

**Drones in the Coastal Zone (DITCZ)
Community of Practice (CoP)
January 22, 2026 Meeting Notes**

DITCZ Community of Practice Notes – 51 people in attendance

Welcome and Introductions

Melissa Cook, NOAA Fisheries (melissa.cook@noaa.gov)

Justin Ridge, NC Coastal Reserve & NERR (justin.ridge@deq.nc.gov)

Whitney Jenkins, NC Coastal Reserve & NERR (whitney.jenkins@deq.nc.gov)

**Drones in the Coastal Zone Community of Practice (DITCZ CoP) Reboot and Revival
(outlined by Melissa Cook)**

Recent History:

The CoP has not met in over a year. Following an in-person meeting in February 2024, the Steering Committee held subsequent meetings in March and May. A planned quarterly call in September 2024 was unfortunately postponed and ultimately canceled. Throughout the remainder of 2025, major changes affecting federal and state employees led to a complete pause in all DITCZ meetings and activities. Additionally, the meeting scheduled for November was cancelled due to the government shutdown.

Moving Forward:

We are now focused on revitalizing the DITCZ CoP, and an active Steering Committee is essential to guide this effort. We are currently working to re-establish the committee by re-engaging previous members and adding new members as needed. If you are interested, please contact Melissa or Justin.

The Steering Committee's immediate priorities will be to:

1. **Define the scope of the group's reboot:** Understand how the CoP can best help meet the community's needs, especially given the ongoing and future changes in drone laws.
2. **Secure some commitment from participants:** Re-engage previous members and welcome new volunteers to ensure the group has the manpower to function.
3. **Ensure that efforts are focused and effective:** Make sure the group's activities are practical and useful so that the CoP is a resource everyone can benefit from.

Presentations

1. UAV Based Water Level Sensor Deployment and Elevation Mapping in Coastal Salt Marshes

Speaker: Ibrahim Hamidian Jahromi, University of Georgia

Summary and Key Points:

The project aims to quantify the coastal protection potential of salt marshes by studying marsh plate hydrodynamics and tidal asymmetry. The study site is a 1.4 km² marsh at the Grove St. Complex in Escuda Way Island, GA.

- **Challenge:** Traditional surveying methods were limited by soft, muddy substrate, tall flora (4-4.5 ft), and short tidal time windows, leading to sparse data and increased safety risk.
- **UAV Solution:** A two-UAV workflow was developed to decouple sensor deployment and surveying for efficiency:
 - **Deployment/Retrieval:** A heavy-lift DJI Matrix 350 RTK was used to precisely place and retrieve a custom-designed tripod-panel structure (weighing approx. 2.35 kg).
 - **Mapping:** A DJI Mavic 3M was flown at 150 ft for patch-based photogrammetry to generate a Digital Surface Model (DSM). Target elevation from the DSM, combined with the known target height, is used to calculate the water level sensor's elevation relative to NAVD 88.
- **Lessons Learned:** Early 3D-printed parts broke during a storm, necessitating a switch to more resistant polycarbonate (PC) filament. The team learned that stability and visibility need further improvement, and surveying right after deployment is recommended to detect any prototype movement.

Q&A Highlights:

- **Drone Models:** DJI Matrix 350 RTK (deployment) and DJI Mavic 3M (mapping).
- **Tripod Weight:** Reduced to approximately 2.35 kg to stay under the 2.7 kg limit of the Matrix 350.
- **Leg Sinkage:** Sinkage into the mud was minor (1-2 cm) and did not significantly affect data accuracy.
- **Design Rationale:** The tripod's height is necessary for visual detection and retrieval from a distance.

2. Using Uncrewed Aircraft Systems (UAS) to Study Protected Species

Speaker: Melissa Cook, NOAA Fisheries Southeast Fisheries Science Center, UXS Coordinator

Summary and Key Points:

The Southeast Fishery Science Center (SEFSC) has a relatively new UAS program focused on protected species. making up 61% of NOAA's total UAS operations.

- **Green Sea Turtle Abundance:** The SEFSC is working with the Southwest Fisheries Science Center (SWFSC) to conduct abundance estimates using small UAS (Mavic 3

Pro's) in San Diego Bay and Chassahowitzka, Florida. Videos are generally preferred over images, especially in high-density areas, to capture movement.

- **AI/Machine Learning Challenges:** Efforts to develop an AI model for automated turtle detection have shown low accuracy, with a high number of false positives (seagrass interpreted as turtles) and false negatives. The team is actively seeking new partners (including University of Washington and Embry-Riddle) to refine the models.
- **Sperm Whale Photogrammetry and Tagging:**
 - UAS are used for photogrammetry (body condition) and group counts from a moving vessel (2.5–3 knots). This requires continually updating the "return to home" point and careful battery management.
 - UAS (Free Fly Astro) are used to deploy suction cup CAT tags on Rice's whales. A joint training program with Duke University is expanding the number of personnel permitted to perform this skilled deployment.
- **Waiver Status:** NOAA has secured a waiver for the continued operation of covered (foreign-made, e.g., DJI) UAS through September 2027, allowing time to transition to "blue drones."

Q&A Highlights:

- **Moving Home Point:** When operating from a moving vessel, the pilot must manually and frequently update the drone's home point to the remote control's location; if not, the drone's automatic 20% battery return-to-home feature will direct it to the old, potentially distant, home point.
- **Permitting/Disturbance:** **Allix North** suggested approaching the NOAA permitting division to establish an altitude-based rule for non-disturbance UAS activities (like turtle counts) to simplify the permit process. **Melissa C.** agreed this was a great idea and will follow up.
- **Splash Drone:** **Melissa C.** noted the Splash drone was "not very reliable" due to quick connection loss.

Discussion Summary

Topic: Updates on the foreign drone purchasing, operation restrictions, and exemption status for certain agencies.

Summary:

The discussion centered on the federal restrictions placed on foreign-made (covered) drones and the effects of the NOAA waiver on partners. NOAA partners expressed concern over how the waiver applies to their federally funded work and the growing difficulty of acquiring new equipment.

Key Takeaways:

- **NOAA Waiver:** NOAA has a waiver allowing its personnel to *operate* existing covered drones (e.g., DJI) through September 2027.
- **Partner Coverage: Melissa C.** noted that partners (like the NERRs) on federally funded NOAA projects need to take **extra steps** and actively coordinate with their NOAA contacts to ensure their operations are covered under the waiver.
- **Purchasing vs. Operation: David Johnston** emphasized that while the waiver covers *operation*, the **purchasing** of new foreign-made drone models is becoming increasingly difficult and challenging, requiring a focus on converting to NDAA-compliant platforms.

Action Items:

- **Justin and Melissa** will re-engage with the Steering Committee (SC) and new potential SC members and select the date for the next SC meeting, planned for mid to late March.
- **Melissa C.** will follow up with the NOAA permitting division regarding the feasibility of establishing altitude-based best practices to simplify the administrative burden for non-disturbance UAS surveys.
- NOAA partners need to contact their federal counterparts to confirm coverage under the NOAA UAS operation waiver.

Particularly Insightful:

- **The deviation between operation and purchasing restrictions:** The realization that the NOAA waiver for *operating* existing covered drones is only a temporary fix, as the difficulty in *purchasing* new foreign-made equipment means organizations must immediately plan and budget for the transition to NDAA-compliant platforms ("blue drones").

If you are interested in joining the DITZ CoP Steering Committee please contact by Feb 13th :

**Melissa Cook, NOAA Fisheries (melissa.cook@noaa.gov)
Justin Ridge, NC Coastal Reserve & NERR (justin.ridge@deq.nc.gov)**

Thank You!



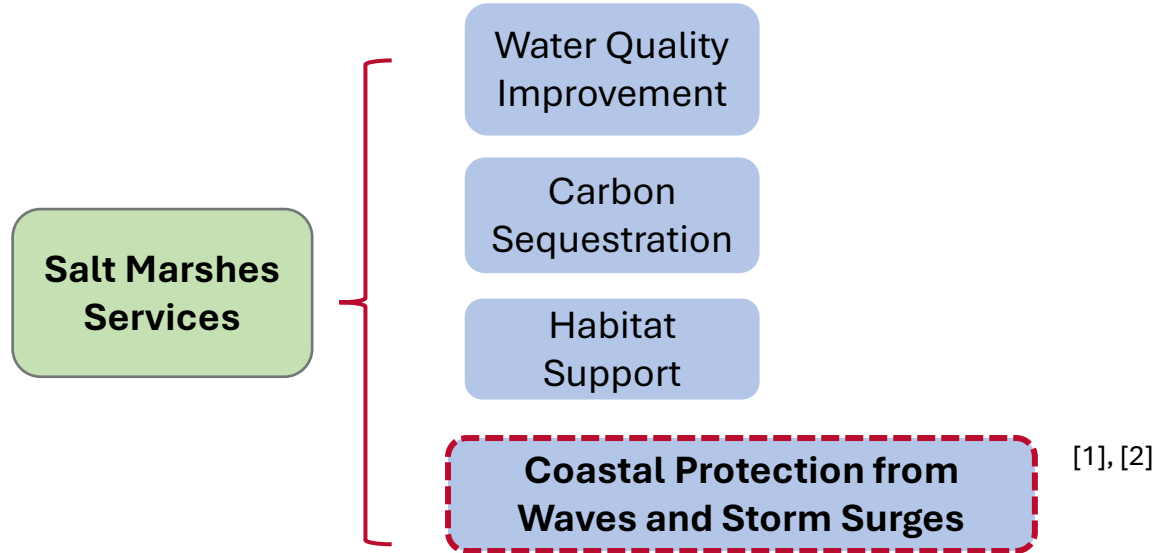
UAV-Based Water Level Sensor Deployment & Elevation Mapping in Coastal Salt Marshes

Ebrahim Hamidian Jahromi - Ph.D. Student, University of Georgia
Aditya Gupta – Ph.D., Research Scientist, University of Georgia
Daniel Coleman – Ph.D., Research Scientist, University of Georgia
C. Brock Woodson – Ph.D., Professor, University of Georgia
Matthew V. Bilskie – Ph.D., Associate Professor, University of Georgia



Groves Creek, Skidaway Island, Georgia

Background:



Complex marsh-tidal creek spatial configuration

Quantifying protection potential requires understanding marsh–creek hydrodynamics

[1] Barbier et al., 2011
[2] Shepard et al., 2011

Study Area:

Groves Creek, Skidaway Island, GA



DEM adapted from Sullivan et al., 2015

- 1.4 km² salt marsh with *Spartina alterniflora*. [3]
- Mean tide range of 2.5 m. [3]
- Mixed, Semidiurnal, ebb dominated tidal regime. [4]
- High-resolution RTK*-derived DEM of the marsh surface.

* Real Time Kinematic

[3] Sullivan et al., 2015 [4] Blanton et al., 2010

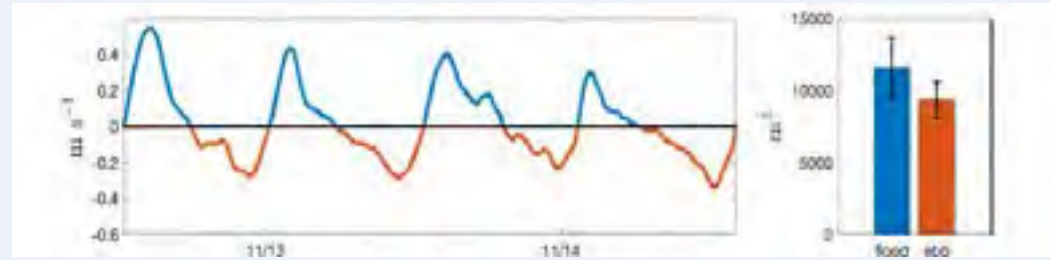
Problem & Objectives:

Previous Field Study:

Studies on Groves Creek

Sullivan (2015, 2019); Alexander (2017)

Observed mean velocity and total volume flux of water
(Woodson, 2014)



The mean difference of **2,246 m³**
over each tidal cycle

“Where does the water go?”

Objectives:



Understanding the complex asymmetrical tidal flows (Requires modeling-+ **field -study**)



Enhancing flood protection design through **natural and nature-based feature (NNBF)** via engineering the marsh tidal creek.

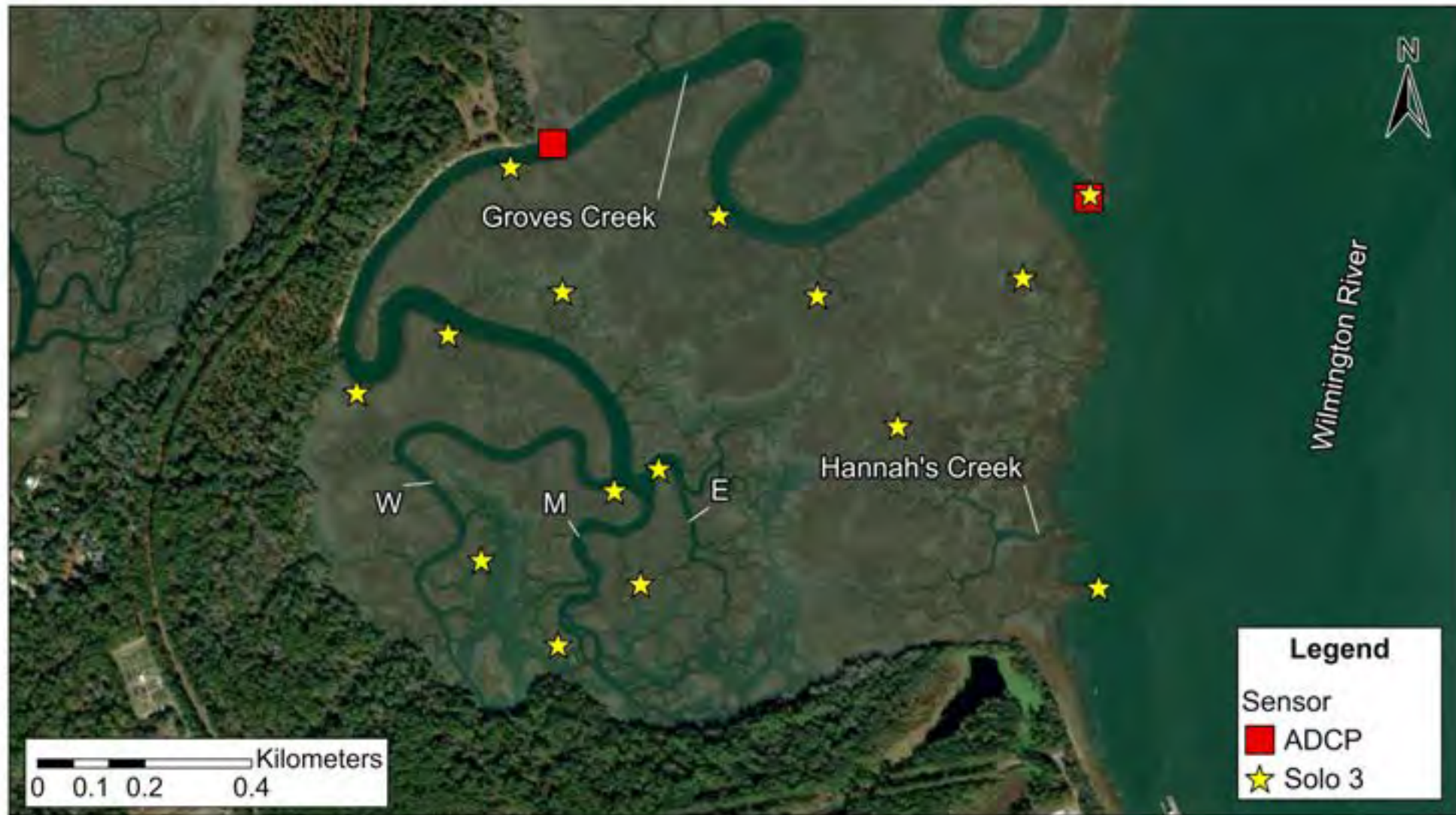
“Can marsh-tidal creek networks be modified to reduce the flood hazard?”



