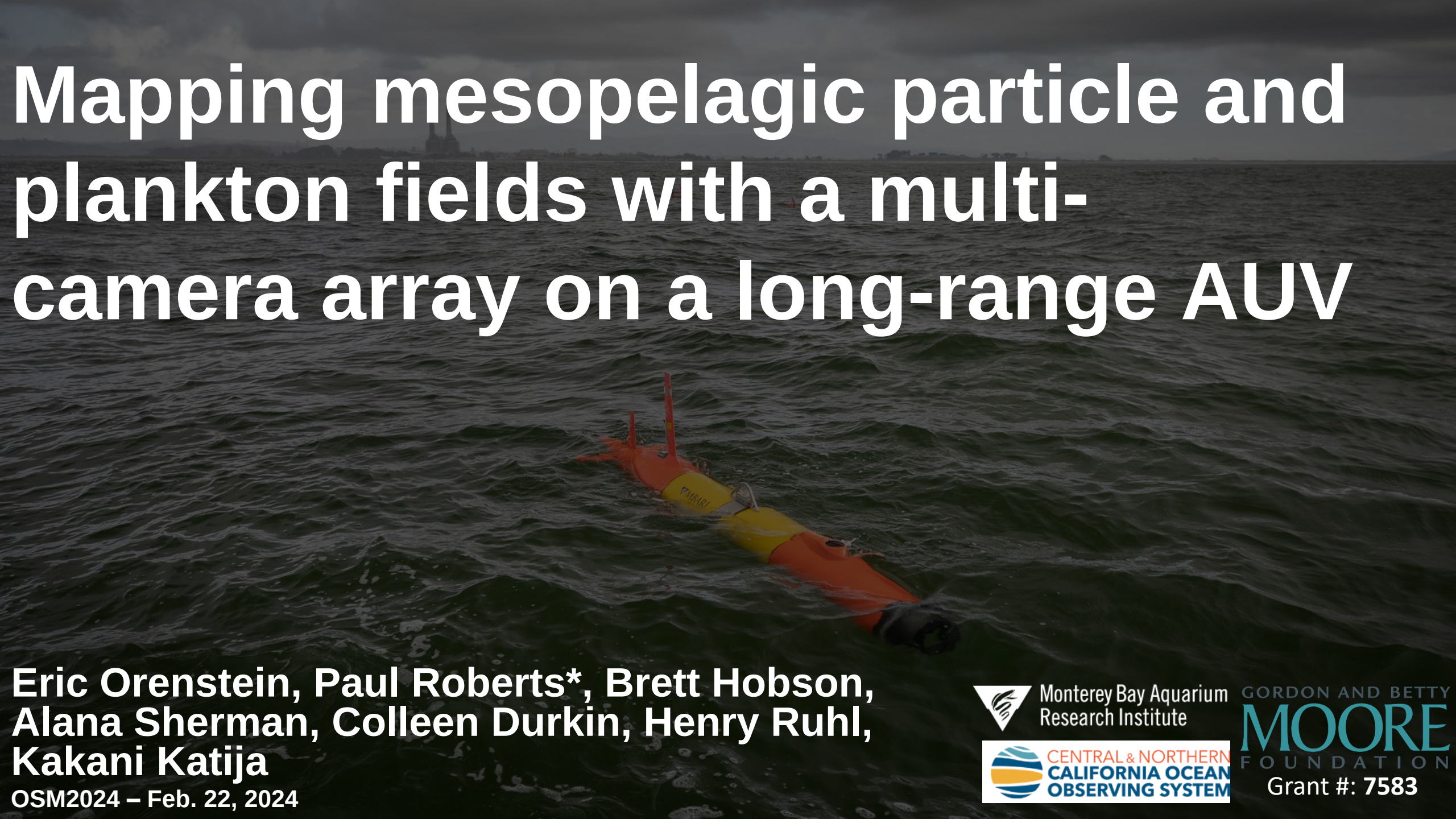
Mapping mesopelagic particle and plankton fields with a multi-camera array on a long-range AUV



Eric Orenstein, Paul Roberts*, Brett Hobson, Alana Sherman, Colleen Durkin, Henry Ruhl, Kakani Katija

OSM2024 – Feb. 22, 2024

Monterey Bay Aquarium Research Institute

CENTRAL & NORTHERN CALIFORNIA OCEAN OBSERVING SYSTEM

GORDON AND BETTY MOORE FOUNDATION

Grant #: **7583**

Biological Carbon Pump

Who/what is there?

