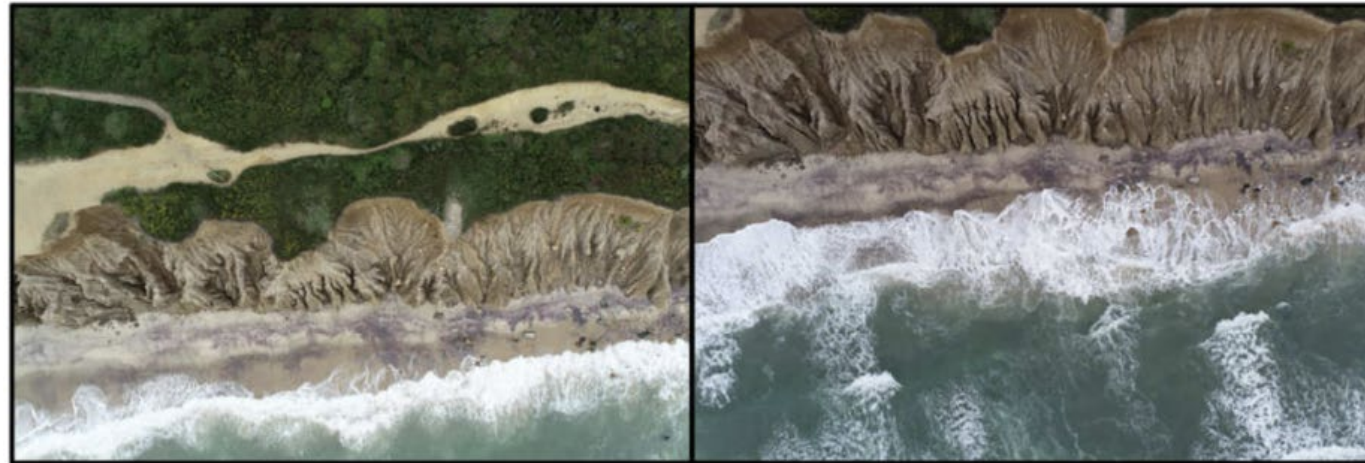
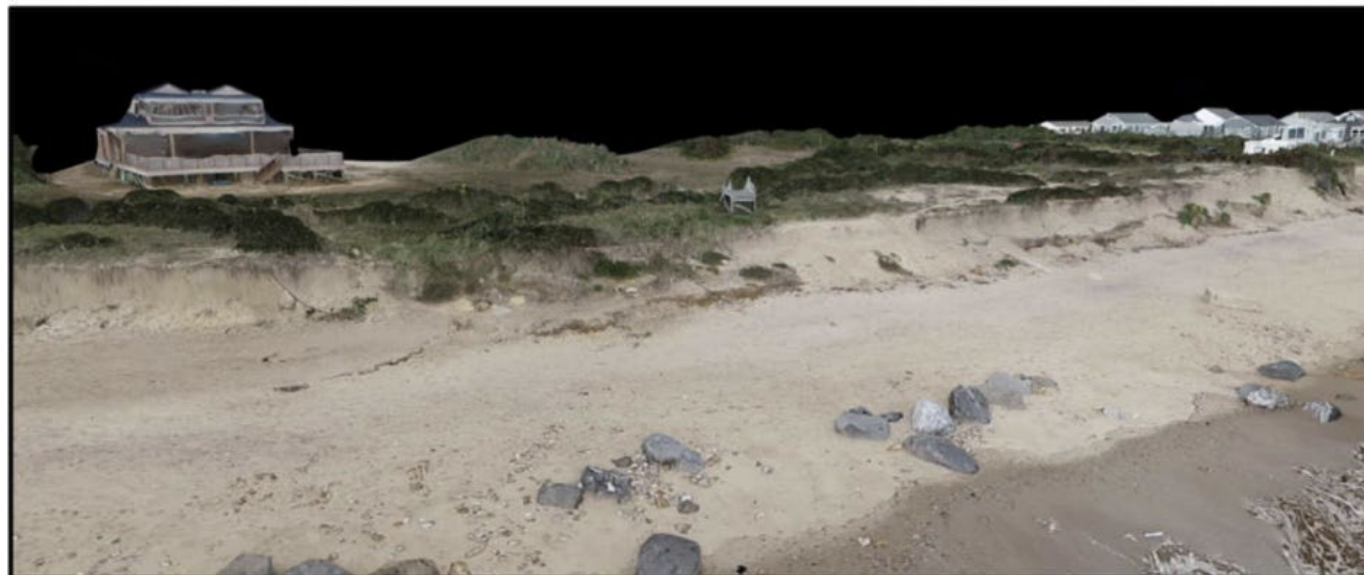
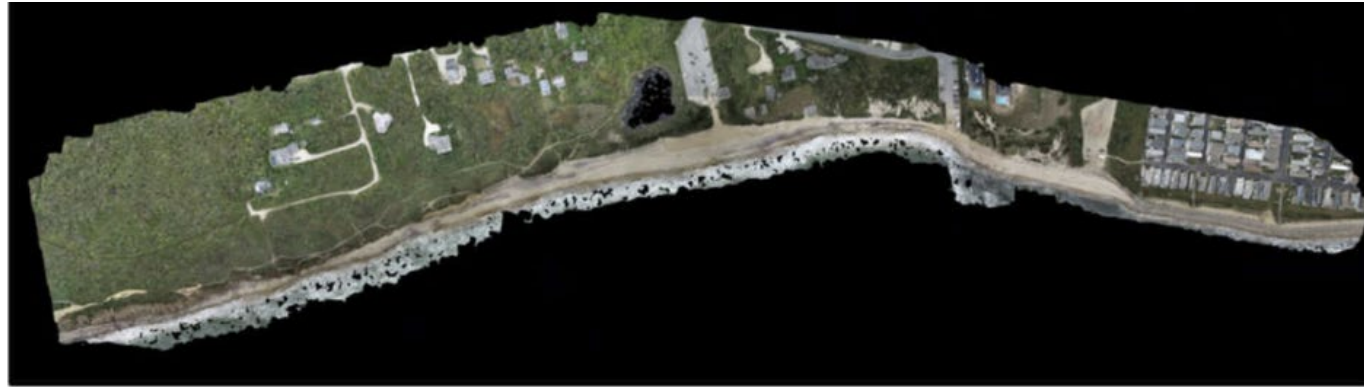


RGB 3D MODEL + CLASSIFICATION



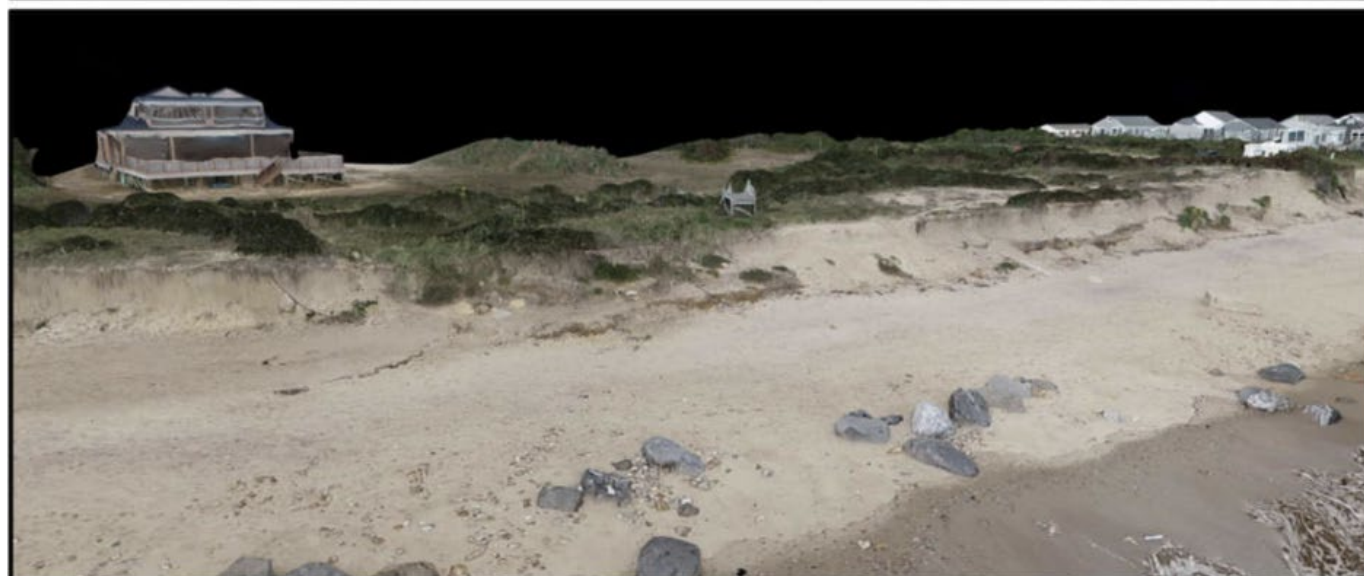
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RGB 3D MODEL + CLASSIFICATION



