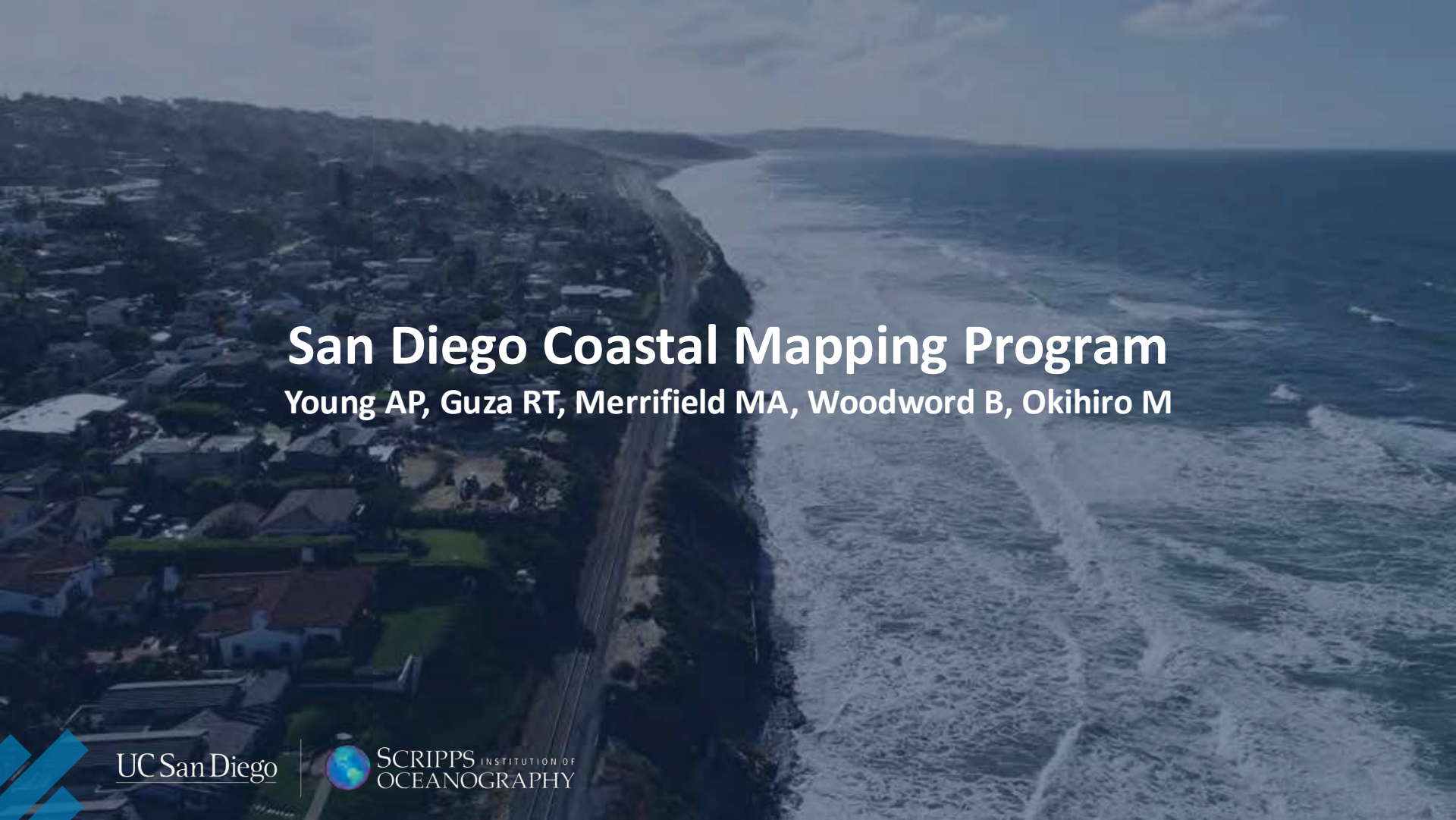
SCRIPPS COASTAL OBSERVATION PROGRAM

Adam Young, PhD

CSBPA Symposium

Santa Cruz| May 12, 2026

UC San Diego | SCRIPPS INSTITUTION OF OCEANOGRAPHY



San Diego Coastal Mapping Program

Young AP, Guza RT, Merrifield MA, Woodword B, Okihiro M

UC San Diego | SCRIPPS INSTITUTION OF OCEANOGRAPHY