Groves Creek Aerial Footage:





Groves Creek Sensor Deployment Map




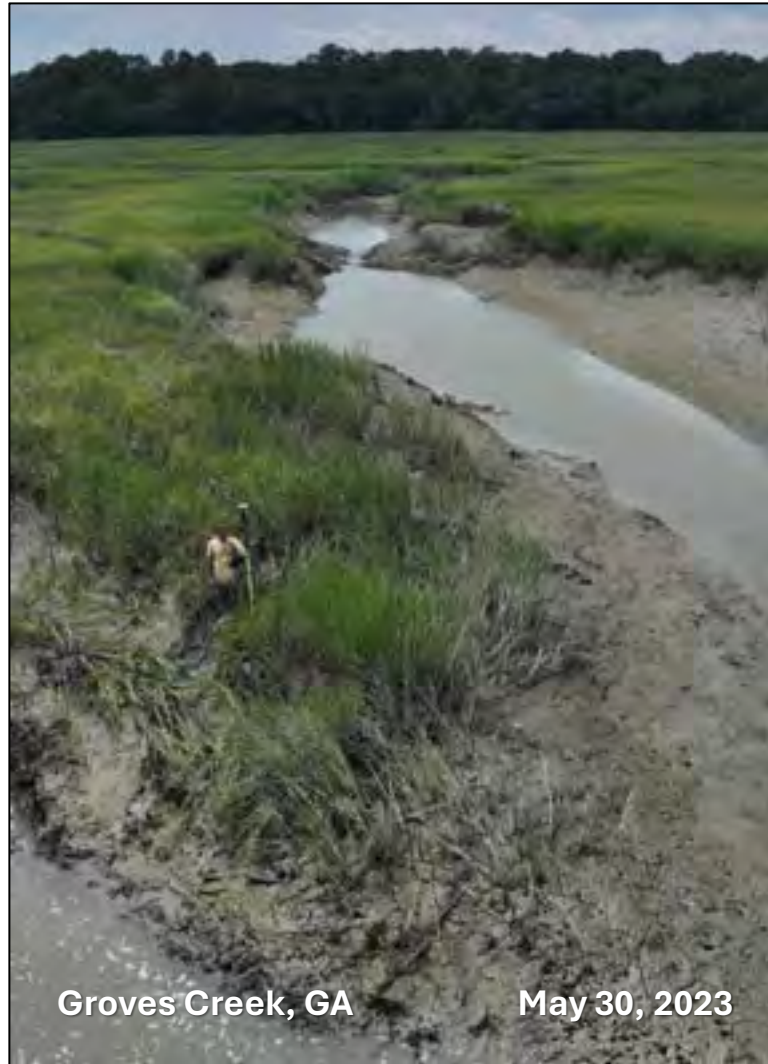
Challenges:

We need to determine the sensors' elevations in real time. Initial approach was using **Trimble DA2 RTK GNSS***, referenced to **NAVD88**.

 Soft, muddy substrate & tall spartina (~4-4.5ft)

 **Tight tidal time window;** limited access on foot

 The need for surveying each site with **Trimble DA2** for NAVD88 elevation is slow at scale.



Groves Creek, GA May 30, 2023

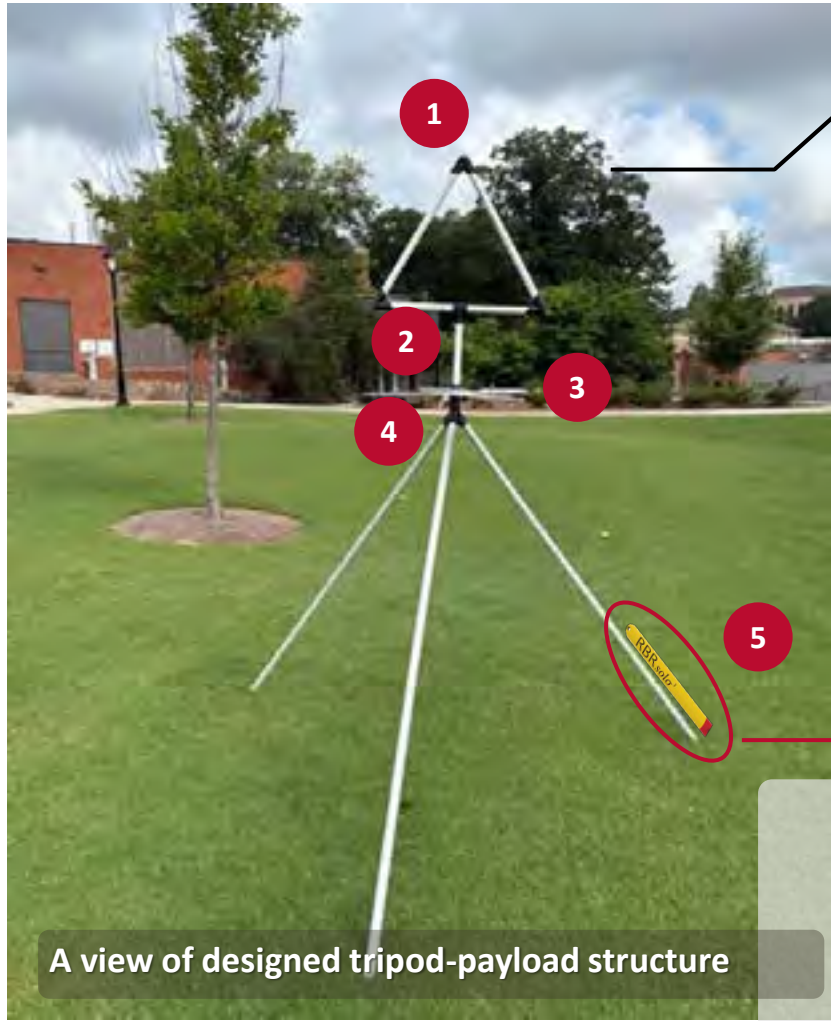


Sep 16, 2025

“Results: sparse coverage, long field days, higher safety risk”

*RTK GNSS: Real-Time Kinematic Global Navigation Satellite System

Methods:



A view of designed tripod-payload structure

NAVD 88

1 Pickup frames

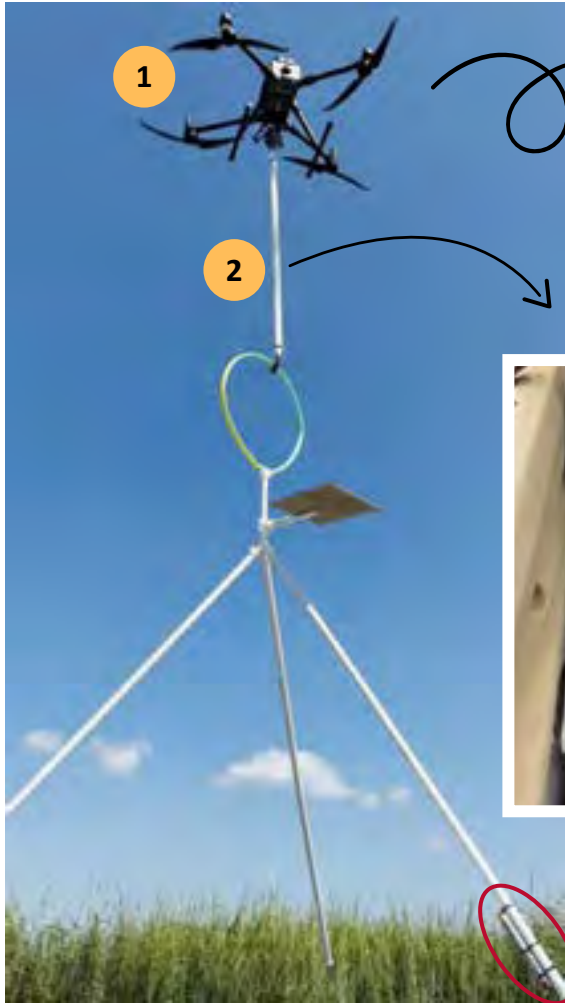
2 Neck

3 Target

4 3D- Printed T-part and Tripod Mount

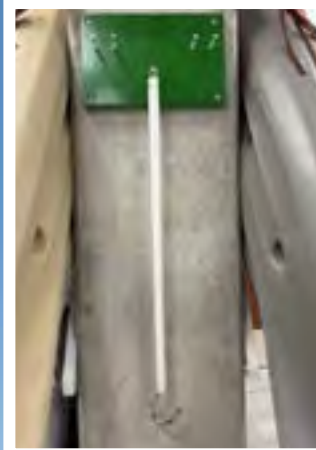
5 Pressure Sensor

Methods:



RBR Solo3

2 The J Hook



1

Deployment UAV:
DJI Matrice 350 RTK



Heavy-lift
(up to 2.7 Kg),
precise
placement/retrieval

3

Mapping UAV:
DJI Mavic 3M
(Multispectral)



**Finding the Sensor
Elevation in the
Marsh**
photogrammetry for
NAVD88 elevations

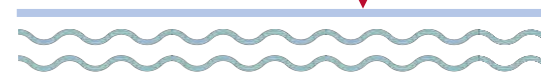


Sensor Elevation ?

Target Elevation

Target Height
Above Ground
Level

NAVD 88



Mavic 3M — For Photogrammetry & Elevation:

- **Purpose**

Derive local DSM elevations at deployment targets to reference pressure sensors to NAVD88

- **Platform/Sensors**

RGB 20 MP + multispectral payload; **RTK-enabled camera positions** (precise image geotags/camera centers)

- **Flight & Image Acquisition**

Altitude: 150 ft AGL

Image geometry: Nadir images [No crosshatch] with high **frontlap/sidelap** ($\geq 80/70\%$)

Patch-based flights centered on sensor stations (not full-marsh coverage)

- **Vertical datum**

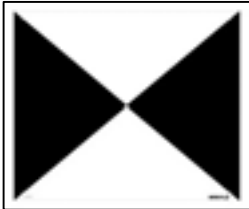
Output: Orthomosaic + DSM* (Pix4Dmapper); read target elevations directly in DSM

RTK GNSS on accessible control; convert ellipsoidal h \rightarrow NAVD88 using GEOID18

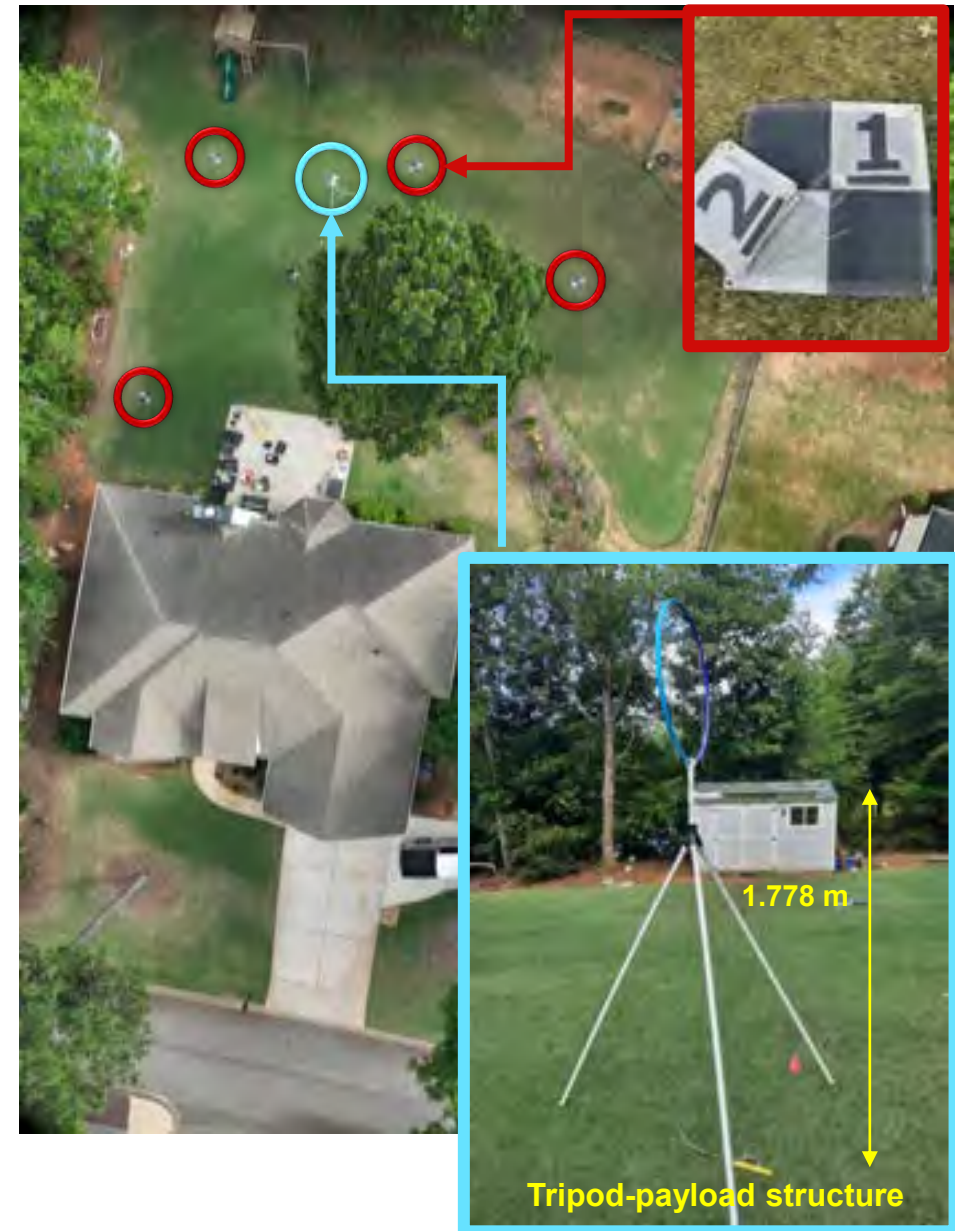
*DSM: Digital Surface Model



UAV Photogrammetry Test:

Target Height above the ground level: 1.778 m			Target	
Vertical Datum: NAVD88 (m)				
RTK Trimble/Ground Elevation (m): 214.26				
Target Elevation (m): 216.038				
Altitude (ft)	12" target DSM elevation (m)	18" target DSM elevation (m)	Avg 12" elevation error	Avg 18" elevation error
100	216.048	216.028	0.002	0.022
150	216.045	216.018	0.004	0.051
200	215.995	215.979	0.061	0.094
250	216.027	215.995	0.038	0.083
300	215.873	215.965	0.255	0.135
Mean Diff			0.072	0.077

12" x 12" target is adequate. 150 ft AGL provides reliable elevation accuracy without sacrificing battery/coverage.