How many?

Size?

Variability in space and time?

Platforms

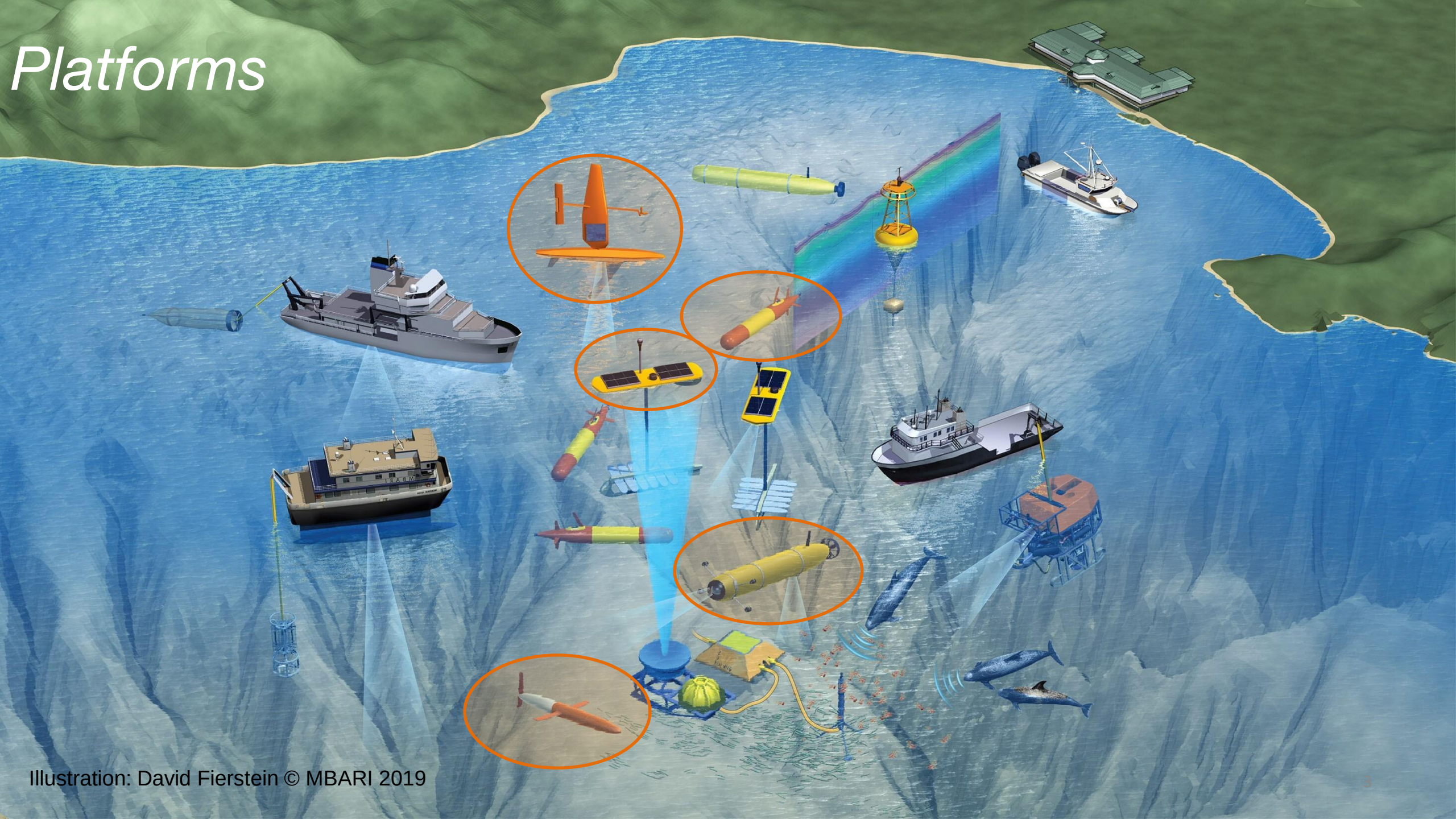


Illustration: David Fierstein © MBARI 2019

Chiton Imaging System

- 140 megapixels per “frame” at up to 10 frames per second (1.4 GB/s raw data rate)
- 50 um pixel size in object space
- 2-10 liter multiview imaged volume
- Objects can be triangulated to obtain 3D position and size