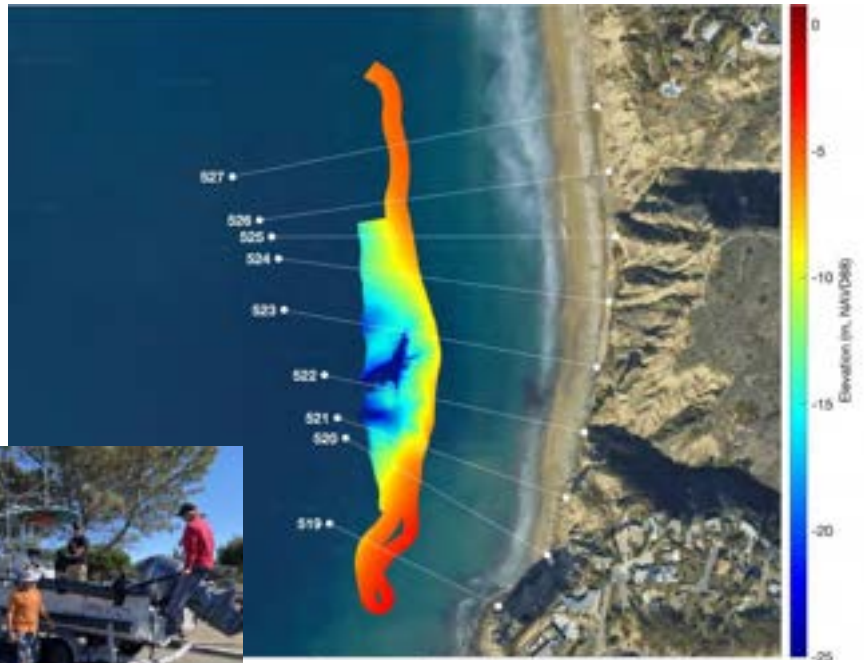
GPS Survey Tools

Lidar

Photos

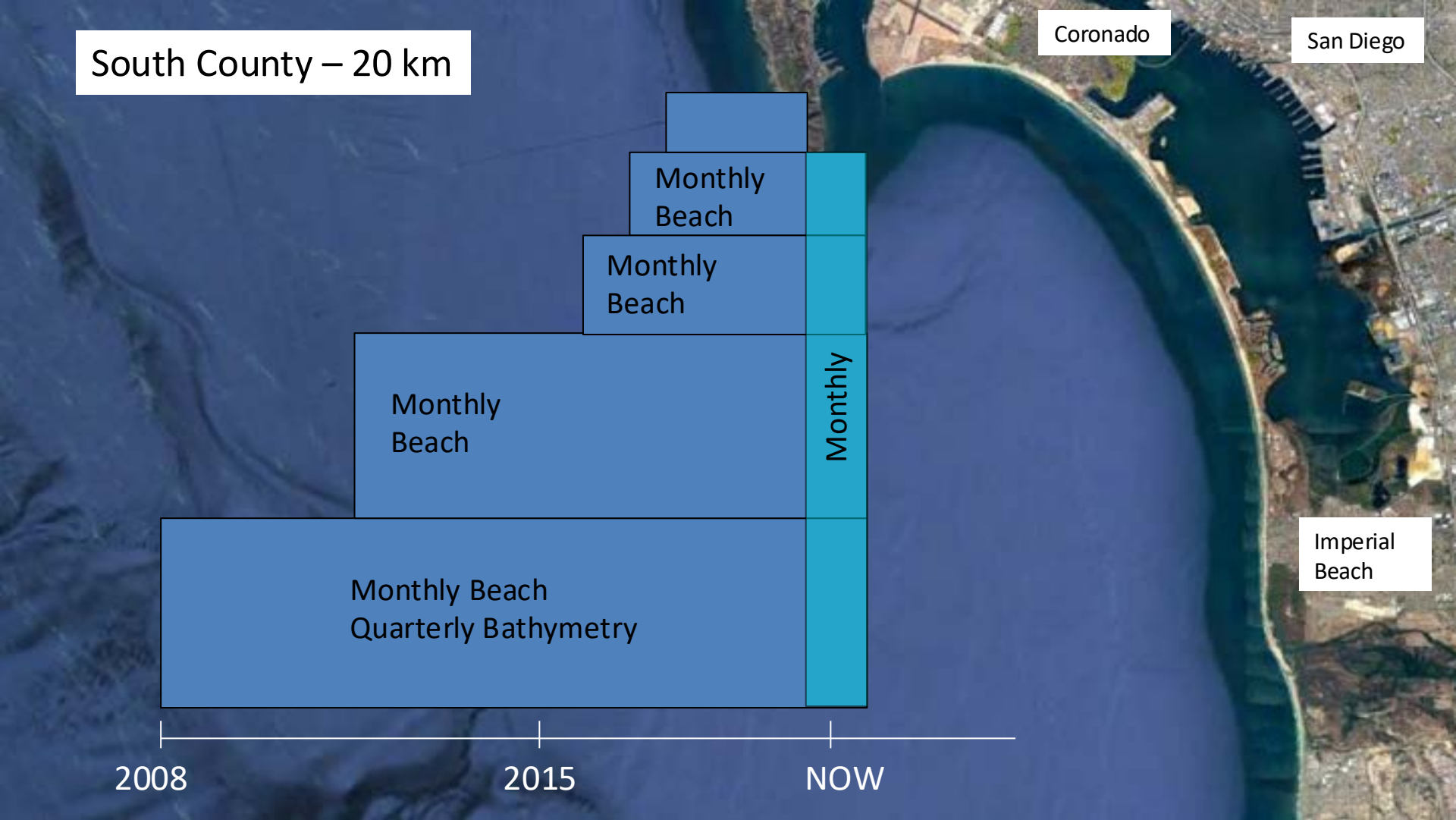
Drones

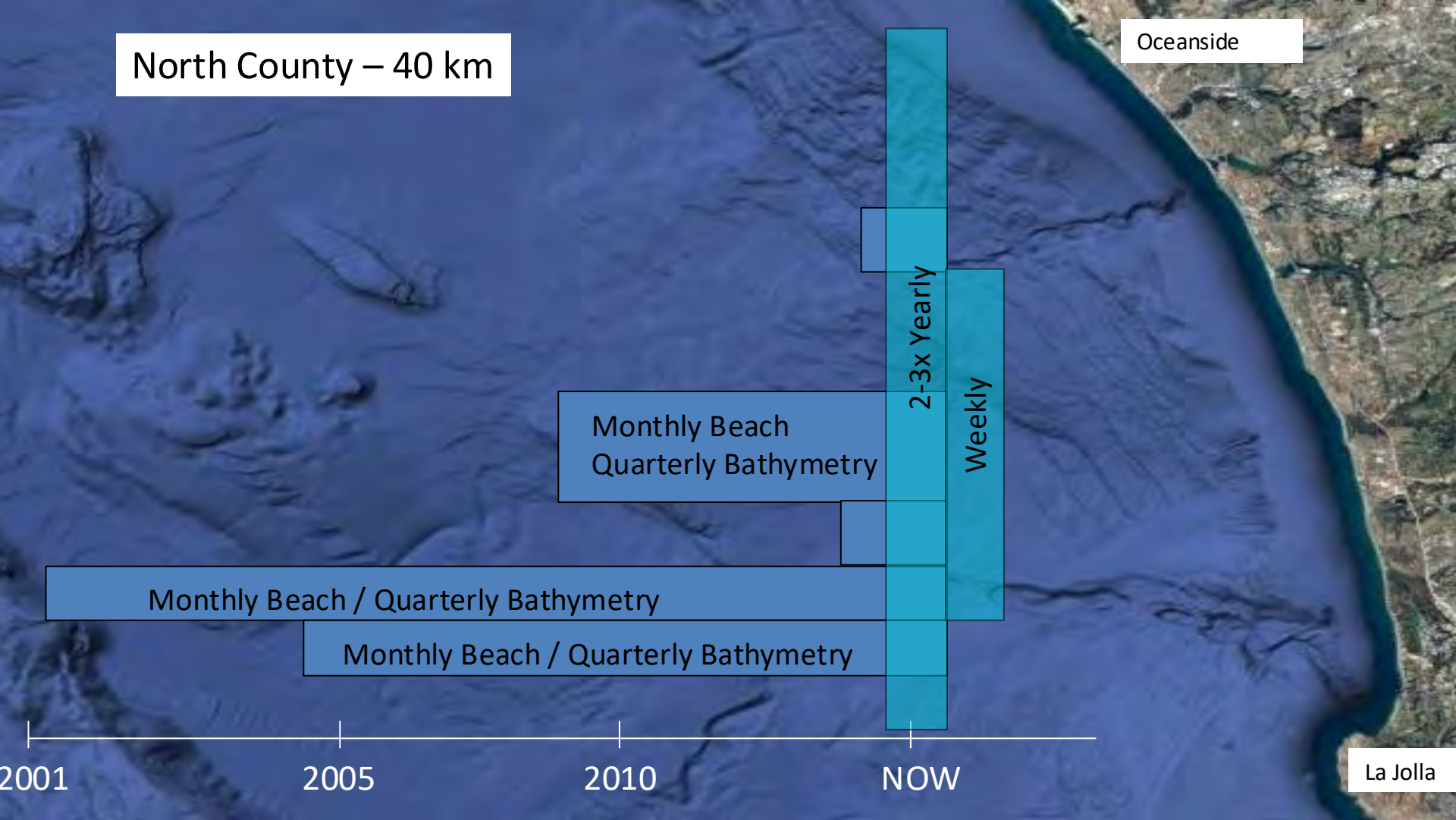
Shallow Water Multibeam



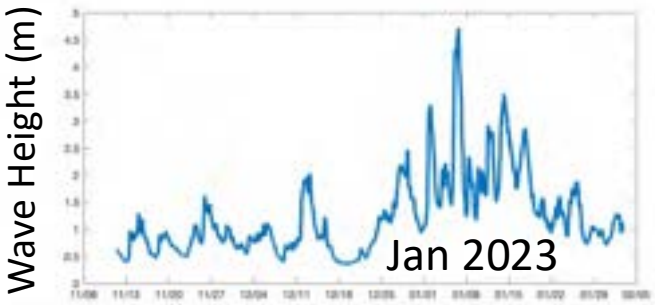
Bathymetric Drone

Coastal Monitoring

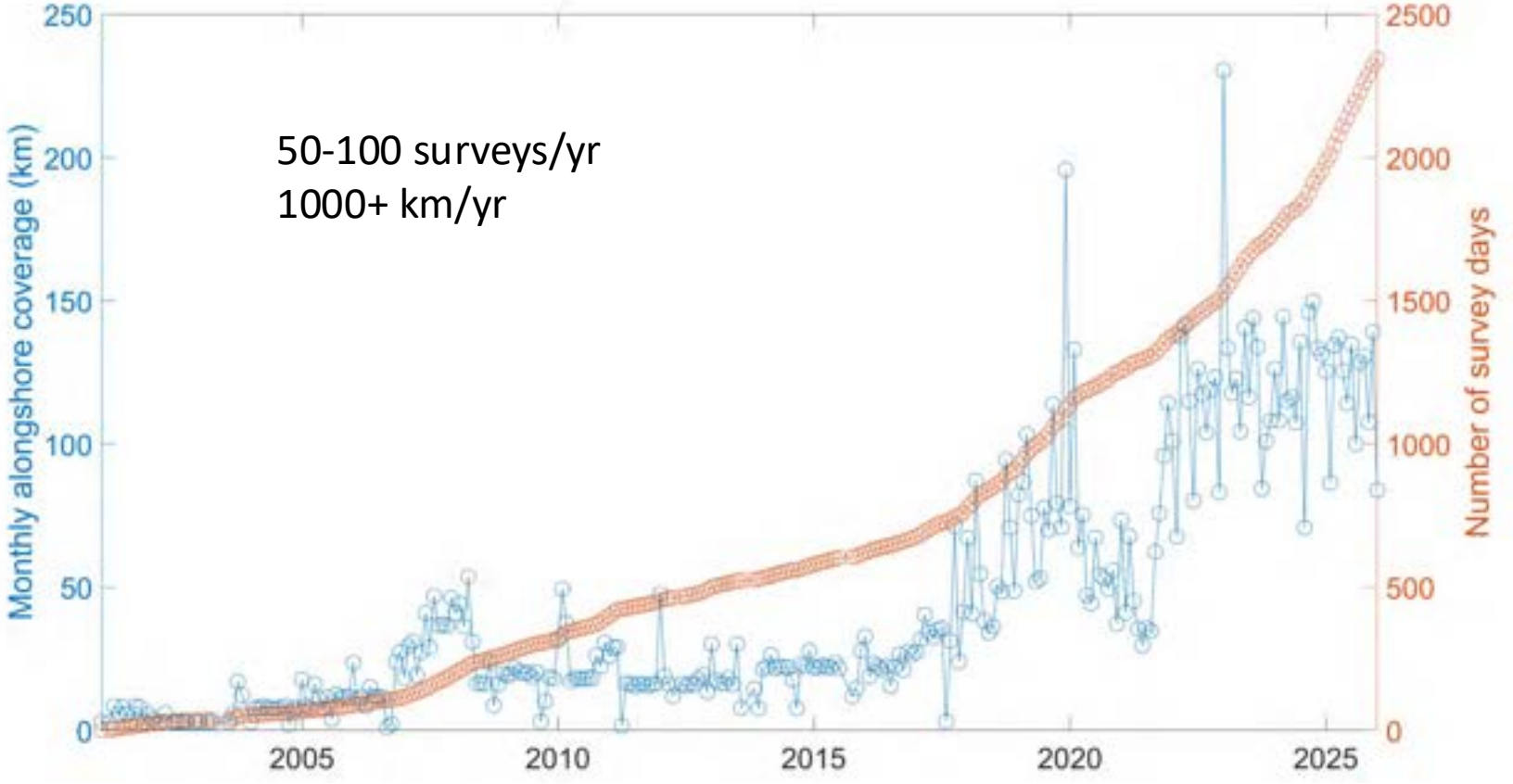

South County – 20 km
Coronado
San Diego
Imperial Beach
Monthly Beach
Monthly Beach
Monthly Beach
Monthly
Monthly Beach
Quarterly Bathymetry
2008
2015
NOW


North County – 40 km
Oceanside
2-3x Yearly
Weekly
Monthly Beach
Quarterly Bathymetry
Monthly Beach / Quarterly Bathymetry
Monthly Beach / Quarterly Bathymetry
2001
2005
2010
NOW
La Jolla