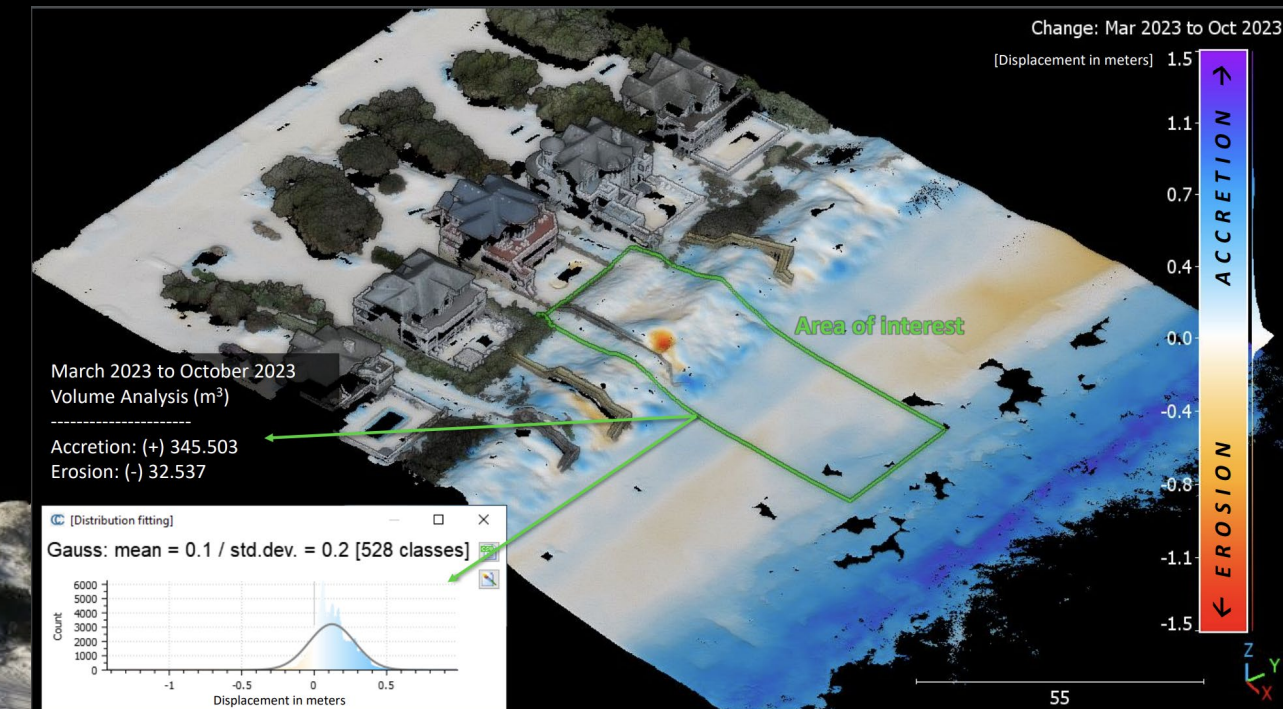
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RGB 3D MODEL + CLASSIFICATION



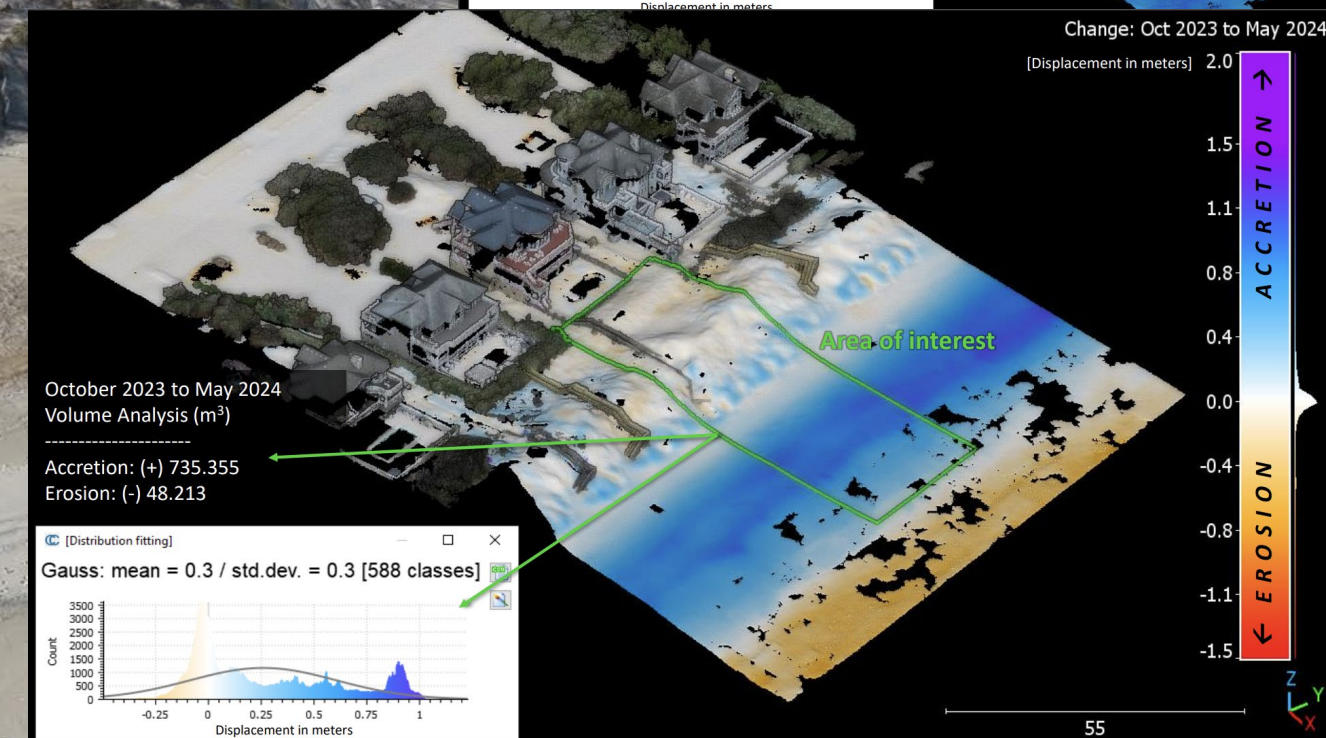
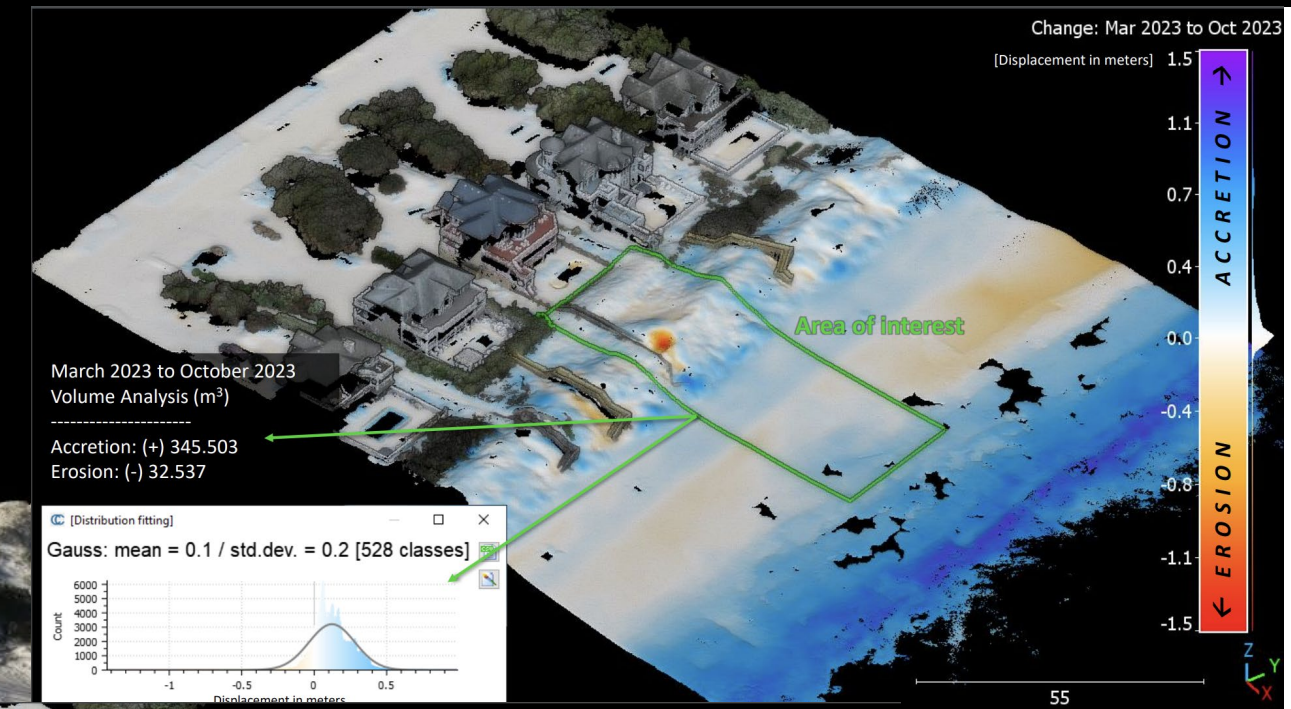
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MITIGATION OVER TIME