Tropical Storm Debby:

Aug 6, 2024



Field Campaign_Sep 15, 2025:

Sensor Deployment Trip



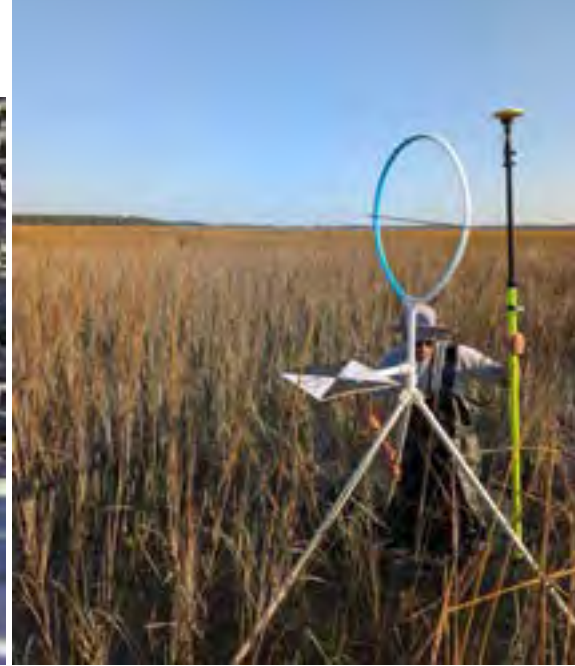
Control Strategy & Field Constraints:

- **Area & logistics:** 1.4 km² basin with **sparse stations** → full-coverage crosshatch missions **not feasible** within tight **tidal time windows/** battery.
- **Access & visibility:** tall **Spartina** + **soft substrate** limit placement of **visible, stable GCPs** across the marsh.
- **Control available:** **RTK control** collection limited to **bluff/firm banks**; only a few additional points elsewhere.
- **Decision:** produce **station-centered photogrammetry patches** rather than a **single basin-wide DEM**.
- **Implication:** **patches** are strong for **local target identification**; **absolute NAVD88 elevations** are most **defensible** where control is nearby.



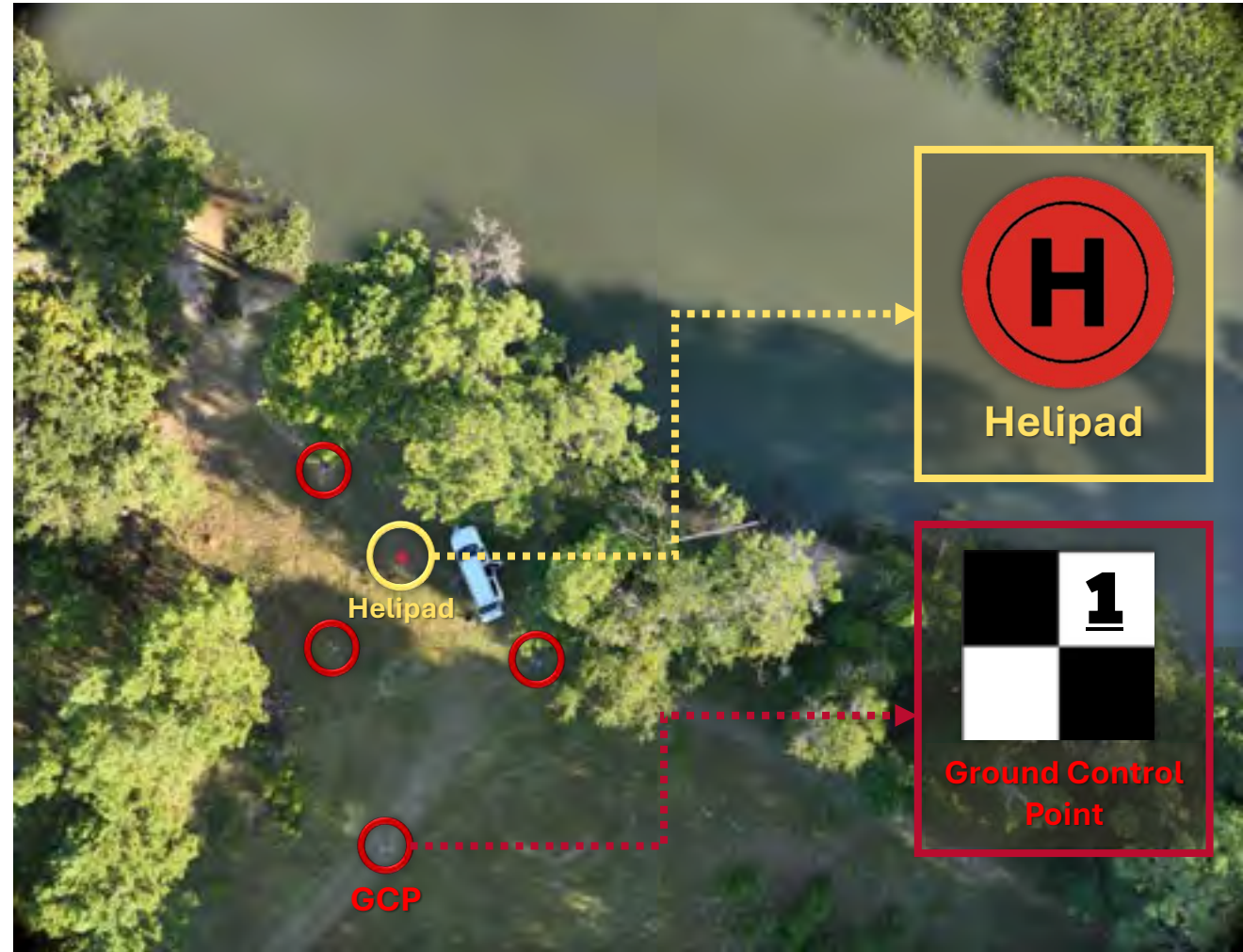
Field Campaign_ Nov 18, 2025:

Sensor Retrieval Trip

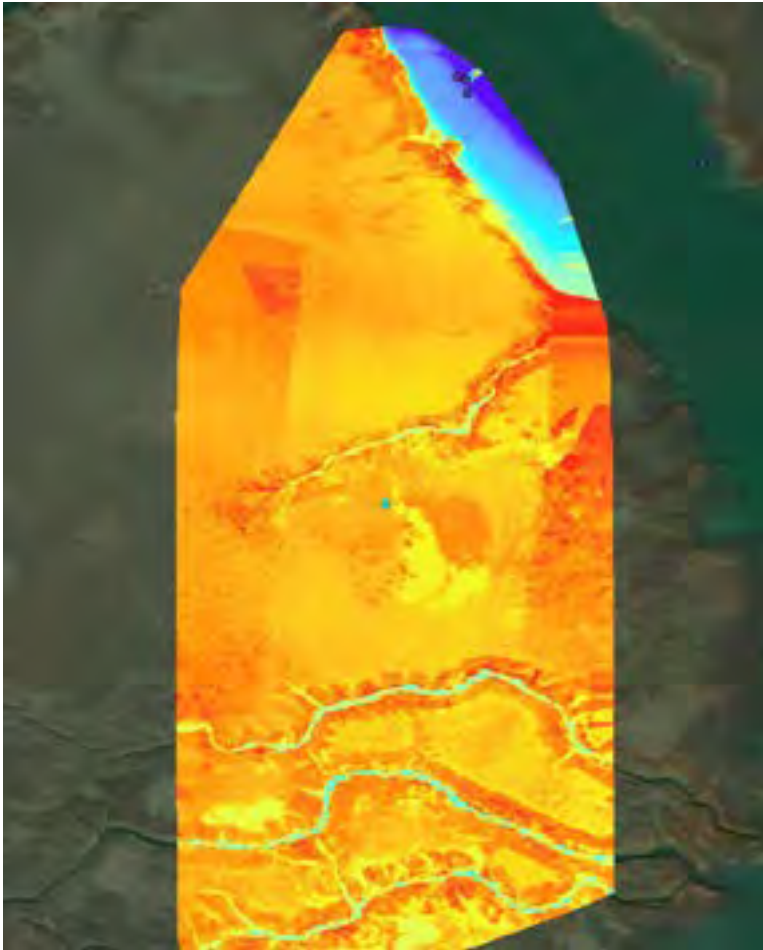


Processing (Pix4Dmapper):

- **Inputs: imagery + RTK camera positions;**
GCPs where available (NAVD88 via GEOID18)
- **Aerial triangulation:** align photos + bundle adjustment (optimize camera model)
- **Georeference:** apply GCP constraints; re-optimize
- **Products:** dense point cloud → **DSM + orthomosaic**
- **Extraction:** pick DSM Z at each sensor target / tripod reference point
- **QC to report:** reprojection error + RMSE (X,Y,Z), etc



Results [Photogrammetry]:



DSM

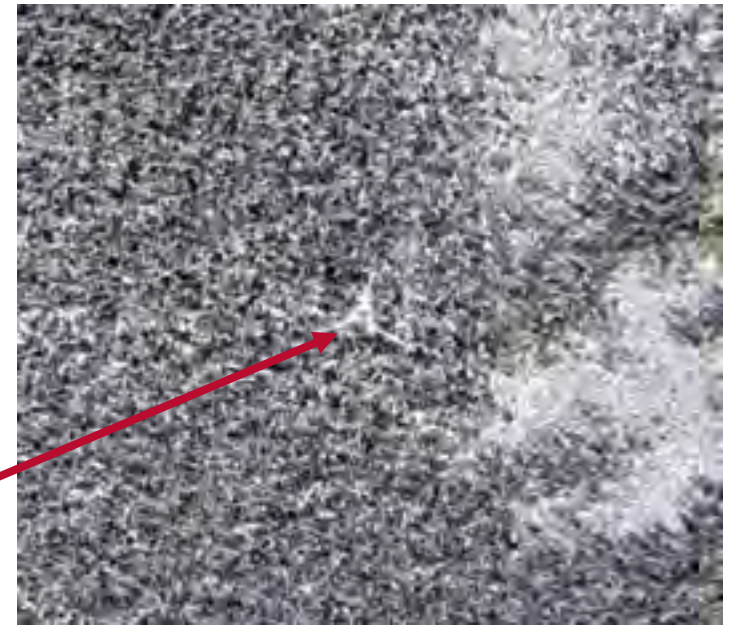
Average GSD*

1.68 cm



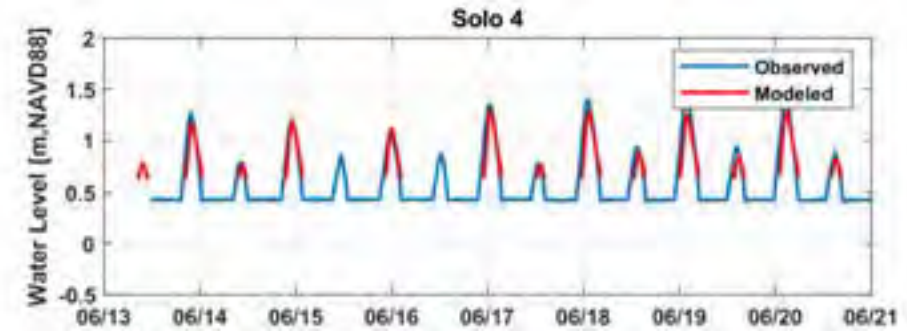
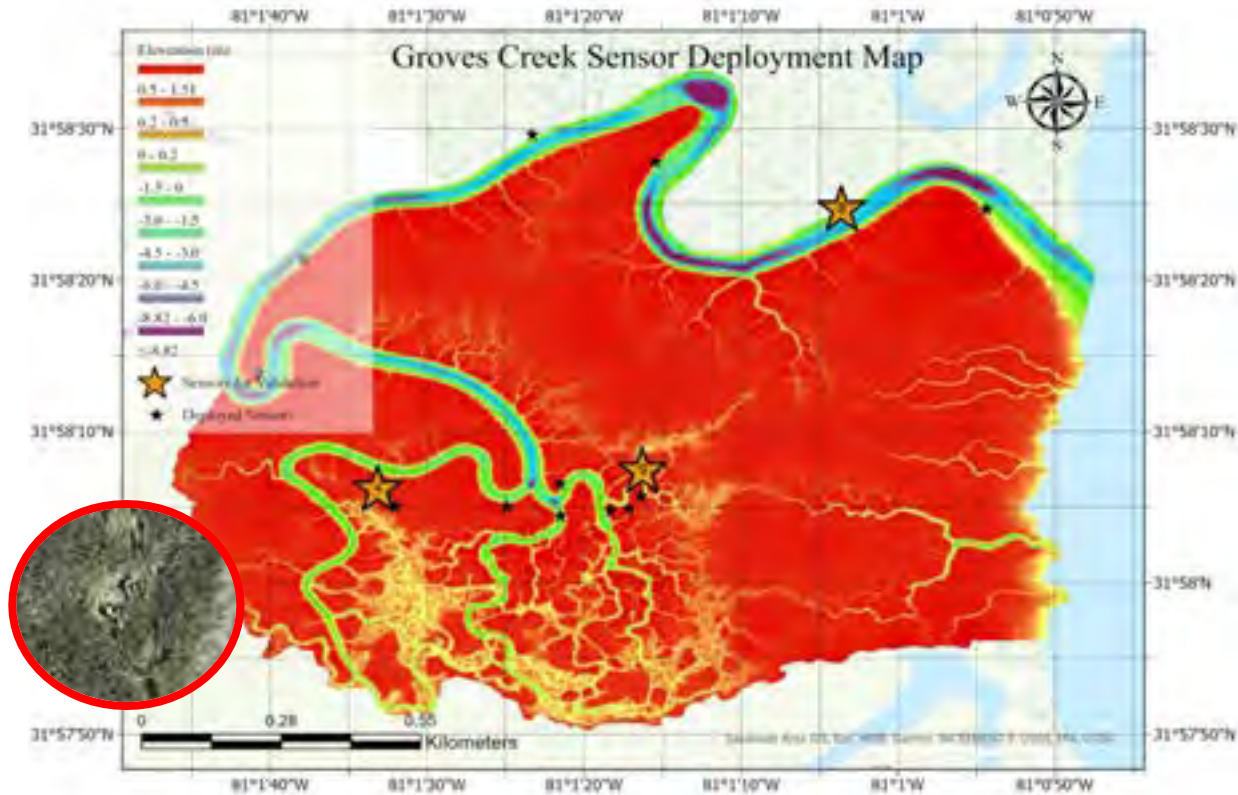
Orthomosaic