Rapid Response Surveys



San Diego Survey Database



Survey Processing Pipeline

Data Collection

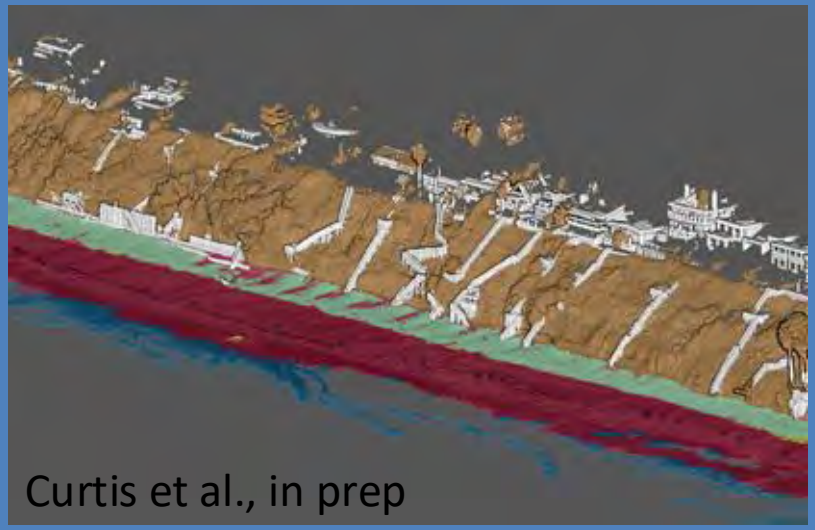
Post Processing

Ground Filter

Machine Learning Segmentation

Beach Sand
Cobble
Bedrock

Waves
Cliff
Structures

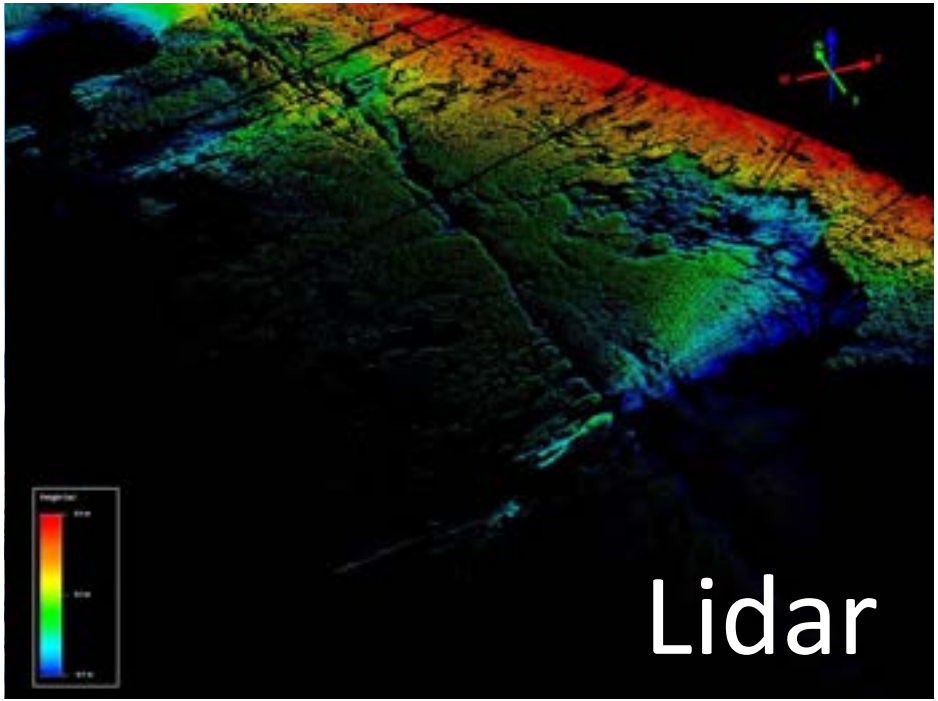


Research Products

DEMs
Profiles
Point Clouds
Change

Management Products

Bedrock Mapping



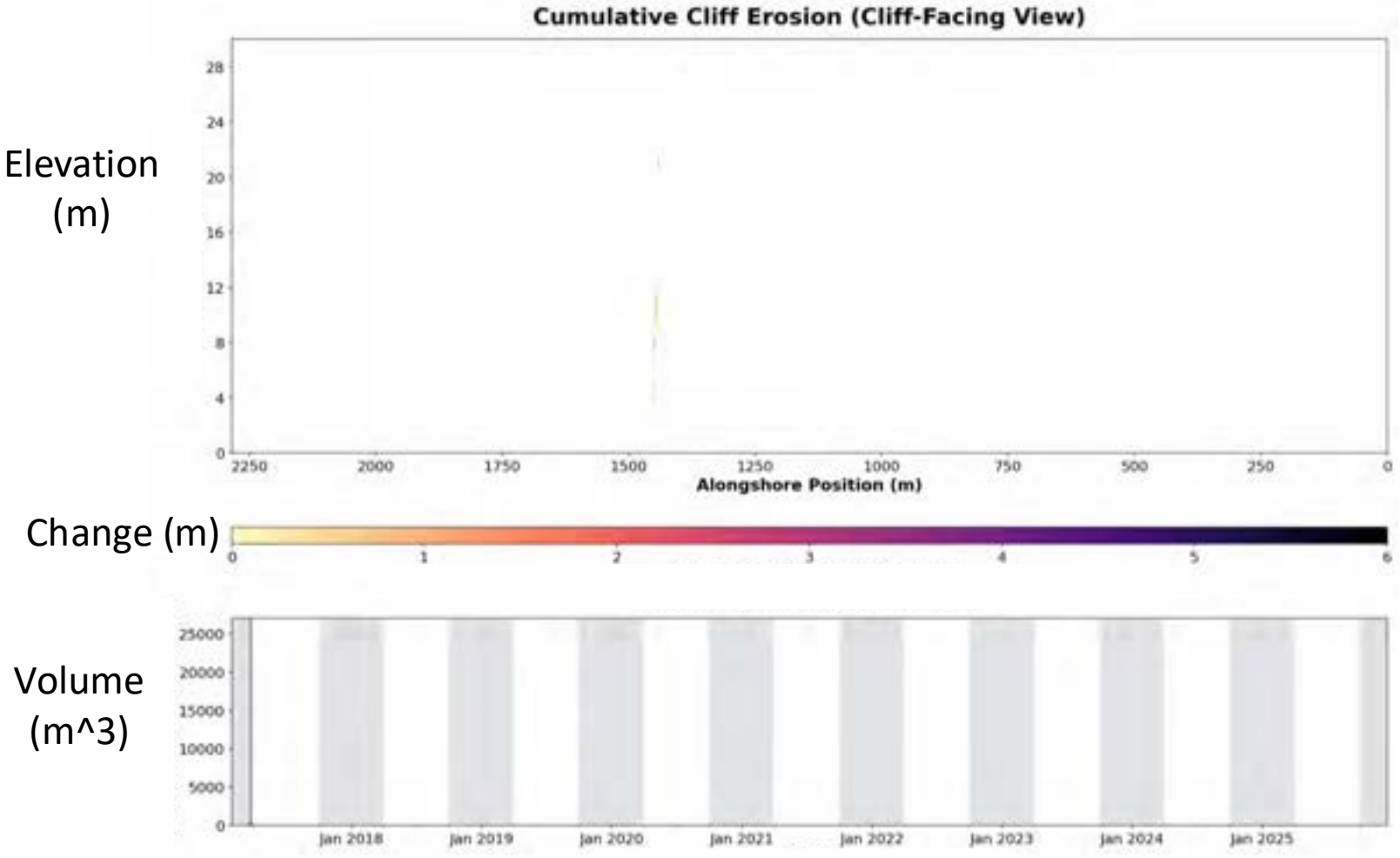
Sand and Cobble

Subsurface Cobble Monitoring

Excavations
GPR
In situ Sensors

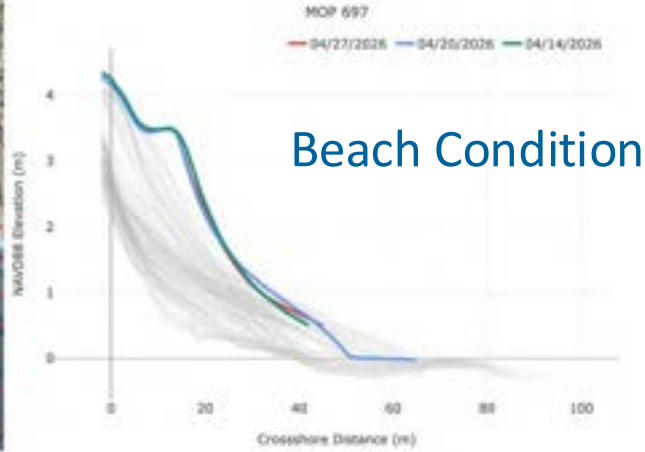
Advanced Monitoring of Subsurface Sediment Structures Within Gravel Berms