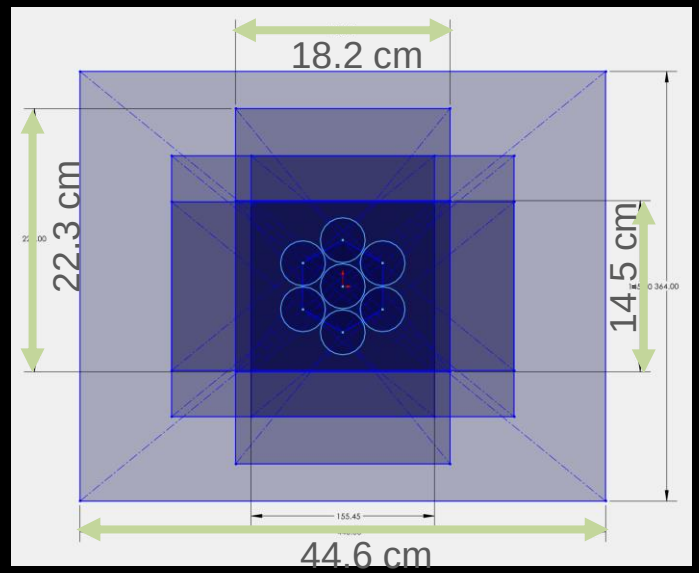
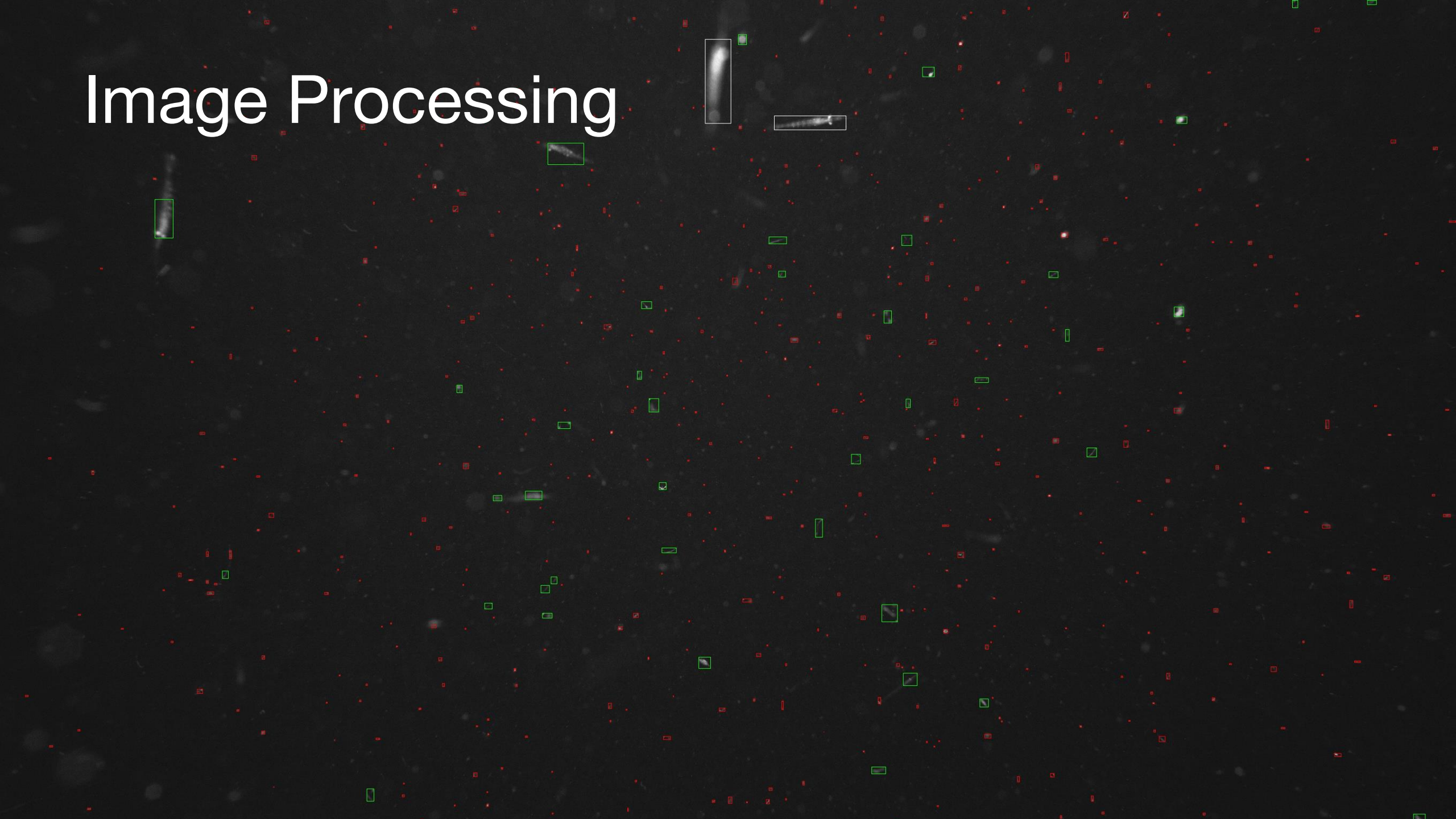