Mean reprojection error: 0.144 pixels (bundle adjustment quality indicator)

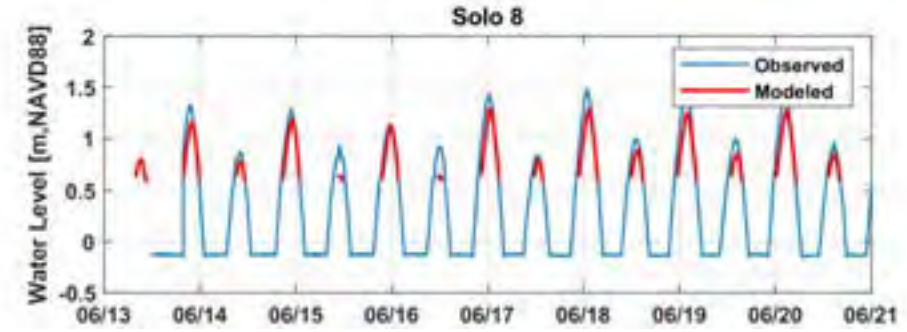


Modeling:

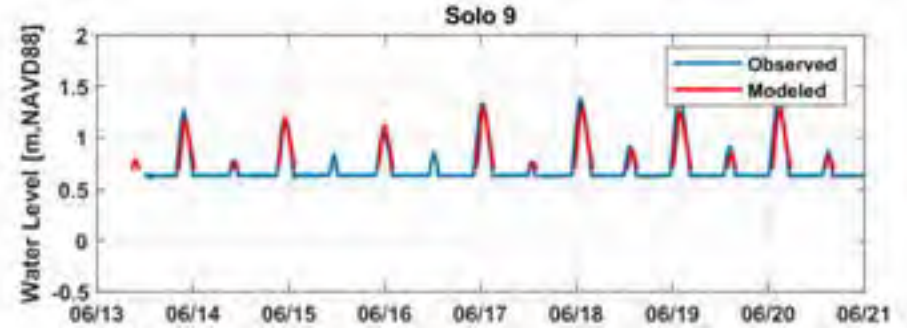
- ✓ High-resolution mesh (<10 m) developed for GC → Integrated into the SAB mesh
- ✓ Forcing: Tides (TPXO) + Wind/Pressure (ECMWF ERA5 Reanalysis)



RMSE = 0.3696



RMSE = 0.1658



RMSE = 0.4767

Lessons & Future Work:

Learned Lessons:

- ❖ **Mounting:** Place RBR Solo3 sensors low on the tripod leg close to the target, to reduce the chance of the sensor being dry if the tripod topples.
- ❖ **Visibility:** Paint tripod structures to high visibility (fluorescent/hot pink) for rapid detection in marsh vegetation.
- ❖ **Displacement check:** Run a UAV survey immediately after deployment and again before retrieval to detect any prototype movement.
- ❖ **Avoiding storm season** (if possible)

Future Work:

- ❖ **Tripod stability:** Improving the stability of the tripod-payload-structure (e.g. adding holes to the legs at certain level which can be filled by the flood tide)
- ❖ **Higher-accuracy vertical control:** Use LiDAR to strengthen elevation products where GCP access is limited and to validate photogrammetry-derived NAVD88 heights.

Thank You for Your Attention!



Acknowledgment

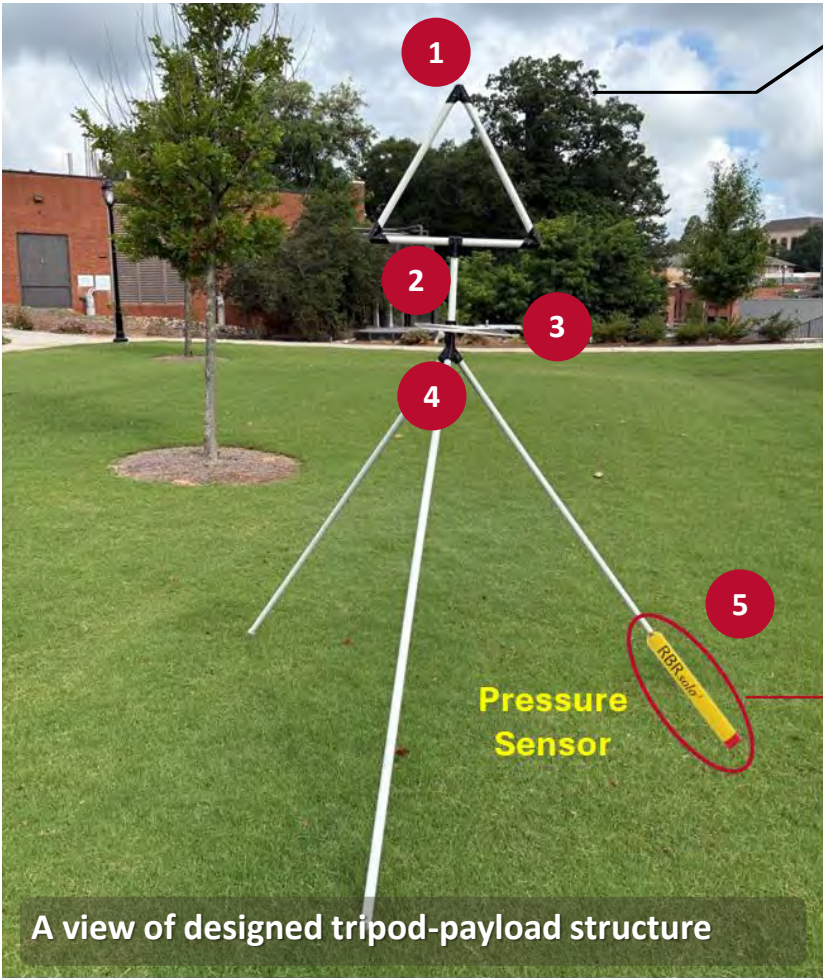


References:

- [1] Barbier, E. B., Hacker, S. D., Kennedy, C., Koch, E. W., Stier, A. C., & Silliman, B. R. (2011). The value of estuarine and coastal ecosystem services. *Ecological monographs*, 81(2), 169-193.
- [2] Shepard, C. C., Crain, C. M., & Beck, M. W. (2011). The protective role of coastal marshes: a systematic review and meta-analysis. *PloS one*, 6(11), e27374.
- [3] Sullivan, J. C., Torres, R., Garrett, A., Blanton, J., Alexander, C., Robinson, M., ... & Hayes, D. (2015). Complexity in salt marsh circulation for a semienclosed basin. *Journal of Geophysical Research: Earth Surface*, 120(10), 1973-1989.
- [4] Blanton, J. O., Garrett, A. J., Bollinger, J. S., Hayes, D. W., Koffman, L. D., Amft, J., & Moore, T. (2010). Transport and retention of a conservative tracer in an isolated creek-marsh system. *Estuarine, Coastal and Shelf Science*, 87(2), 333-345.



Methods:



A view of designed tripod-payload structure

NAVD 88

1 Pickup frames

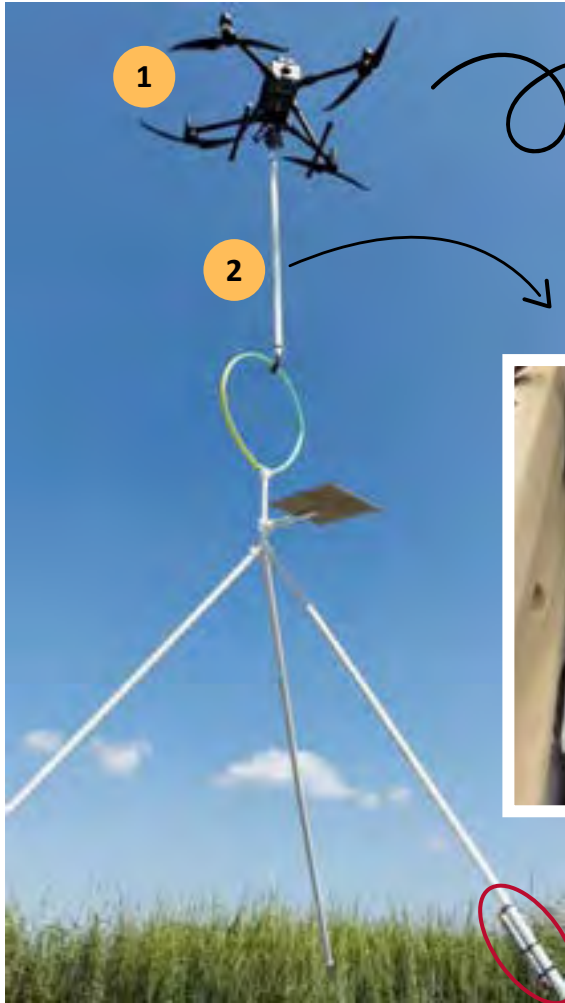
2 Neck

3 Target

4 3D- Printed T-part and Tripod Mount (5- 6' PVC legs)

5 Pressure Sensor

Methods:



RBR Solo3


1

Deployment UAV:
DJI Matrice 350 RTK

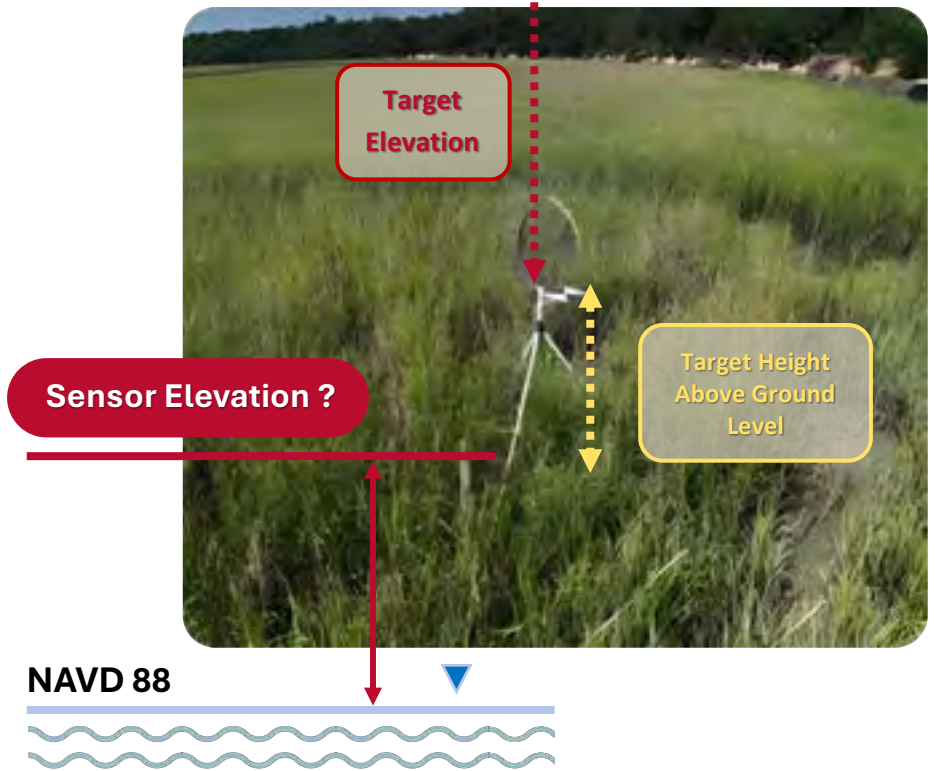
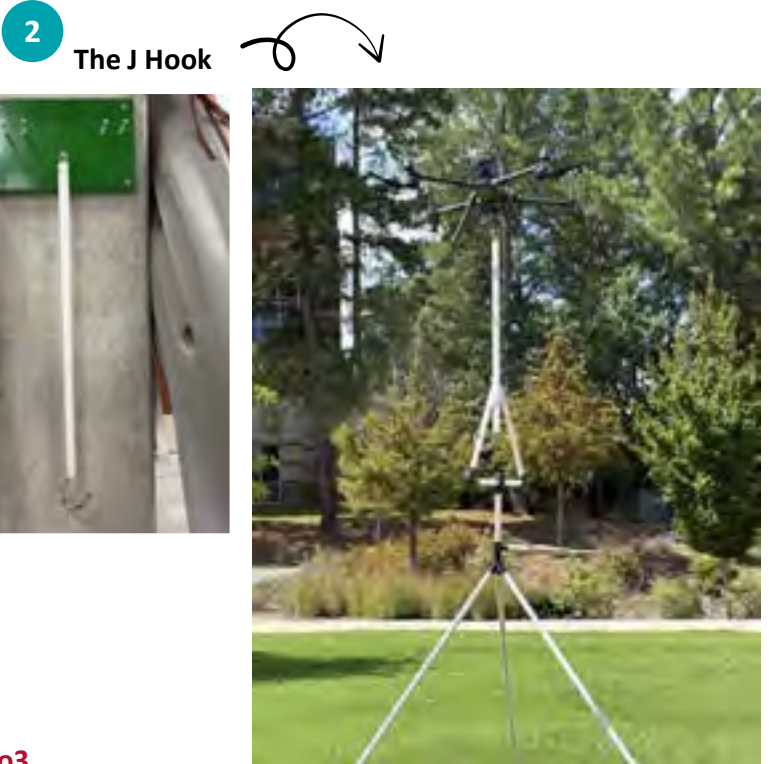


Heavy-lift
(up to 2.7 Kg),
precise
placement/retrieval

Mapping UAV:
DJI Mavic 3M
(Multispectral)



**Finding the Sensor
Elevation in the
Marsh**
photogrammetry for
NAVD88 elevations





**NOAA
FISHERIES**

Southeast
Fisheries
Science Center

Using Uncrewed Aircraft Systems (UAS) to Study Protected Species

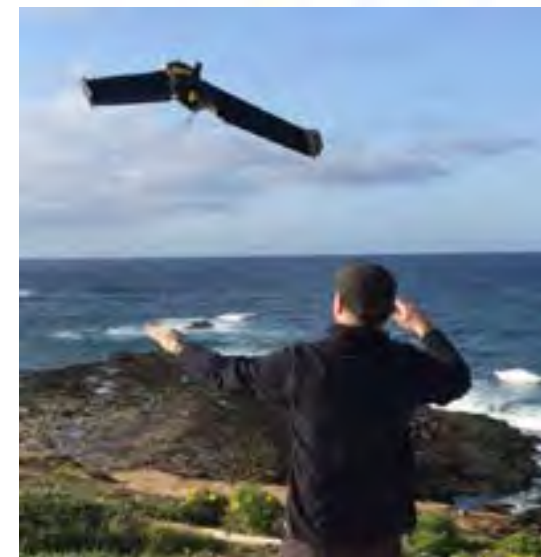
Melissa Cook¹ and Trevor Joyce²

¹Southeast Fisheries Science Center

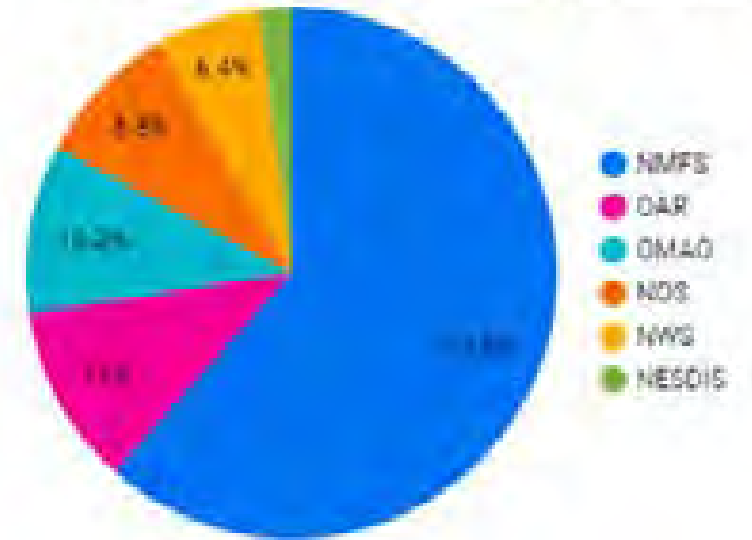
²Southwest Fisheries Science Center

NOAA Fisheries | U.S. Department of Commerce

NOAA Uses a Variety of UAS



Percent of Flight Time by Line Office



Southeast Fishery Science Center UAS

- Green sea turtle abundance
- Sperm whale photogrammetry & body condition
- Tagging marine mammals using small UAS