H. Matsumoto[1], G. Shtienberg[2], and A. P. Young[1]



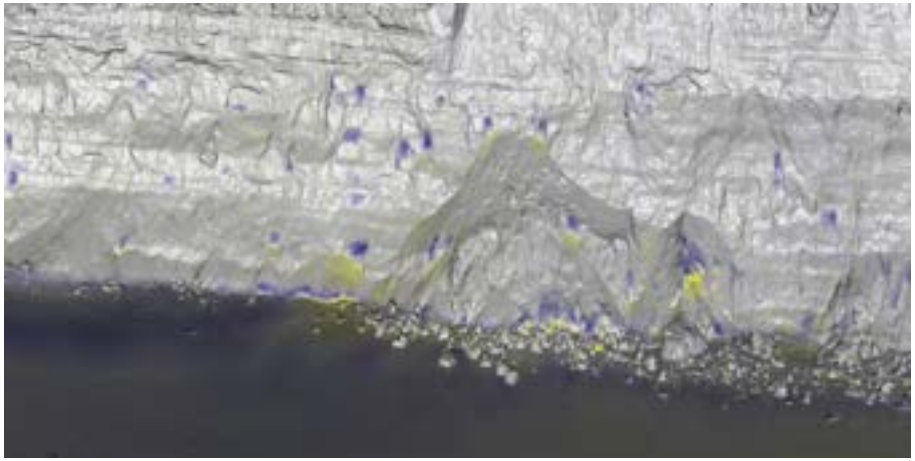
Krier-Mariani et al., submitted

Rapid Management Products

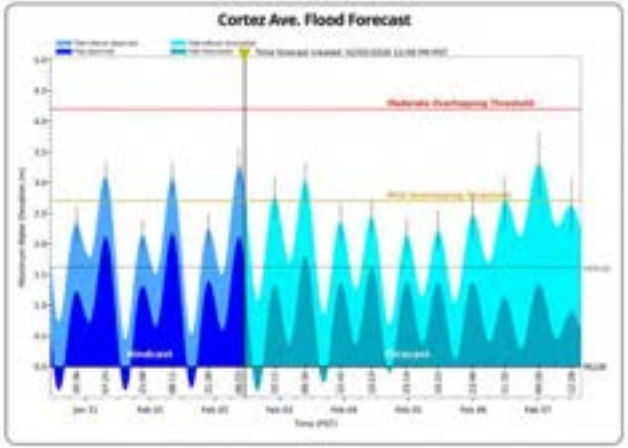


Beach Conditions

Cliff Changes



Flood Forecast

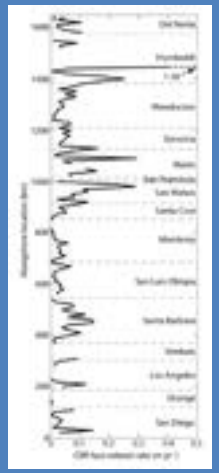


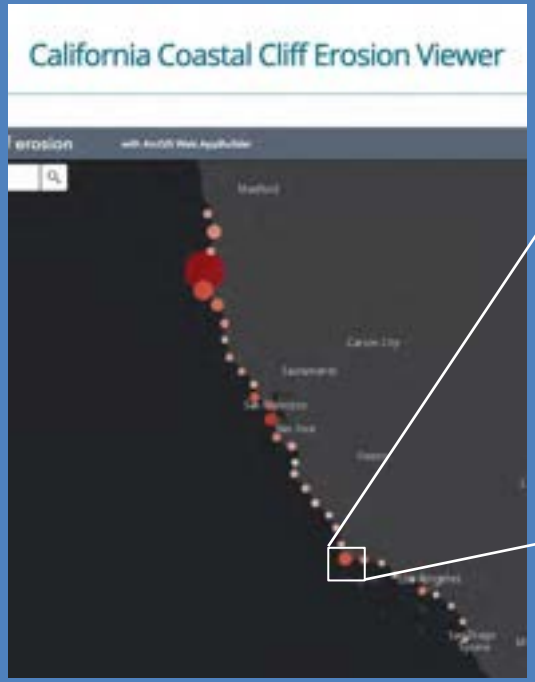
Statewide Coastal Mapping

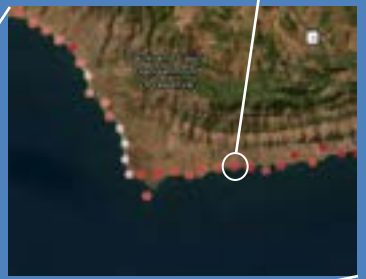
UC San Diego | SCRIPPS INSTITUTION OF OCEANOGRAPHY