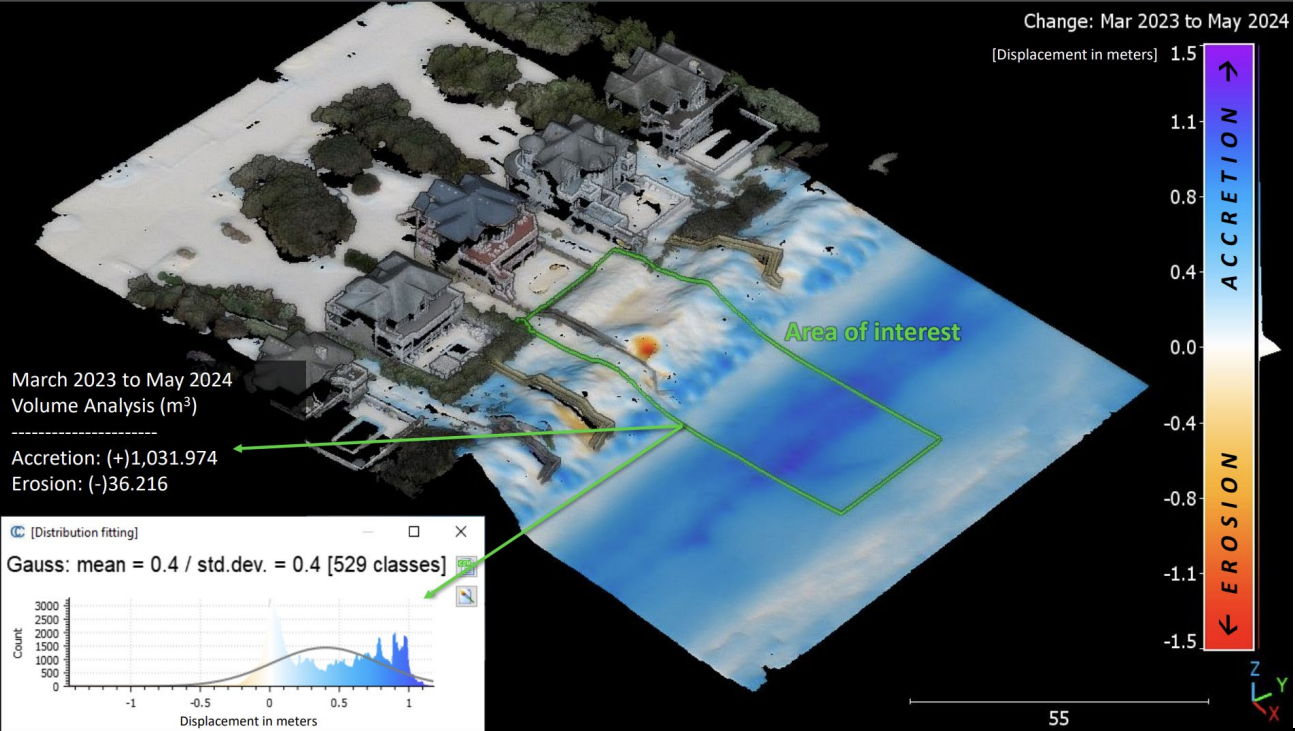
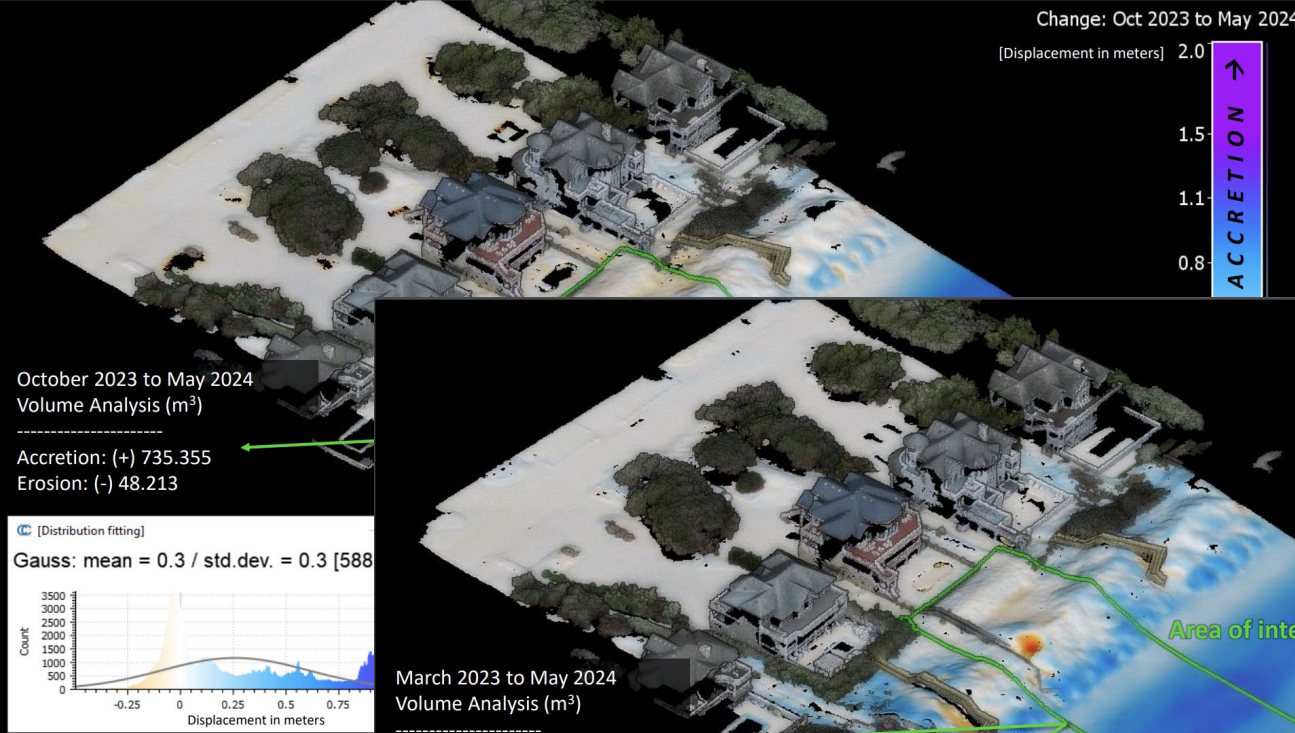
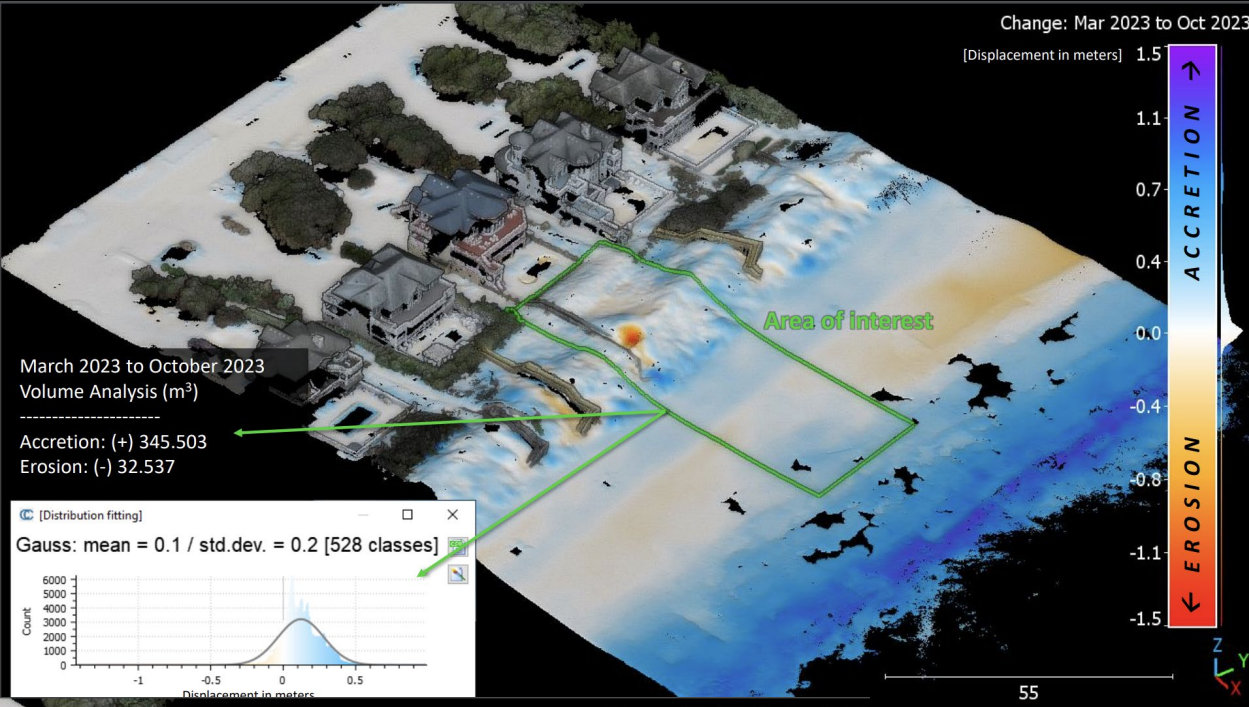
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MITIGATION OVER TIME