Green Sea Turtle Abundance (SEFSC & SWFSC)

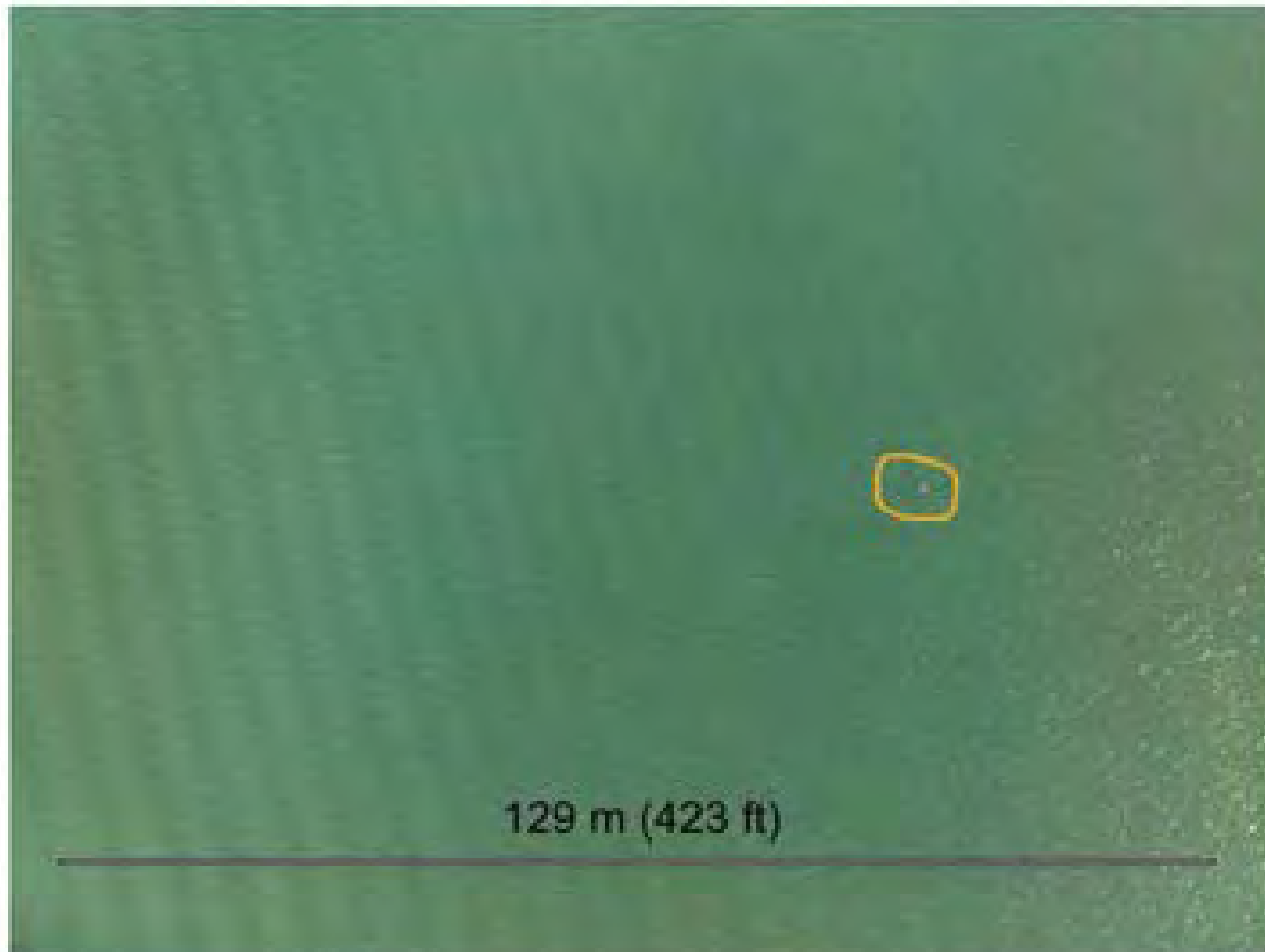
- San Diego Bay, CA
 - 5 surveys completed
 - 8.2 km² - flying 300 ft



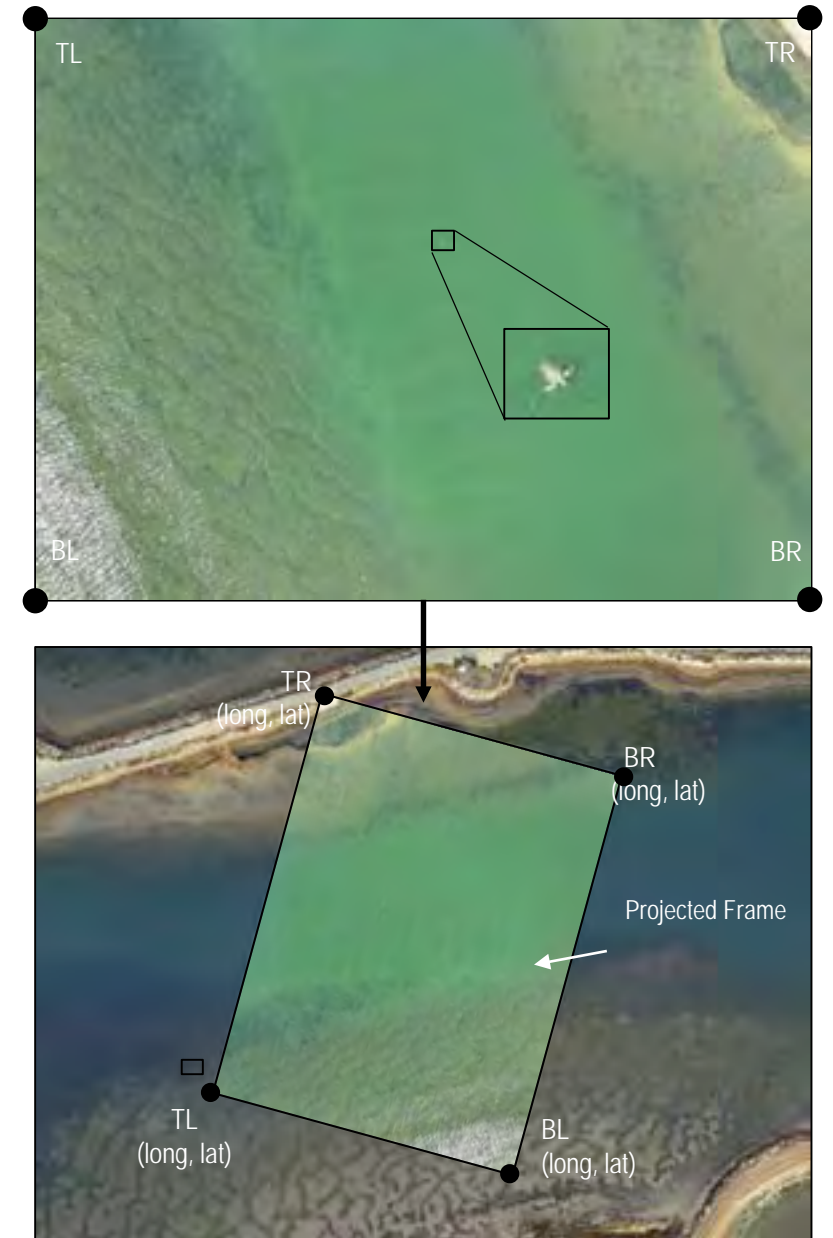
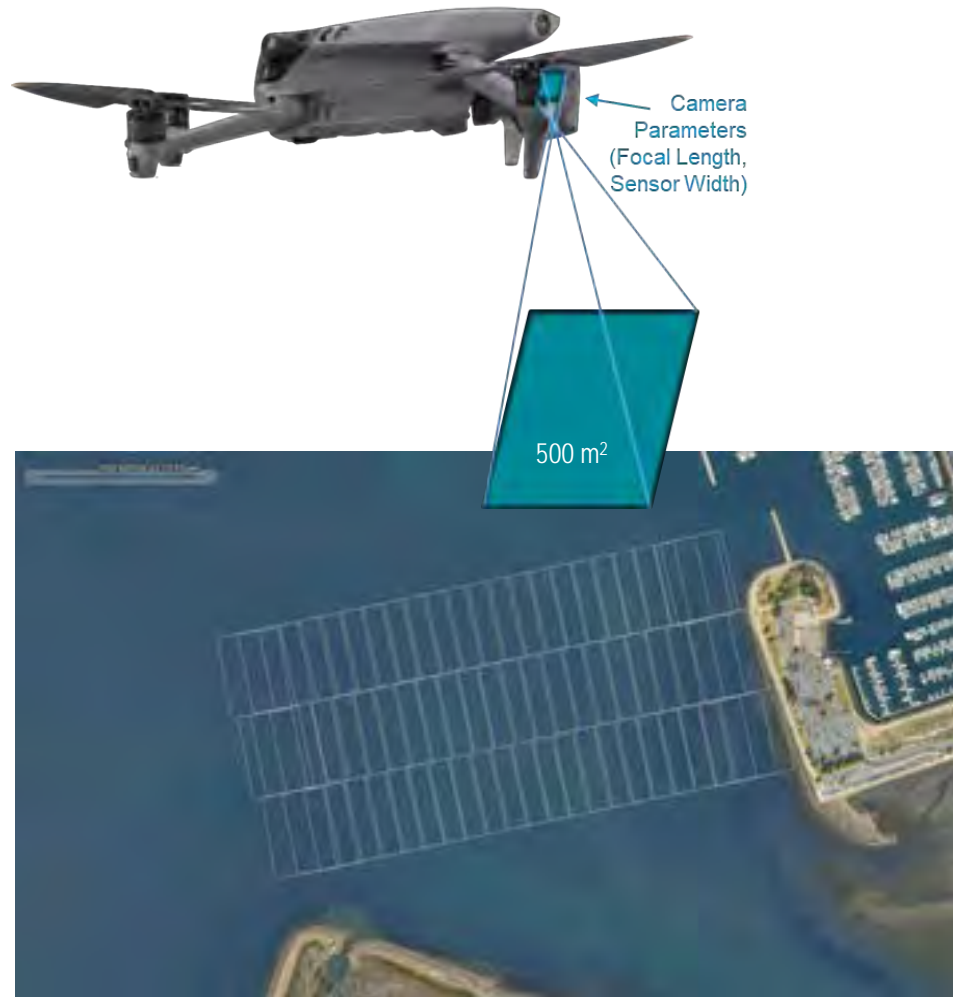
Examples of Images (300 ft altitude)



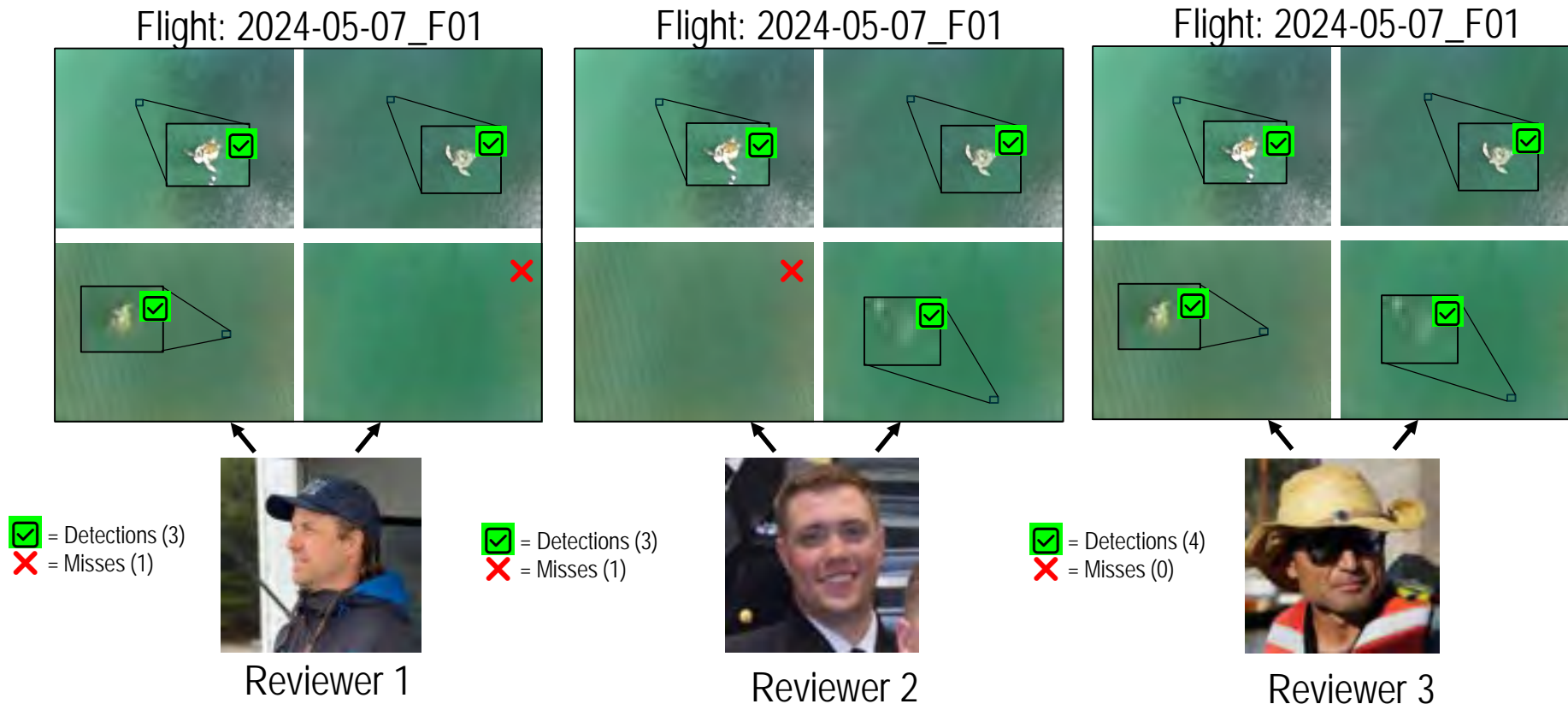
Green Sea Turtle Abundance - SDB



How do we estimate abundance?