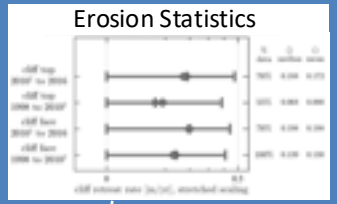
STATEWIDE EROSION ANALYSIS

1998-2009-2016
Online viewer









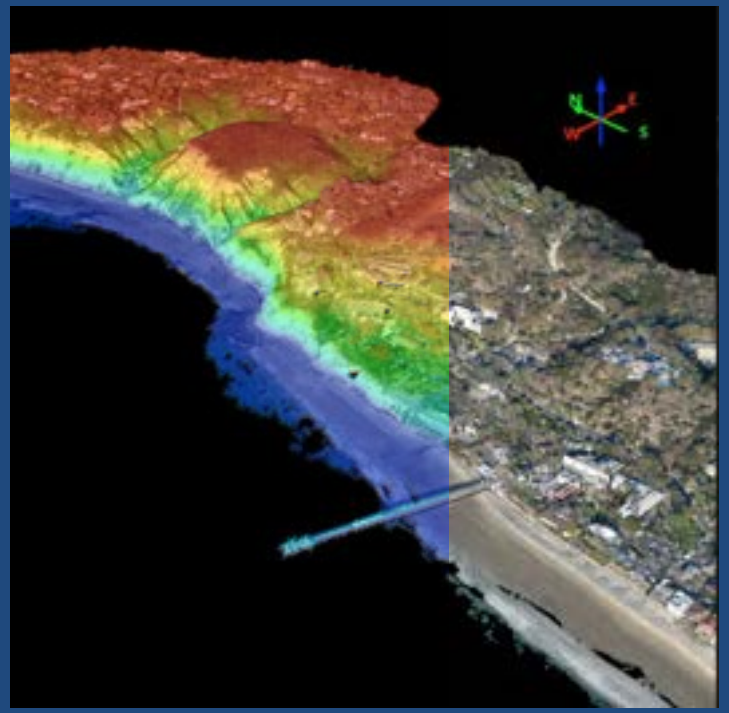
STATEWIDE AIRBORNE SURVEYS

Adam Young and Luc Lenain

Consistent Systematic Surveys
Routine Updated Baseline Data

Lidar
Imagery
Hyper Spectral
Video

Flights Conducted:
2023-current
Spring and Fall



Coastal Hazard Stations

UC San Diego | SCRIPPS INSTITUTION OF OCEANOGRAPHY

Autonomous Remote Coastal Hazard Monitoring Stations

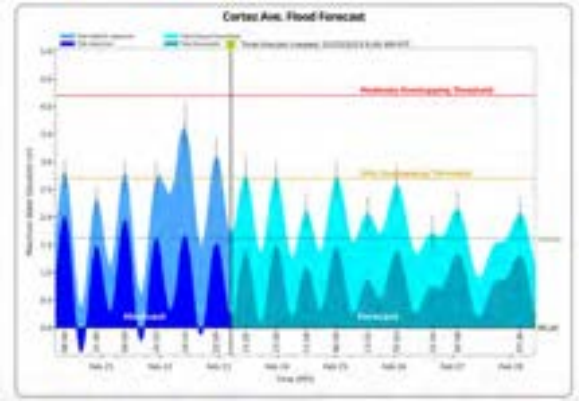
- Automated Hazard Monitoring
- Continuous Data
- Online Dashboards

Los Angeles Times

Record wet winter inflicted more than $210 million in damage to California parks

Offshore

Onshore



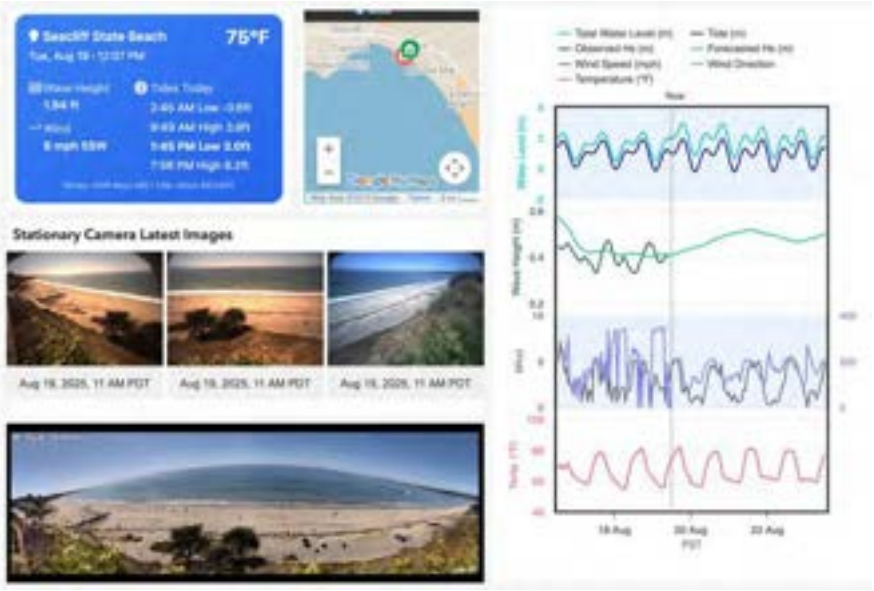
Autonomous Remote Coastal Hazard Monitoring Stations

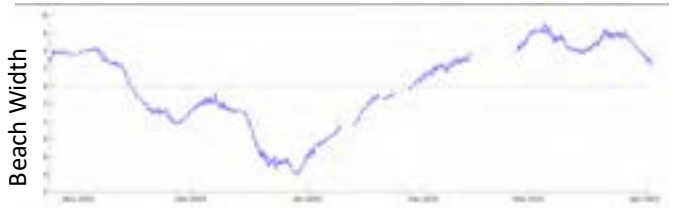
Torrey Pines
South Carlsbad
Solana Beach
Del Mar
Scripps
Seacliff State Beach
Doheny

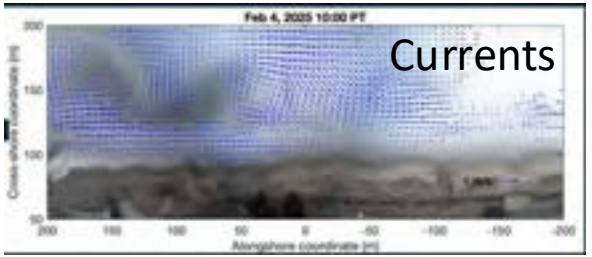
Applications

Shoreline Change
Beach Slope
Wave Runup
Flooding
Estuary Closures
Bathymetry
Currents
Nourishments
Landslides