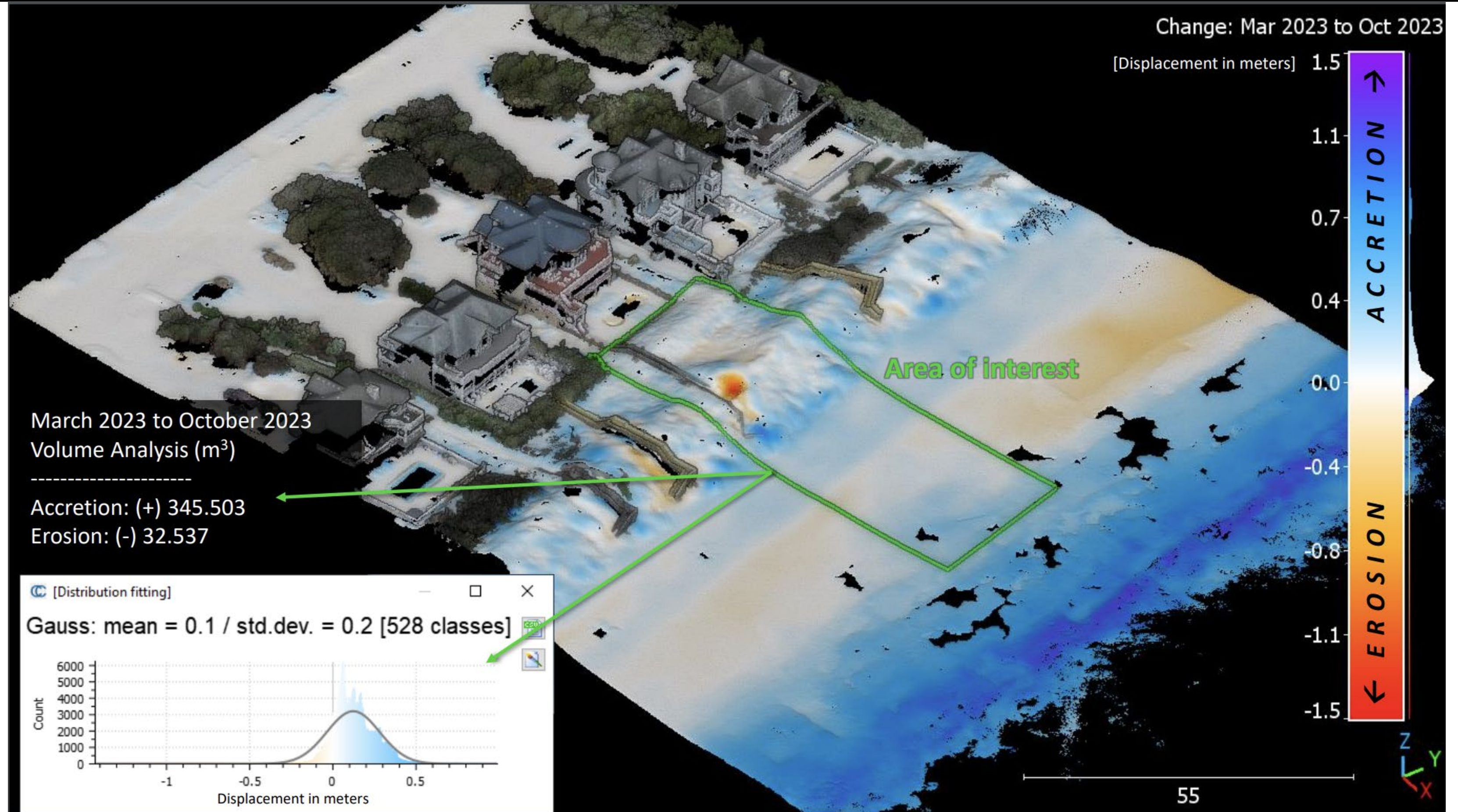
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MITIGATION OVER TIME



RCOAST

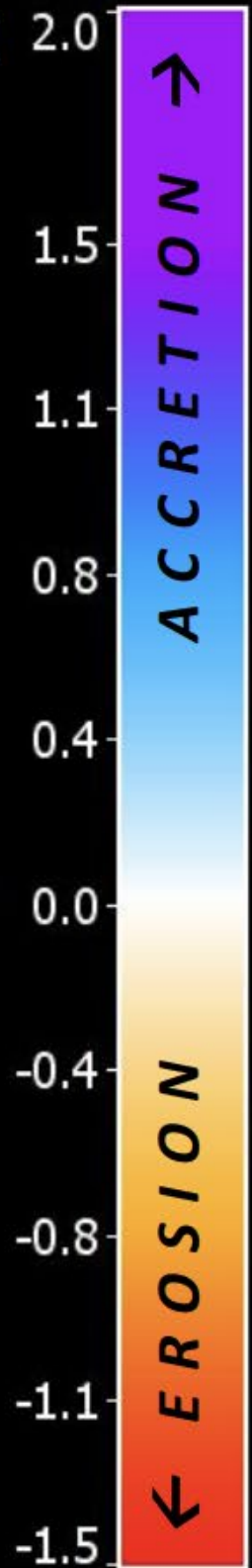
MITIGATION OVER TIME



MITIGATION OVER TIME

Change: Oct 2023 to May 2024

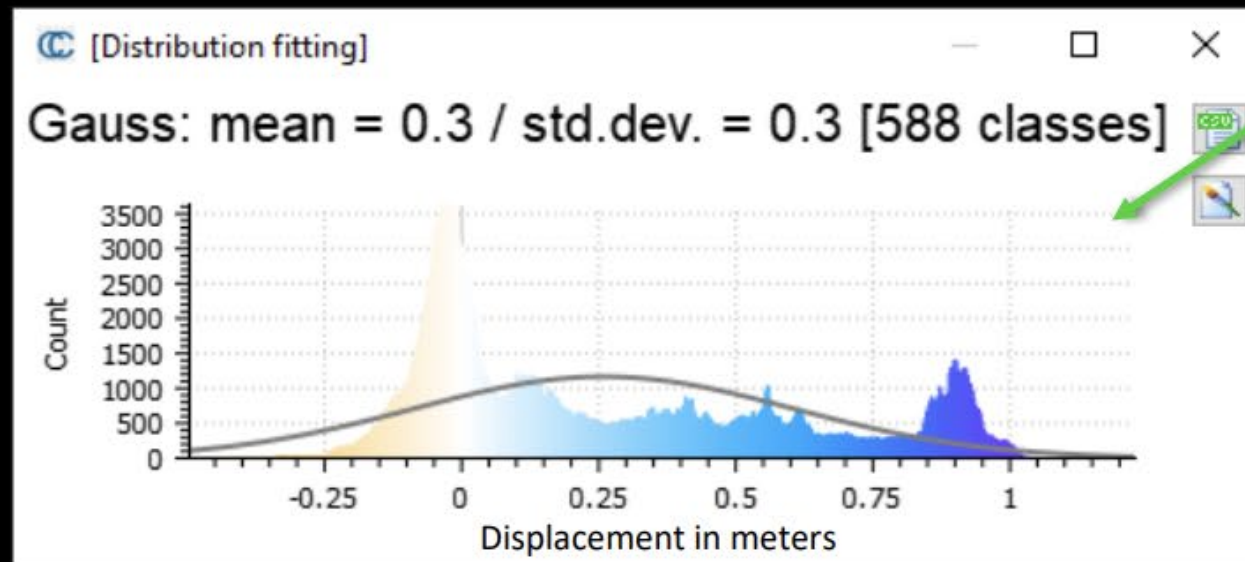
[Displacement in meters]



Area of interest

October 2023 to May 2024
Volume Analysis (m³)

Accretion: (+) 735.355
Erosion: (-) 48.213



MITIGATION OVER TIME

Change: Mar 2023 to May 2024

[Displacement in meters]