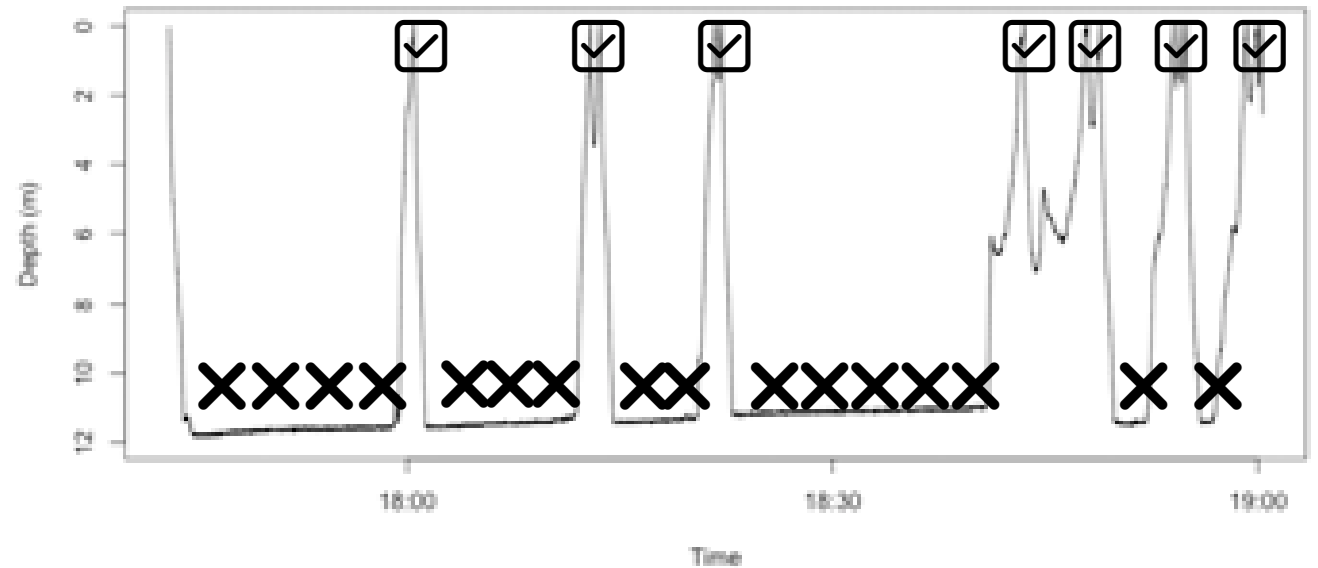
Multiple reviewers look for turtles



Green Turtle UAS Detections

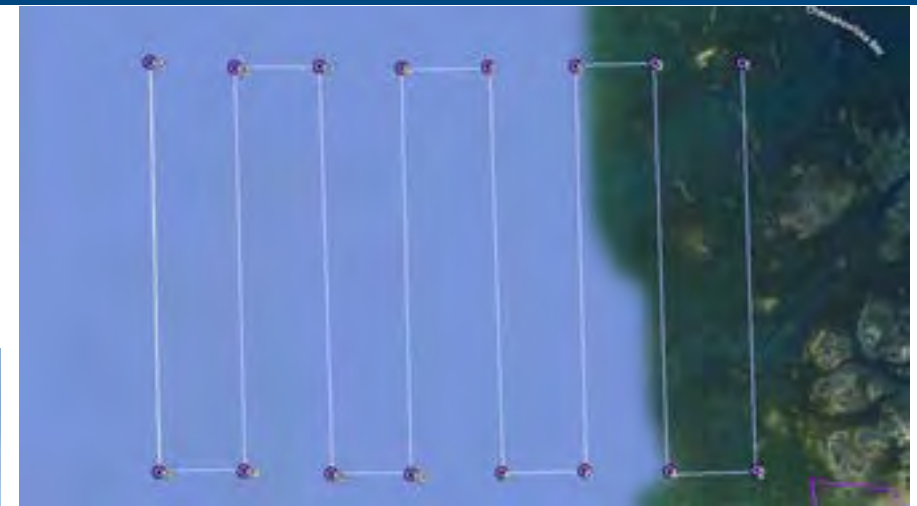


Sea Turtle Captures

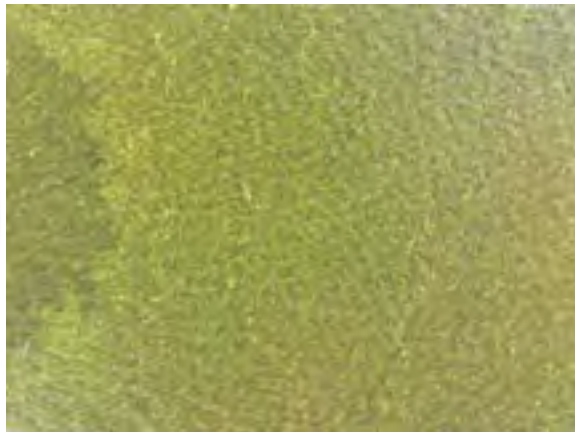
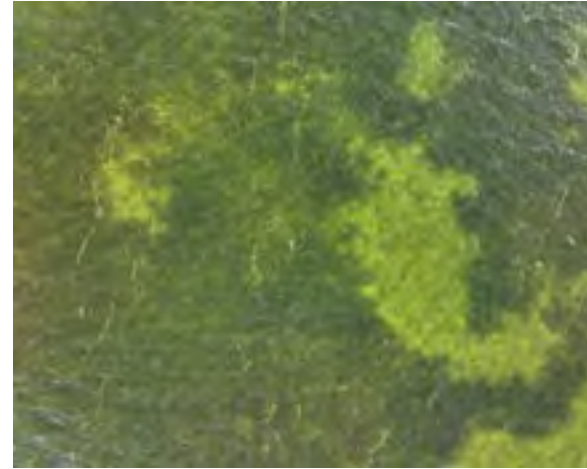
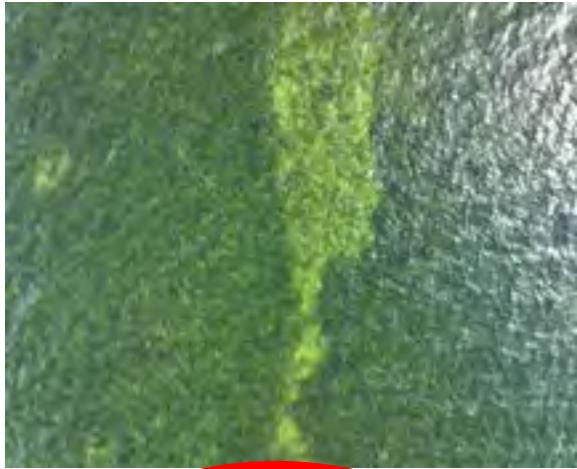


Green Sea Turtle Abundance (SEFSC & SWFSC)

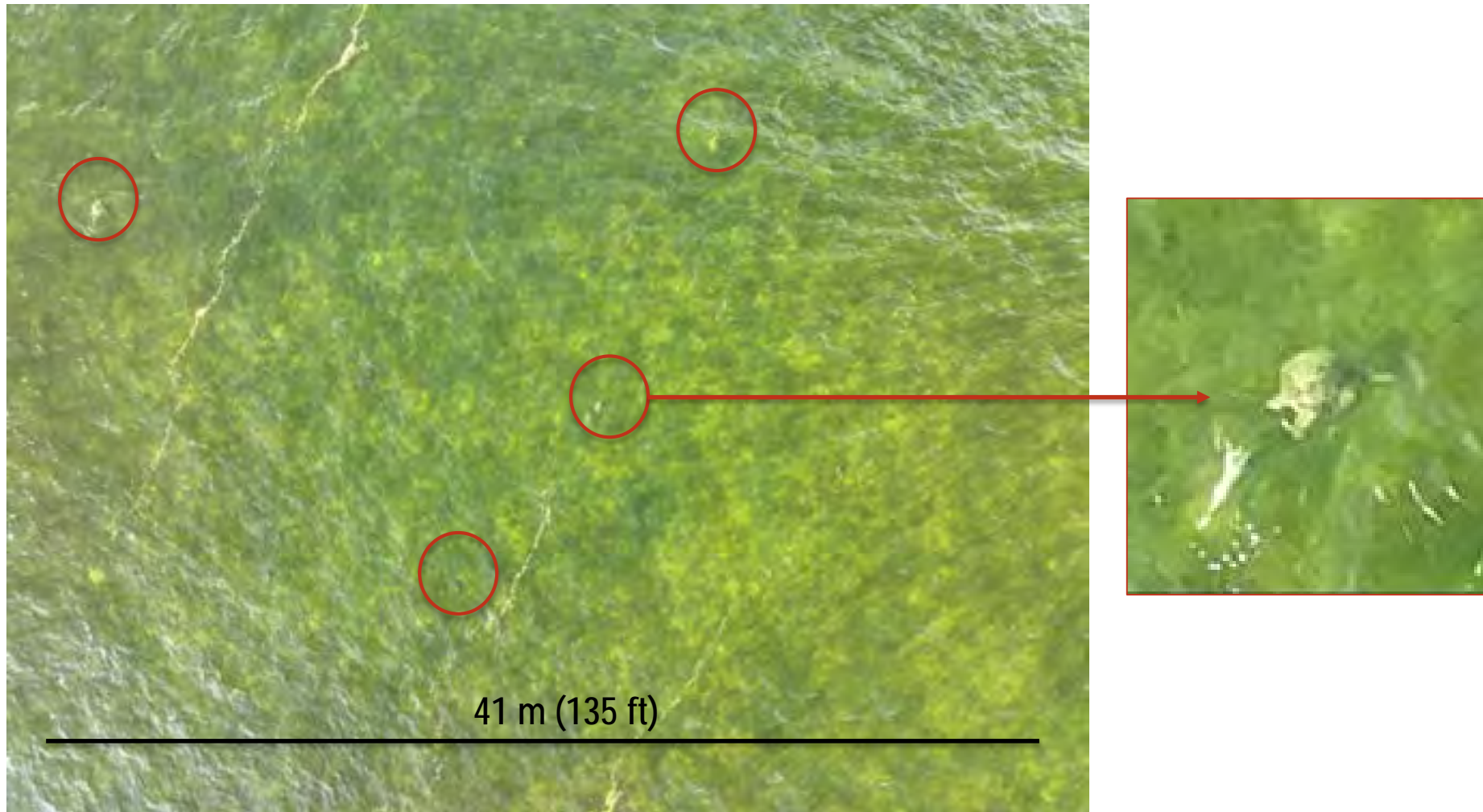
- Chassahowitzka Bay, FL
 - 1 trip, 2 replicates
 - 40 km line transect - flying 100 ft
 - VO vs UAS



Examples of Images (100 ft altitude)