Online Dashboards

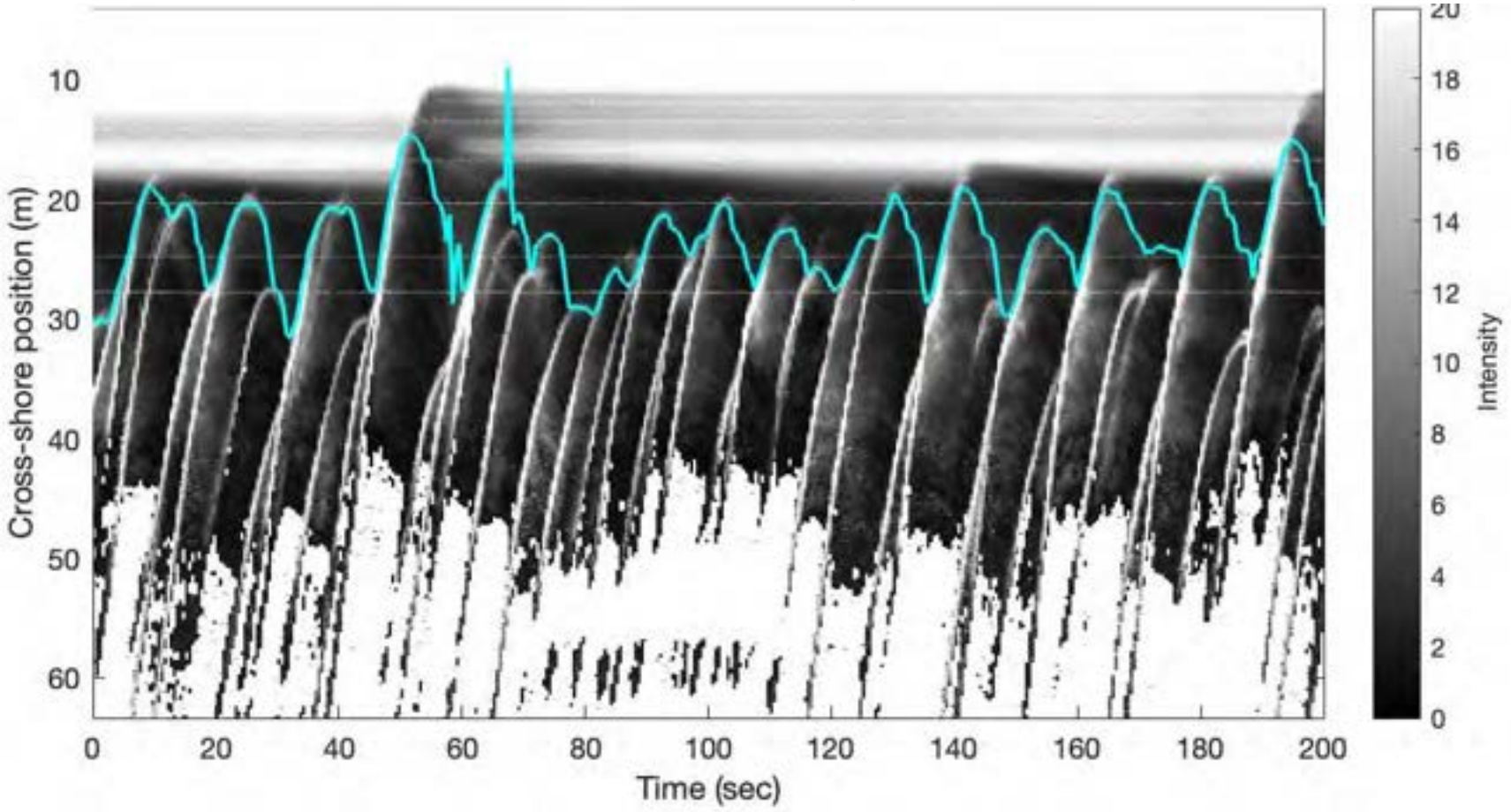


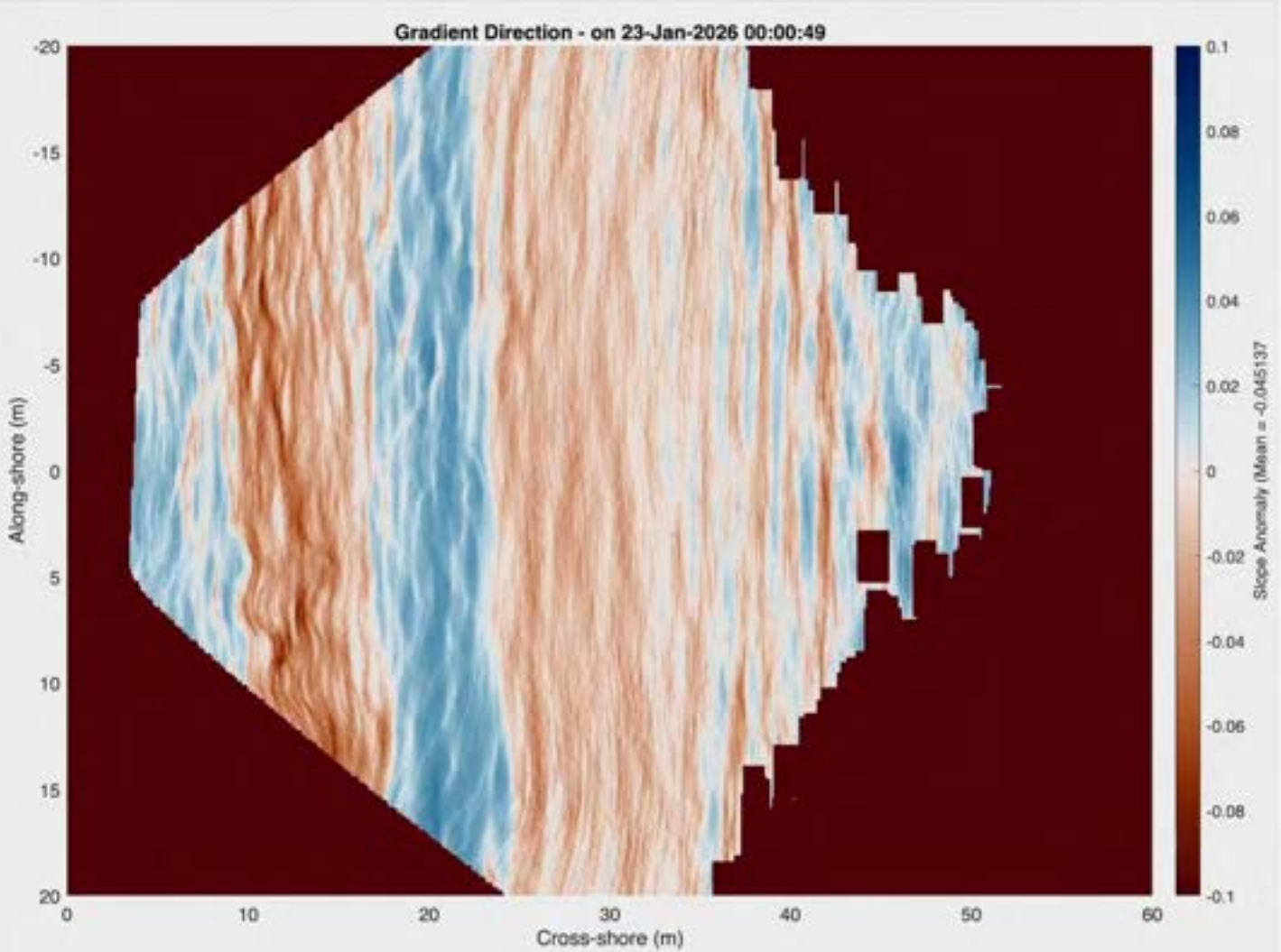




Solana Beach

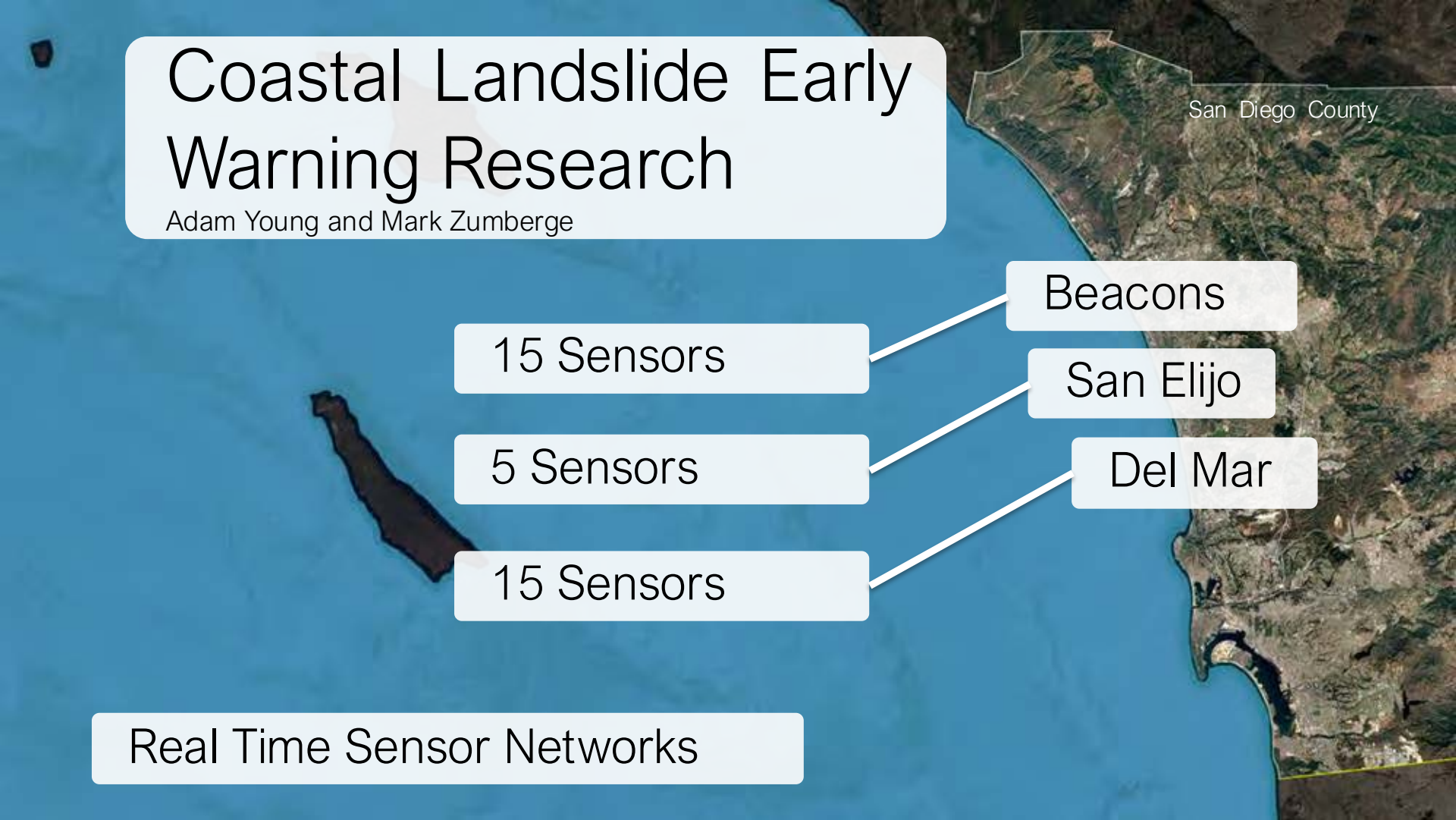
Wave Runup


Cross-shore position (m)
10
20
30
40
50
60
0
20
40
60
80
100
120
140
160
180
200
Time (sec)
Intensity
0
2
4
6
8
10
12
14
16
18
20


Gradient Direction - on 23-Jan-2026 00:00:49
Along-shore (m)
-20
-15
-10
-5
0
5
10
15
20
0
10
20
30
40
50
60
Cross-shore (m)
0.1
0.08
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