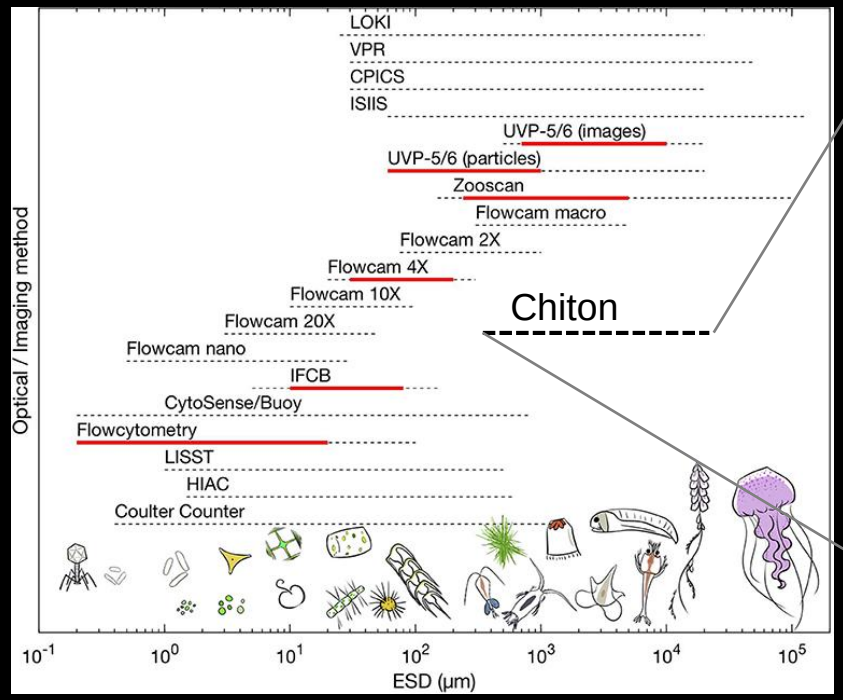
Image Processing

Image Processing

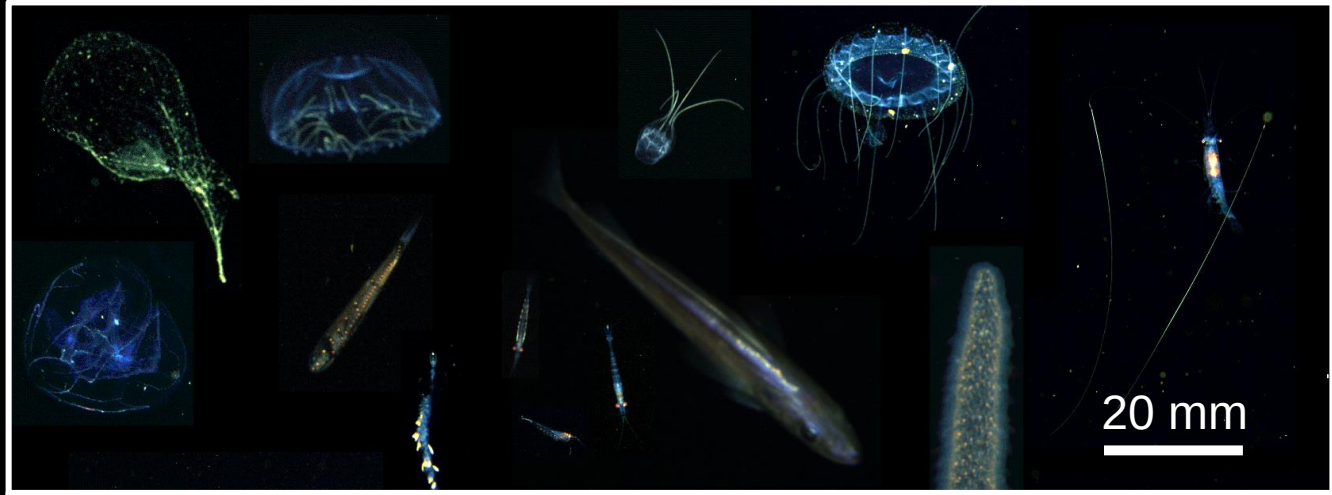


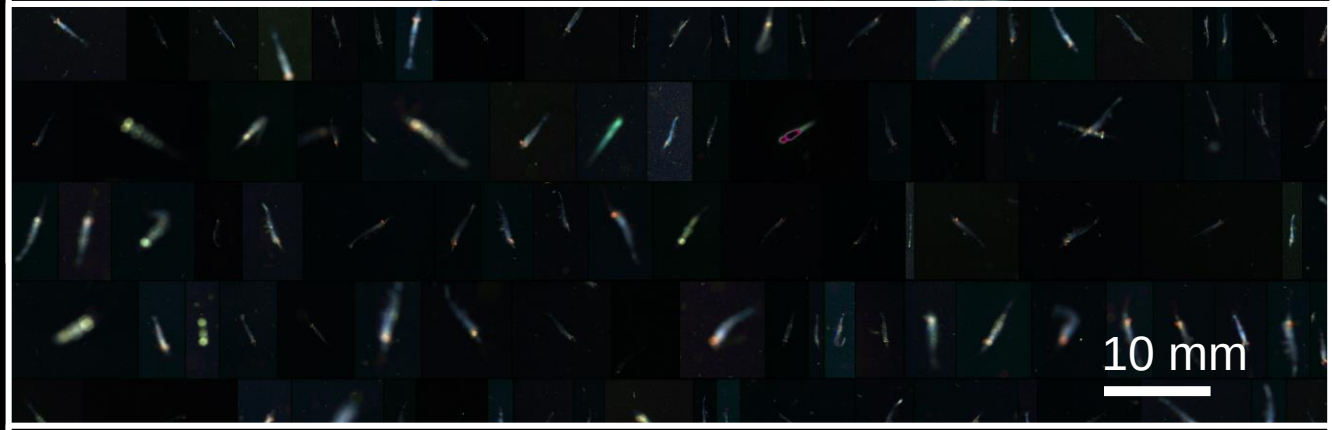
Imaging Capabilities