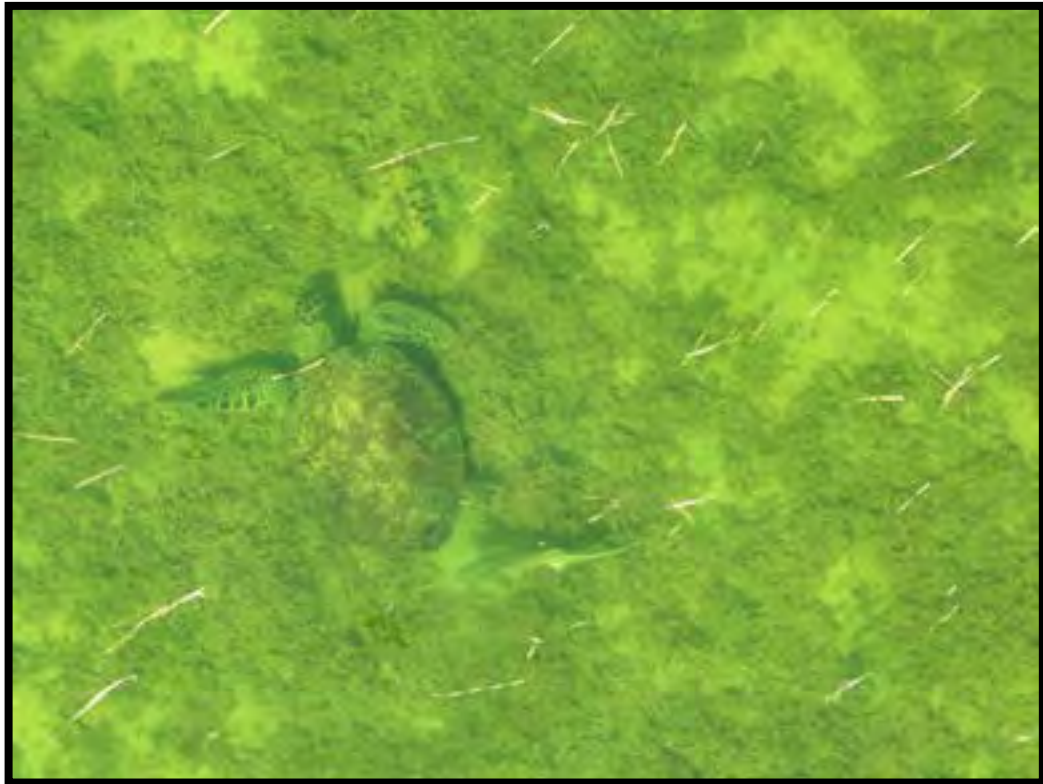


Preliminary Results: Multiple turtles observed in an image



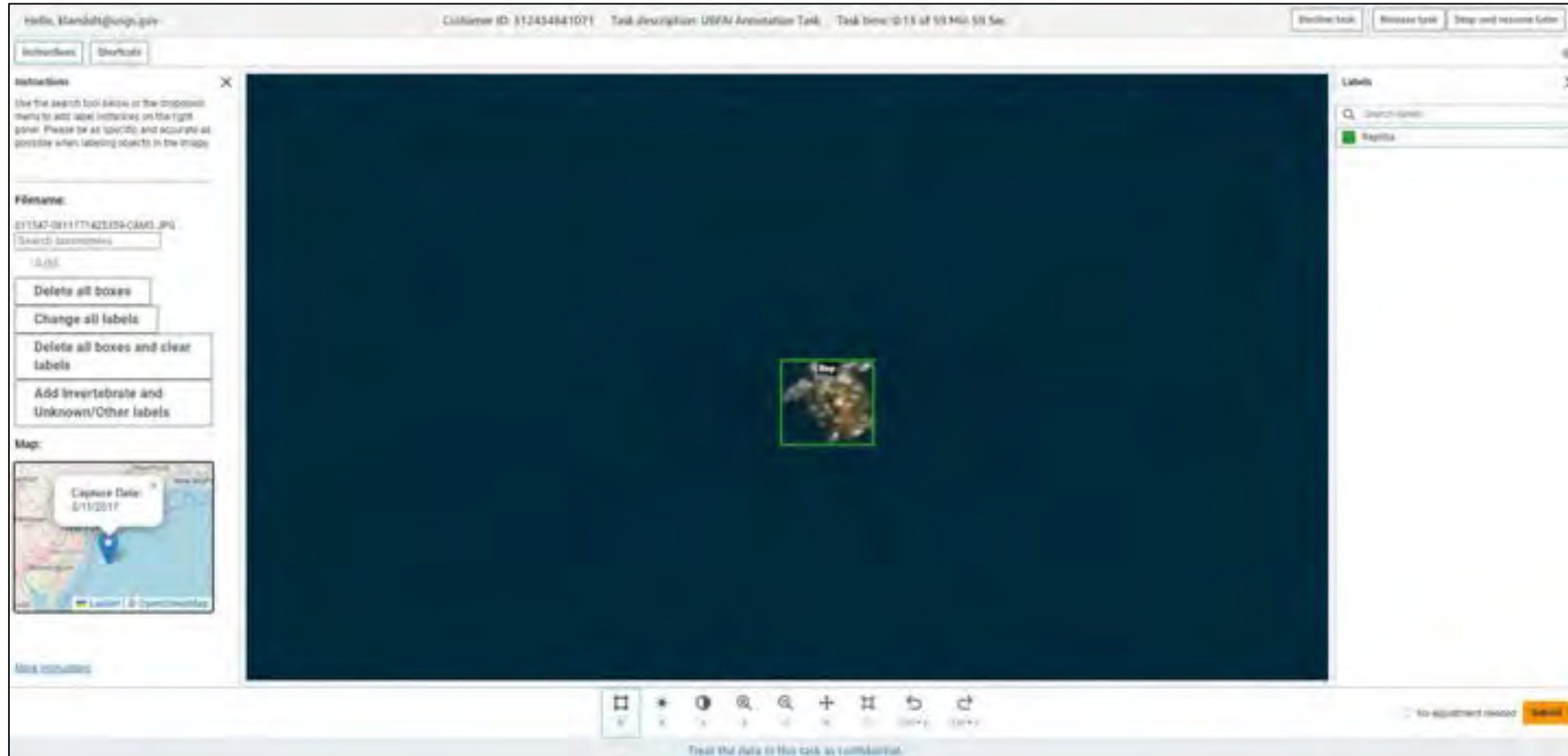
Data Collected:

- 37 UAS flights completed over 5 days
- 19 transect lines surveyed
- 4,172 images captured
- 29 videos (~75 minutes) collected

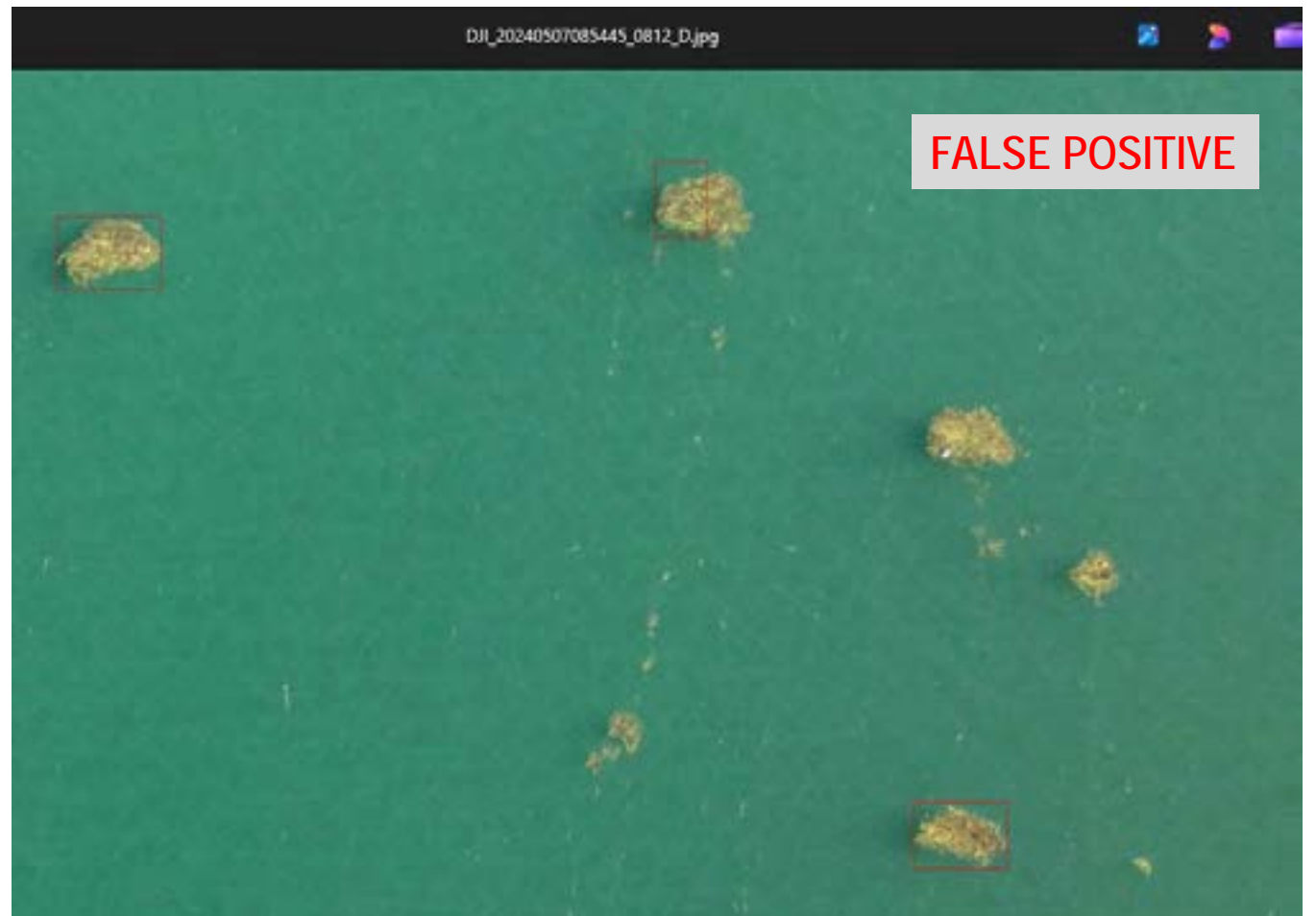
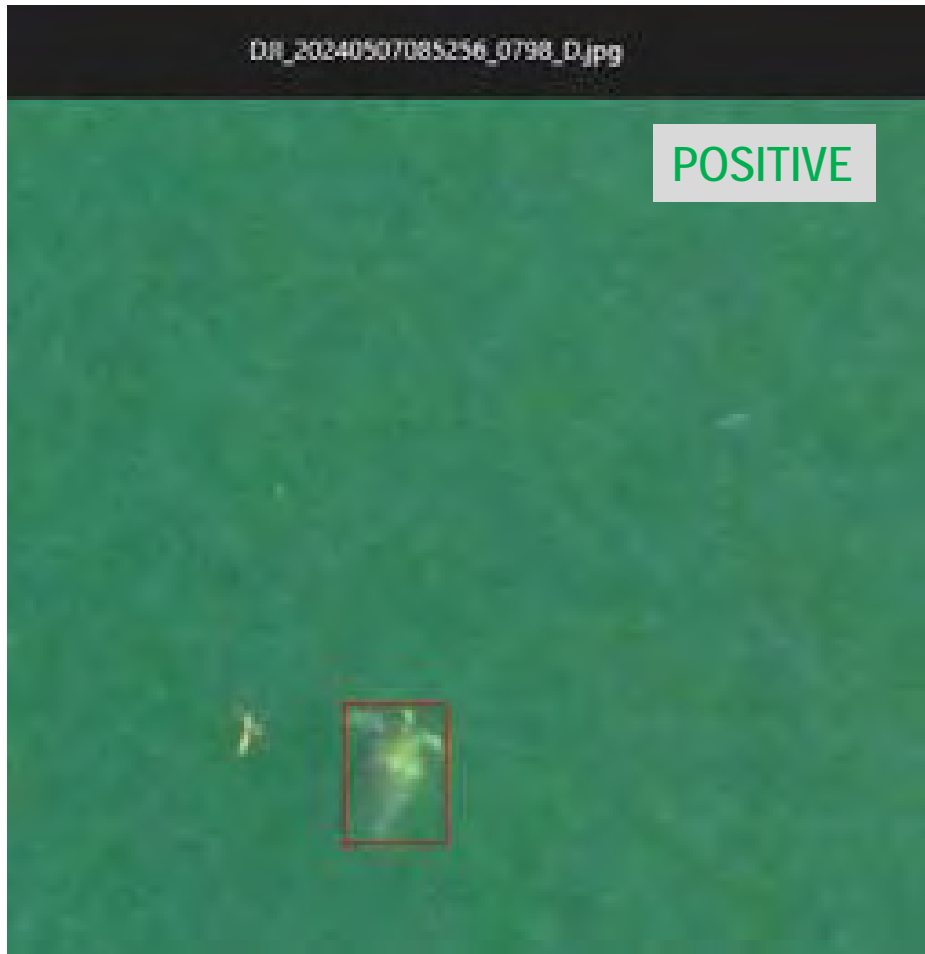


Artificial Intelligence (AI) turtle detection: USGS

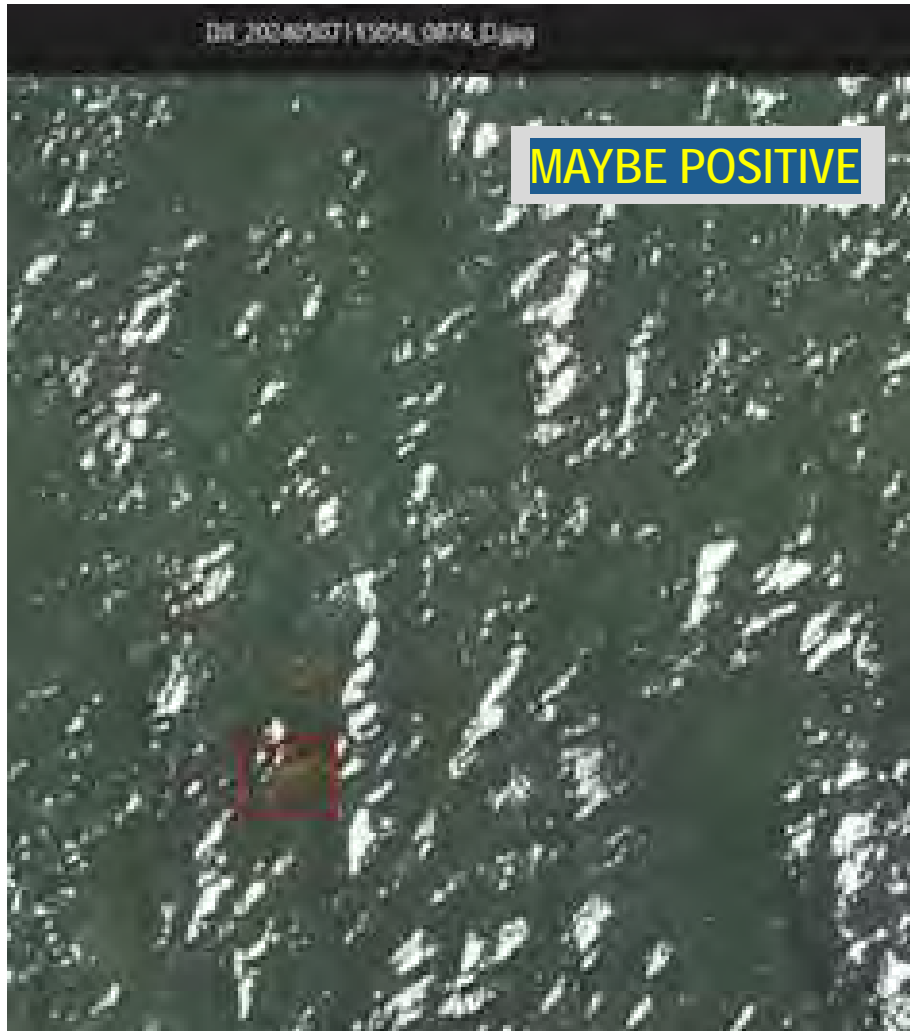
USGS AI Aerial Survey Tool (based on YOLO algorithm)



Artificial Intelligence (AI) turtle detection

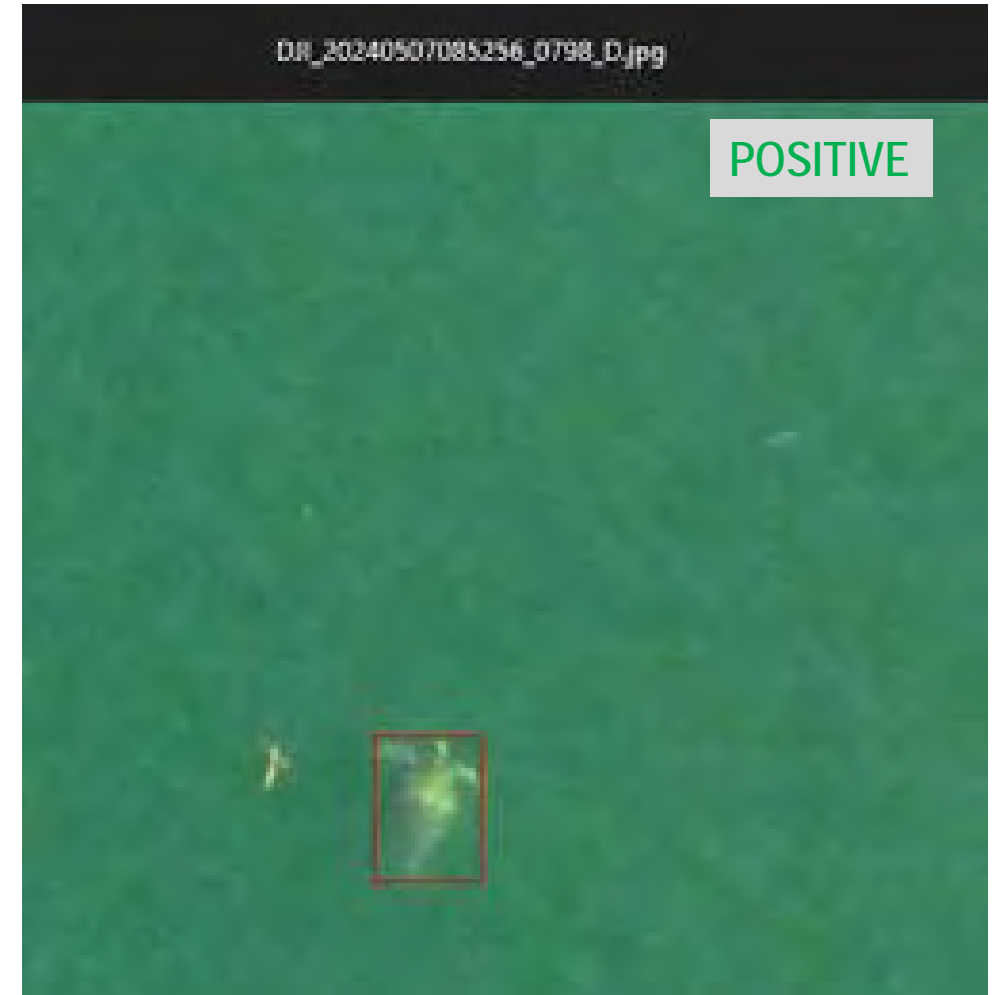


Artificial Intelligence (AI) turtle detection



AI vs Reviewer turtle detections: Results

- 1,386 Images
- 20 Reviewer Detections
- 80 AI Detections
 - 5 Actual turtles
- **AI missed 15 turtles**