-0.08
-0.1
Slope Anomaly (Mean = -0.045137

Coastal Landslide Early Warning Research

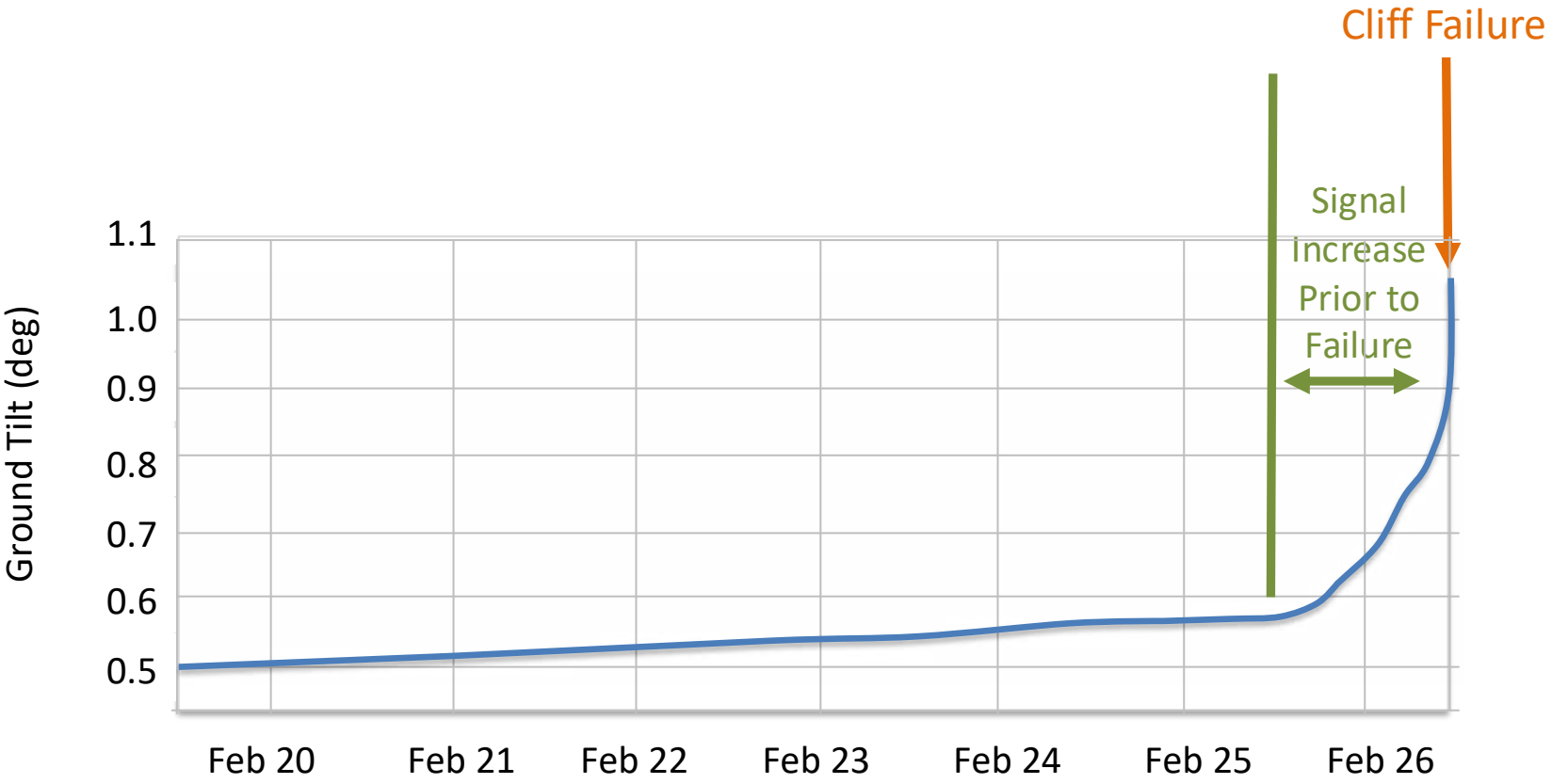
Adam Young and Mark Zumberge



Real Time Sensor Networks

Del Mar North

Sensor Readings Prior to Failure



Cook et al., accepted

Summary

- Coastal Mapping Program
- Continuous Monitoring Stations
- Landslide Warning System
- Research Applications

OCEAN PROTECTION COUNCIL

Sea Grant

UC San Diego

SCRIPPS INSTITUTION OF OCEANOGRAPHY