Area of interest

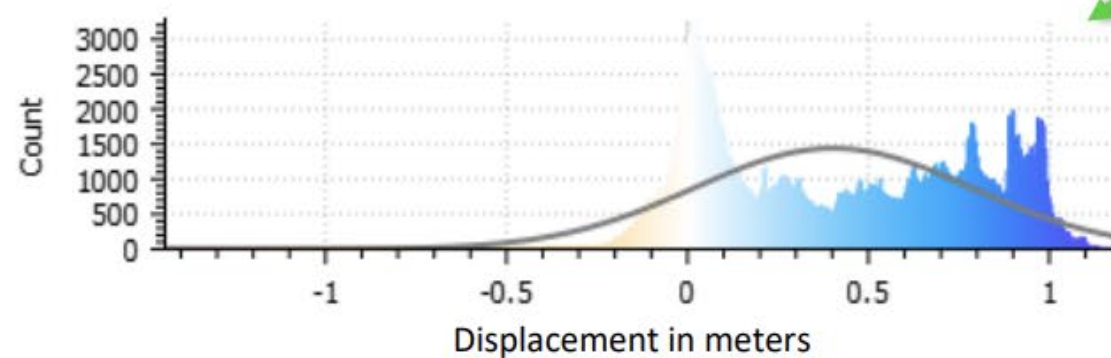
March 2023 to May 2024
Volume Analysis (m³)

Accretion: (+)1,031.974

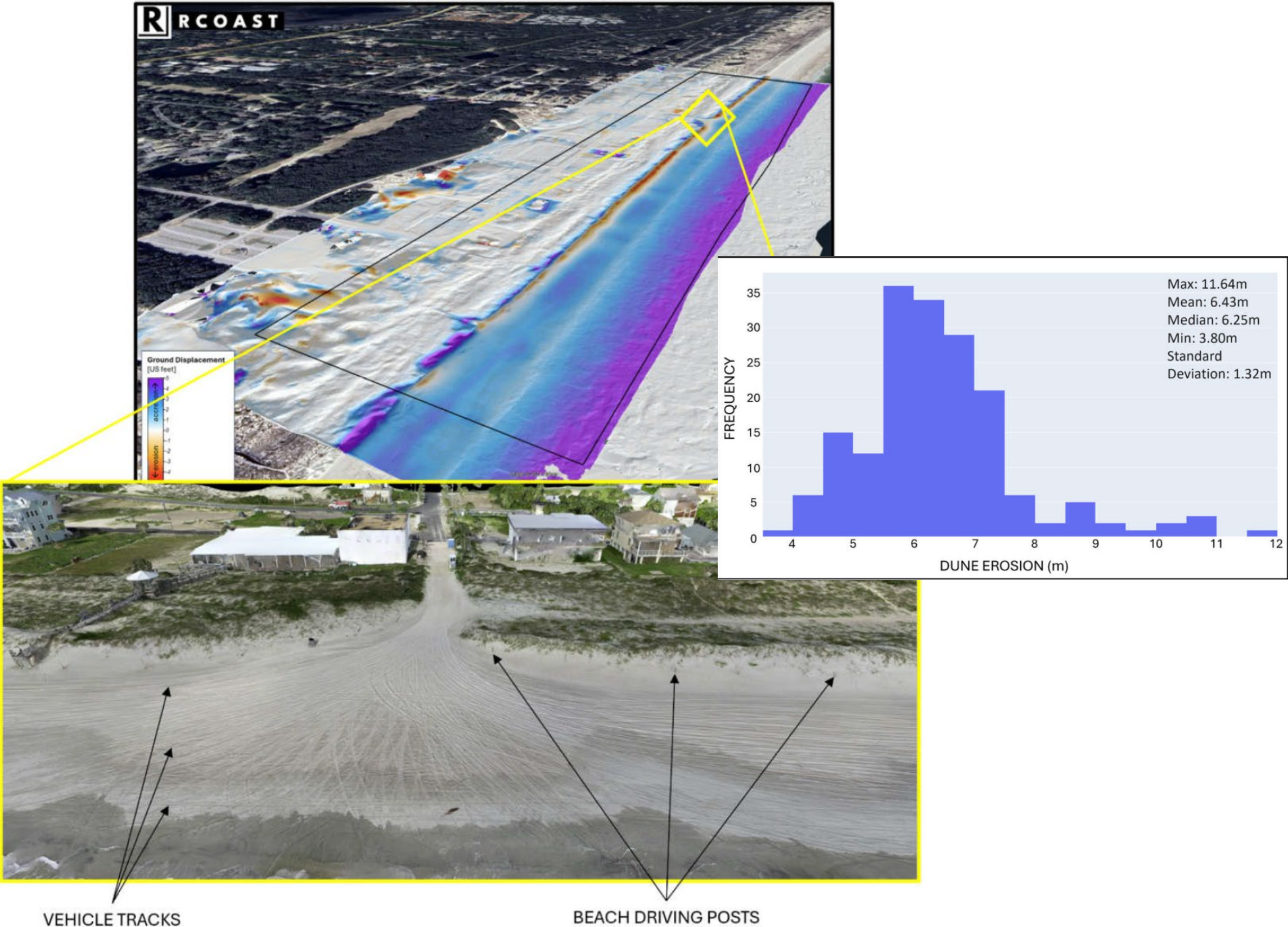
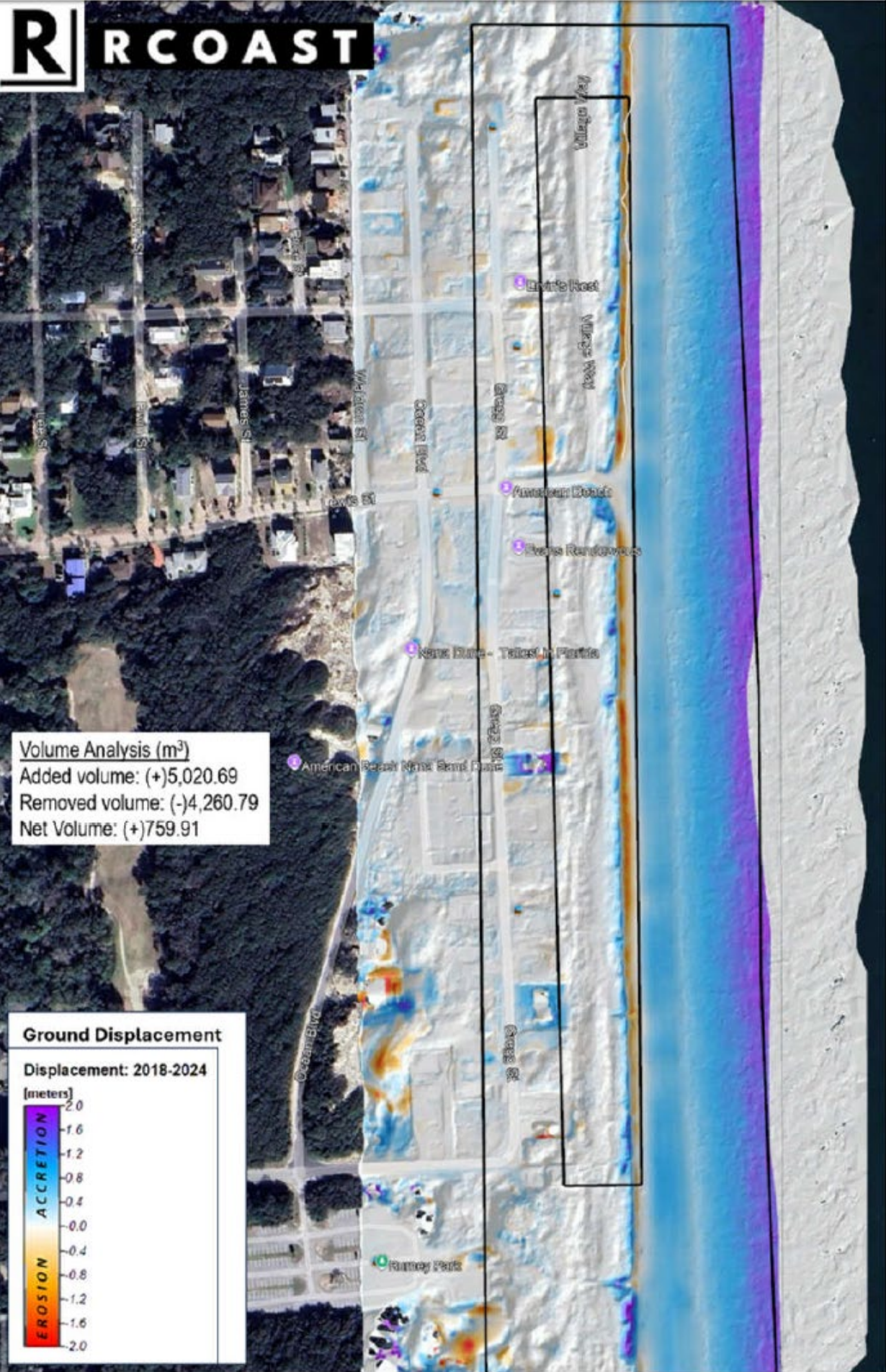
Erosion: (-)36.216