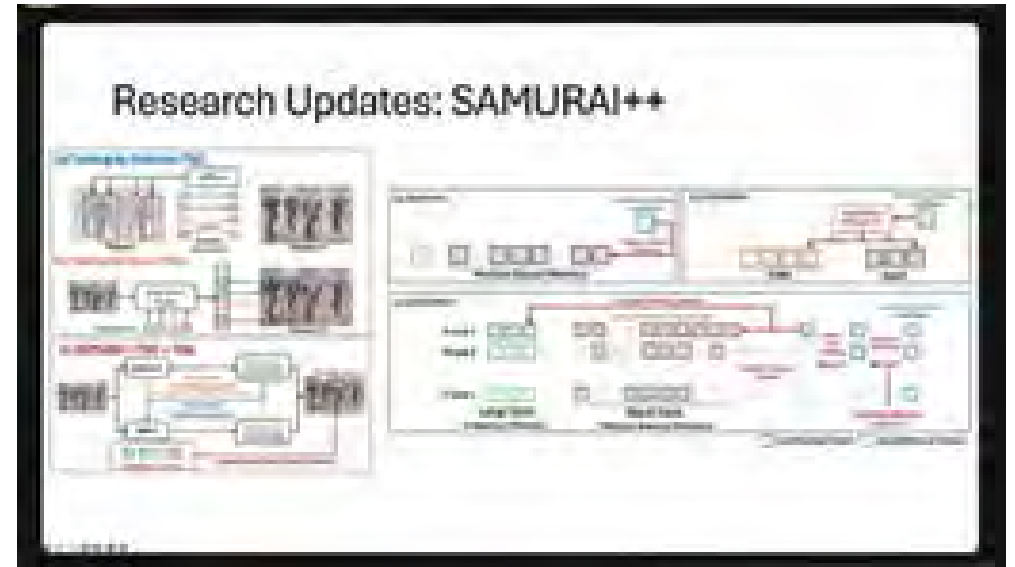
AI turtle detection: University of Washington

IDEA-Research/ GroundingDINO

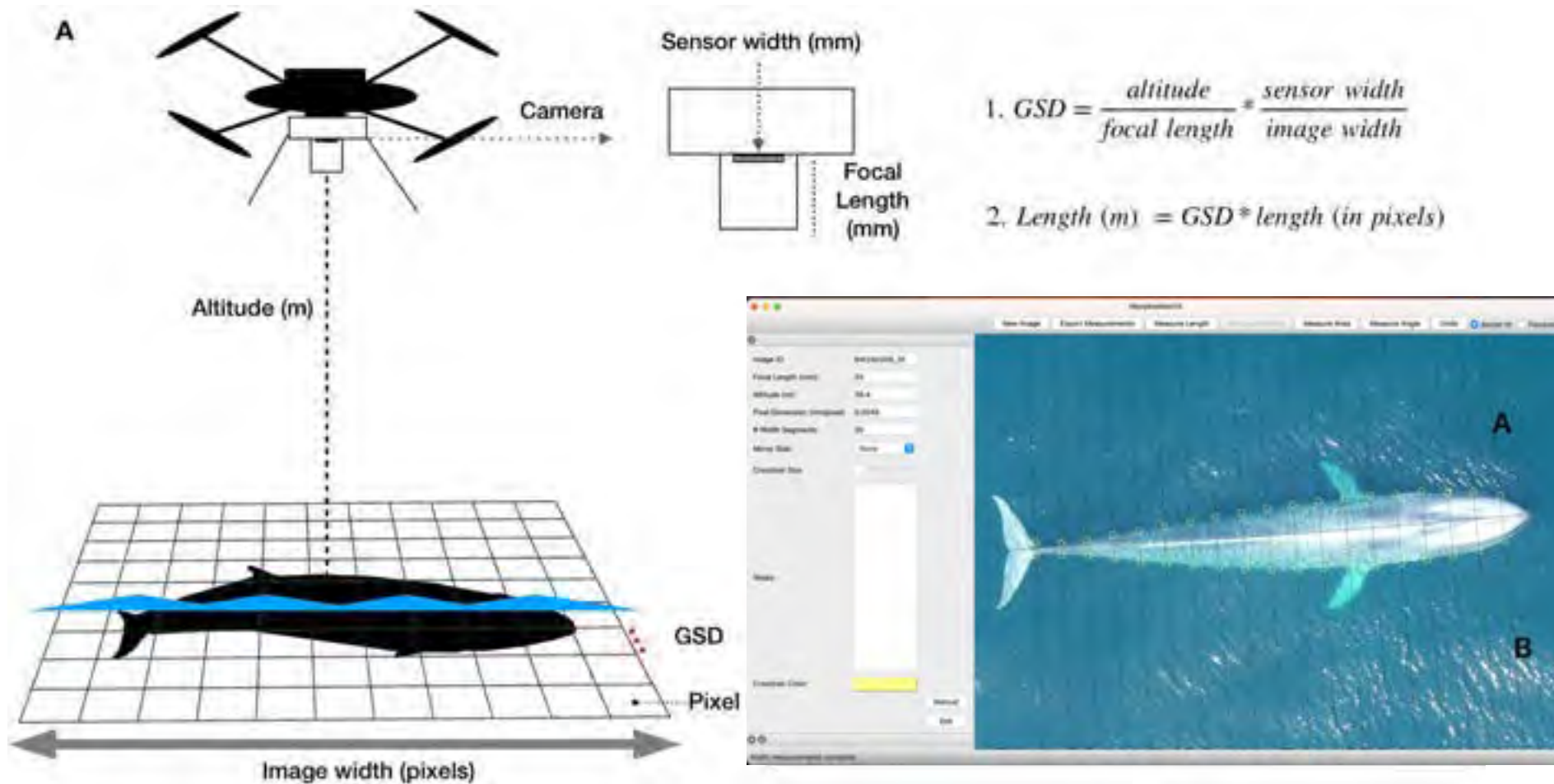


[ECCV 2024] Official implementation of the paper
"Grounding DINO: Marrying DINO with Grounded
Pre-Training for Open-Set Object Detection"

26 Contributors 125 Used by 10 Discussions 9k Stars 888 Forks

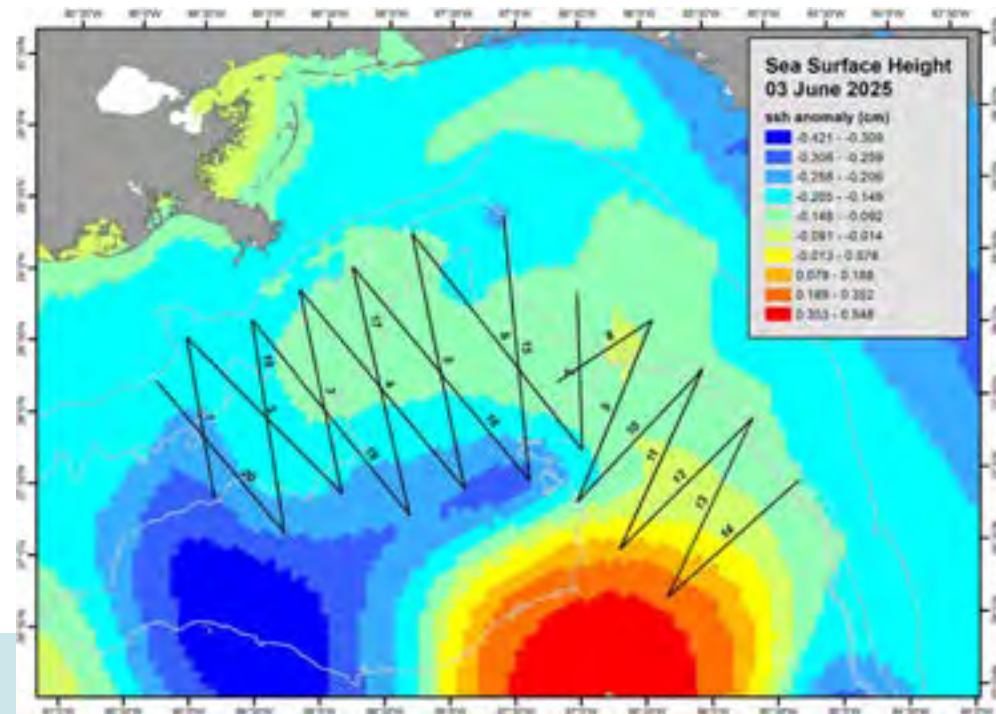


Marine Mammal Photogrammetry & Body Condition



Credit: Torres & Bierlich (2020)

2025 Summer Sperm Whale Survey



N Mode In flight

92 35'07" RC 28

AJ



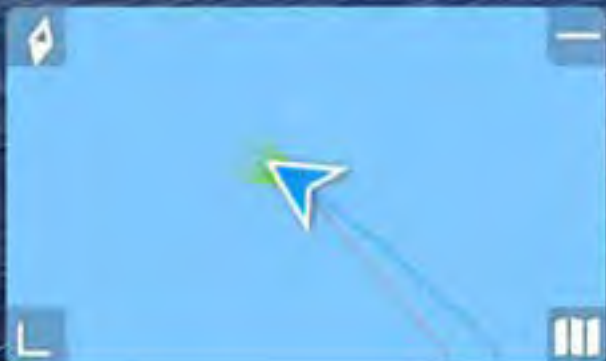
7

3

1x

AF

00:57



0.3m/s 13.6m/s
H 47m D 859m

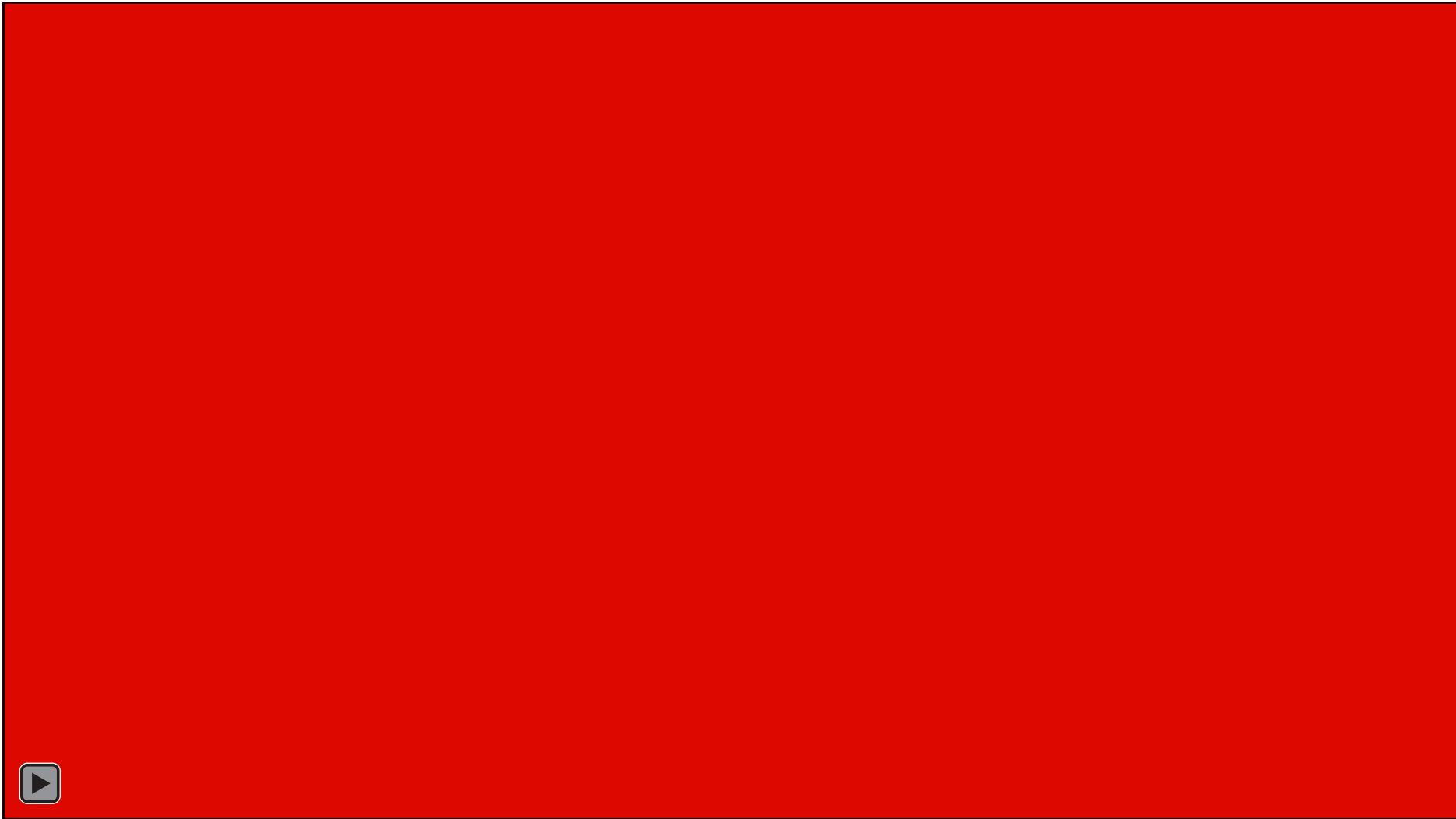
5.1K 24 02:24:30 S 1/640 F 2.8
Norm. WB 6200K^A ISO 140^A EV 0.0 PRO

Example Images for Photogrammetry



Using UAS to Tag Rice's Whales





[NOAA Fisheries and partners got an up-close look at the life of endangered Rice's whales by using drones to deploy suction cup tags. Credit: NOAA Fisheries/Ocean Alliance \(Permit #21938\)](#)



What's Next in 2026?

- NOAA's ASDA "covered UAS" waiver extended until Sept 30, 2027
- April-Jun sea turtle UAS in SDB & Chassahowitzka, FL
- June – July Rice's whale survey w/ UAS component
 - Photogrammetry
 - Suction cup tag deployment
 - Blow sampling (AKA Snot bot)
- Development of Freely Astro suction cup tagging & training

Questions?