- Detection of objects: 2 mm to 20 cm
- Detection of particles: 0.4 mm to 20 cm



Lombard et al. 2019





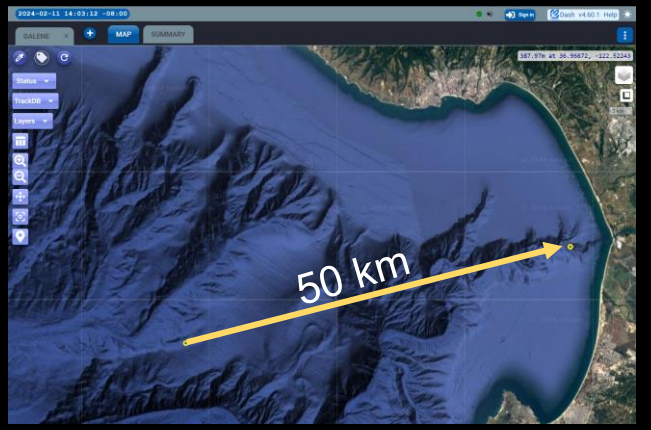
Chiton

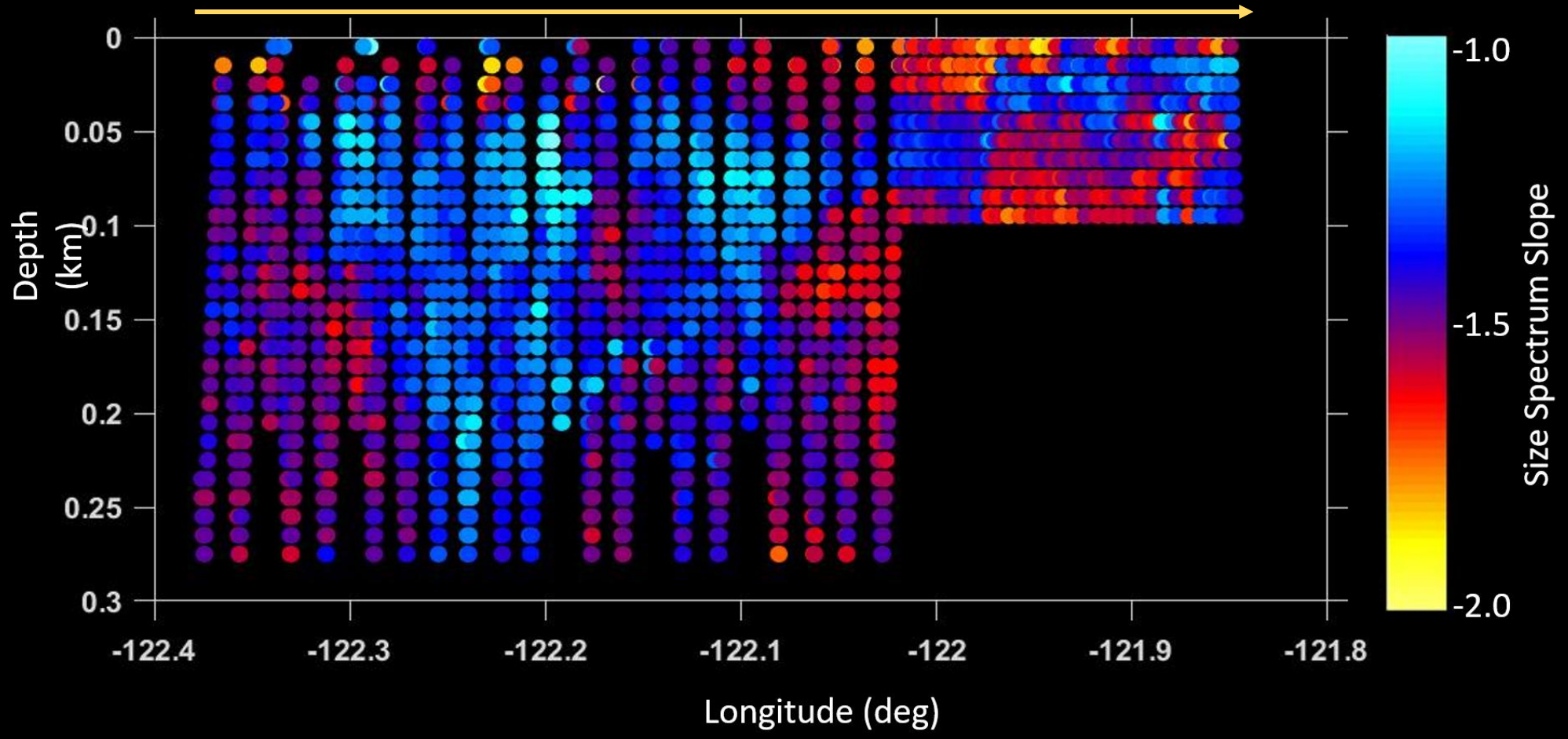
Application Examples

- Quantifying particle spectral slope along AUV transects
- Detecting krill patches while profiling around an acoustic mooring