[Distribution fitting]

Gauss: mean = 0.4 / std.dev. = 0.4 [529 classes]



AMERICAN BEACH, FLORIDA



AMELIA ISLAND, FLORIDA

**LiDAR volumetric
measurements of
dunes**



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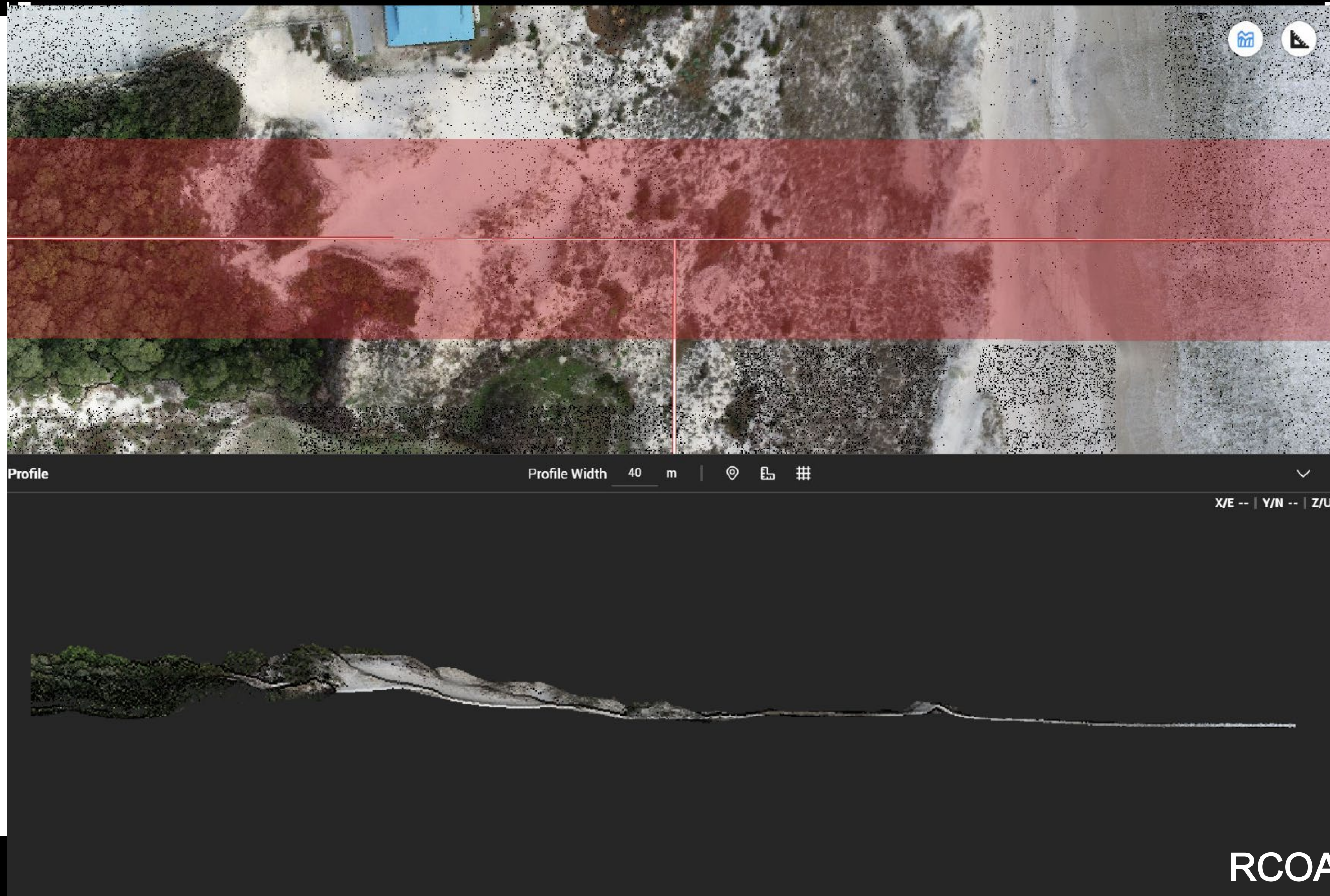
AMELIA ISLAND, FLORIDA

Dune Exposure

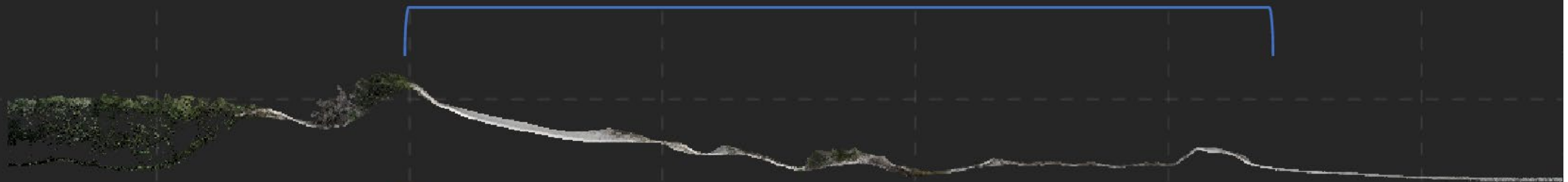


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AMELIA ISLAND, FLORIDA



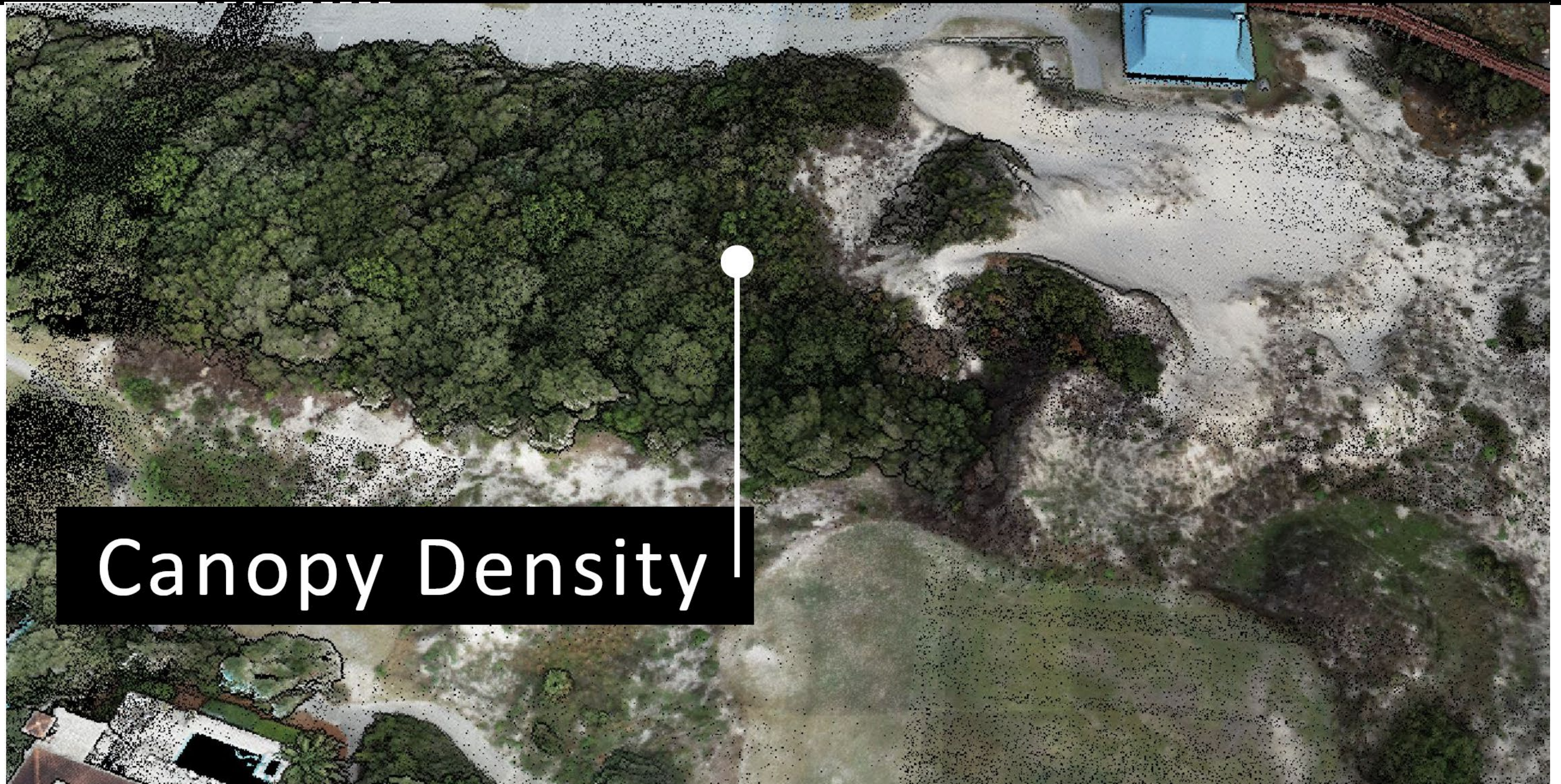
AMELIA ISLAND, FLORIDA



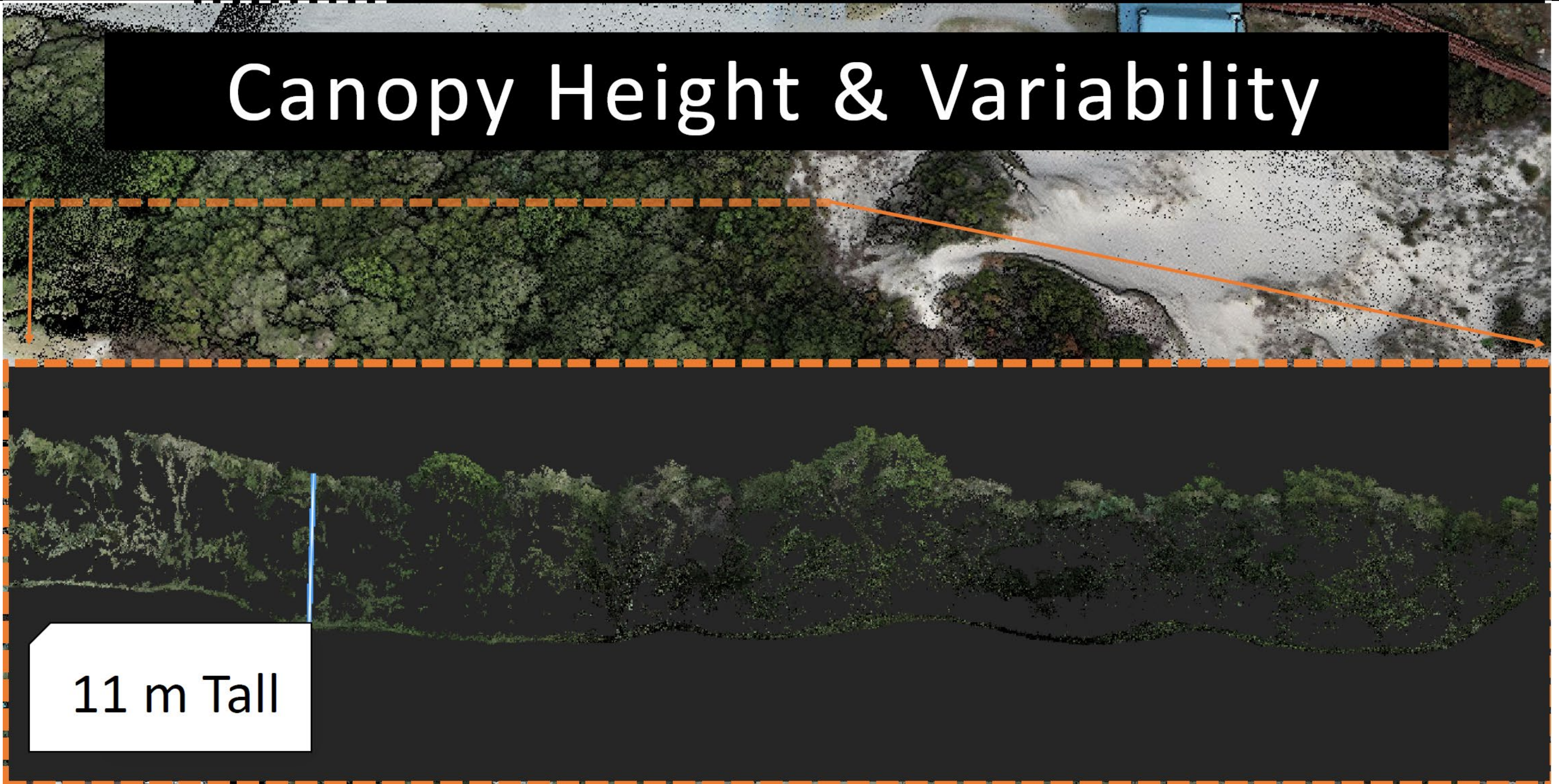
140 m

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AMELIA ISLAND, FLORIDA

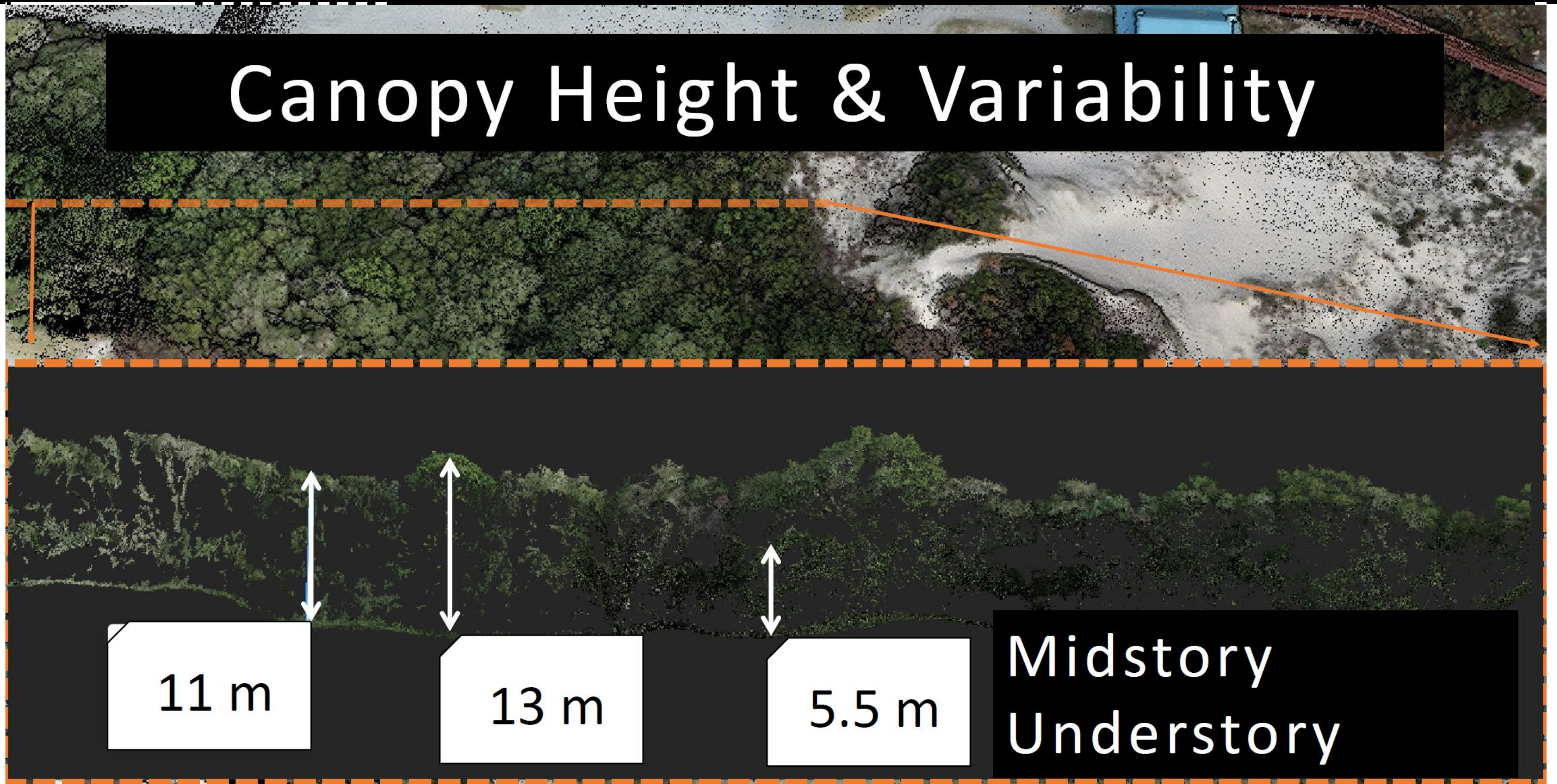


Canopy Height & Variability



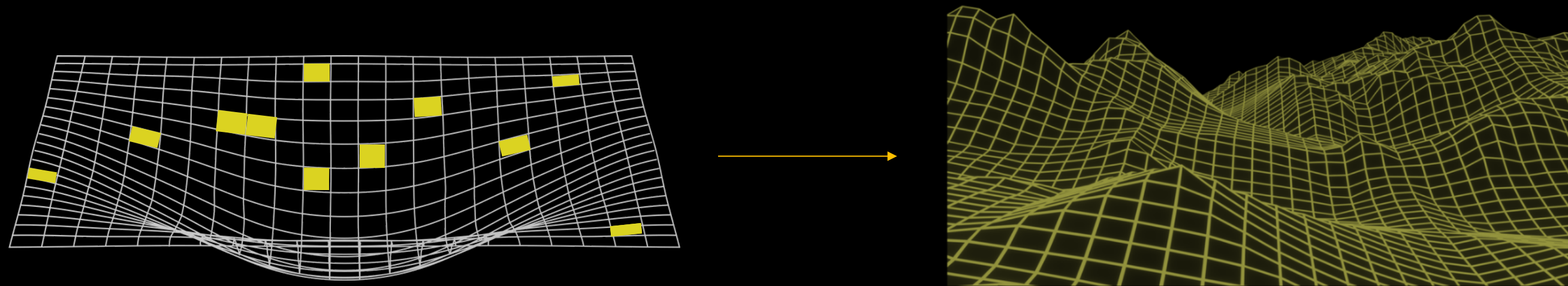
11 m Tall

Canopy Height & Variability



MACHINE LEARNING

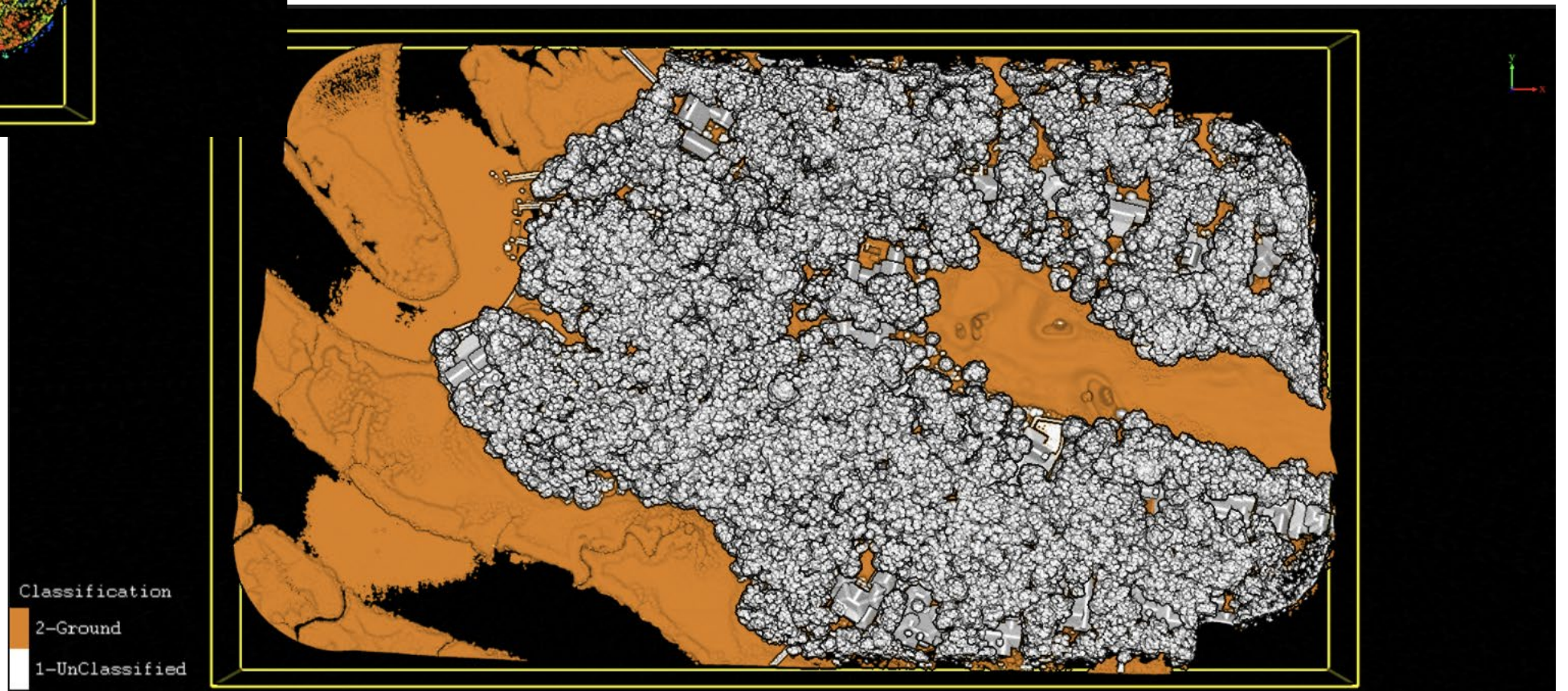
to **build** a **3D** Mitigation **Library** of
what **mitigation** works and where



MACHINE LEARNING

height
species
crown
dbh

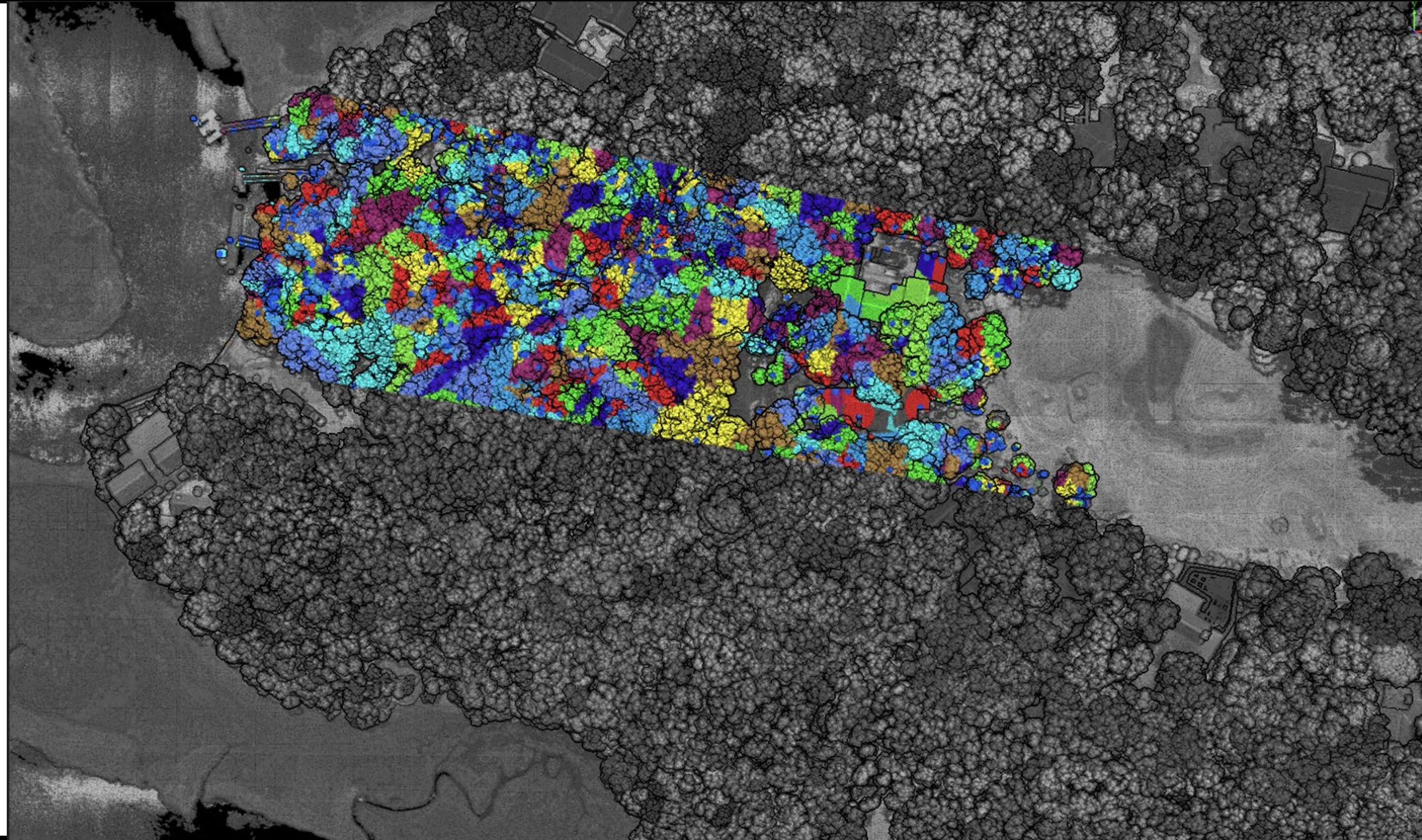
high res
classification



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MACHINE LEARNING

train to
predict



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