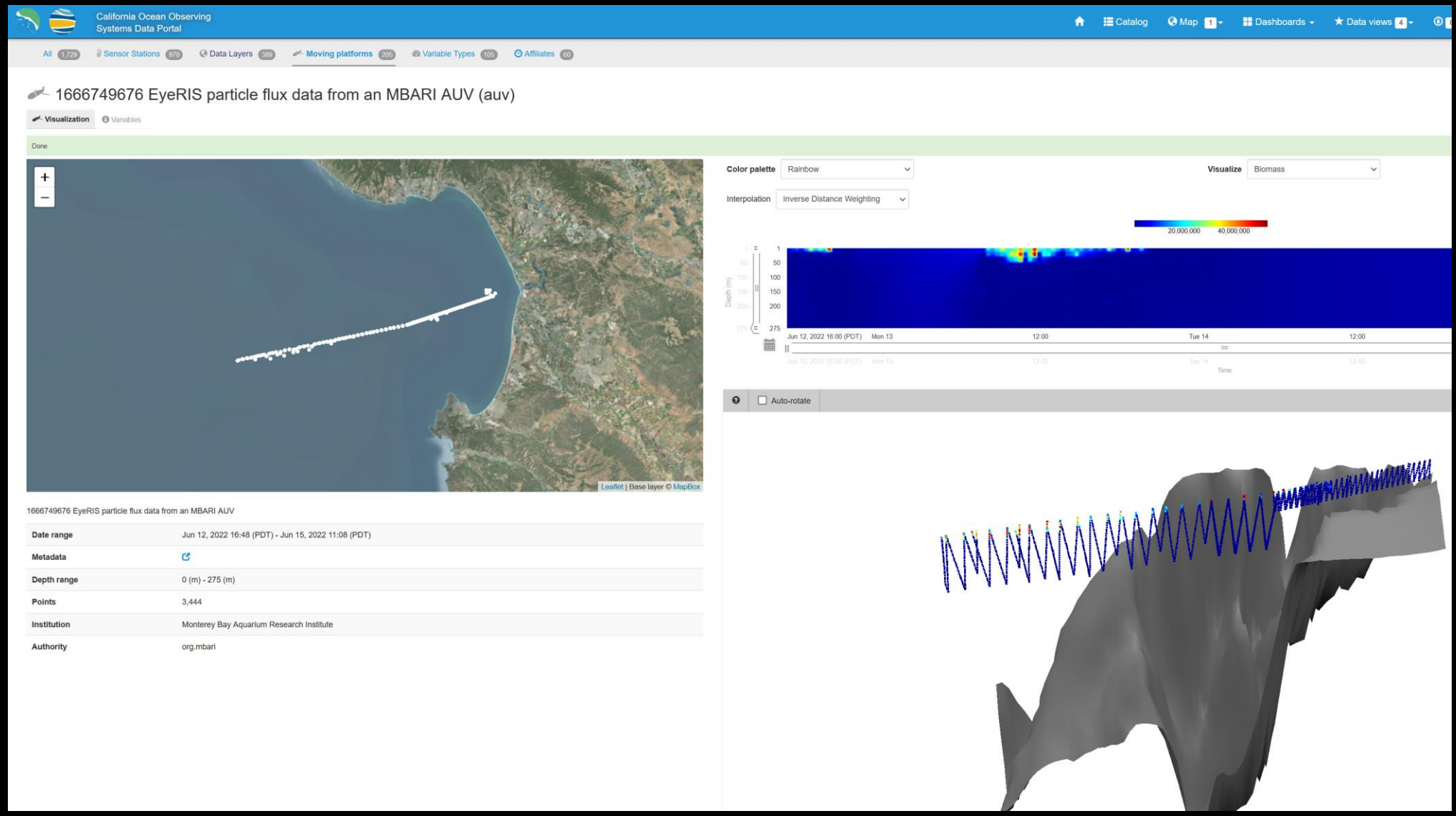
Deployed on Long-Range AUV Galene in Monterey Bay During 2022 field season

Transects of Particle Statistics

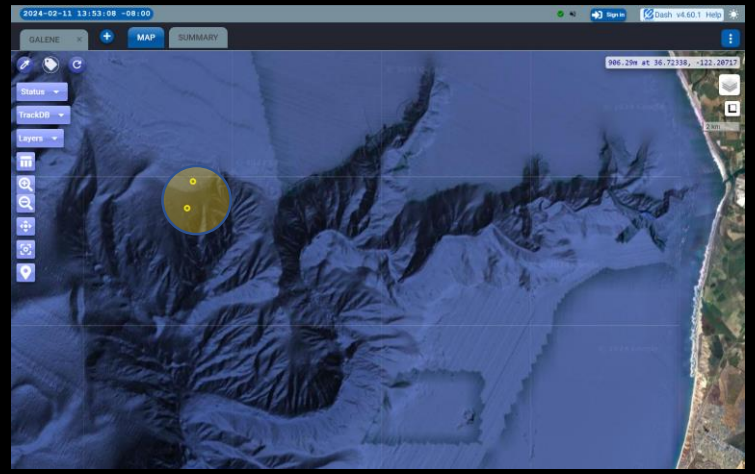


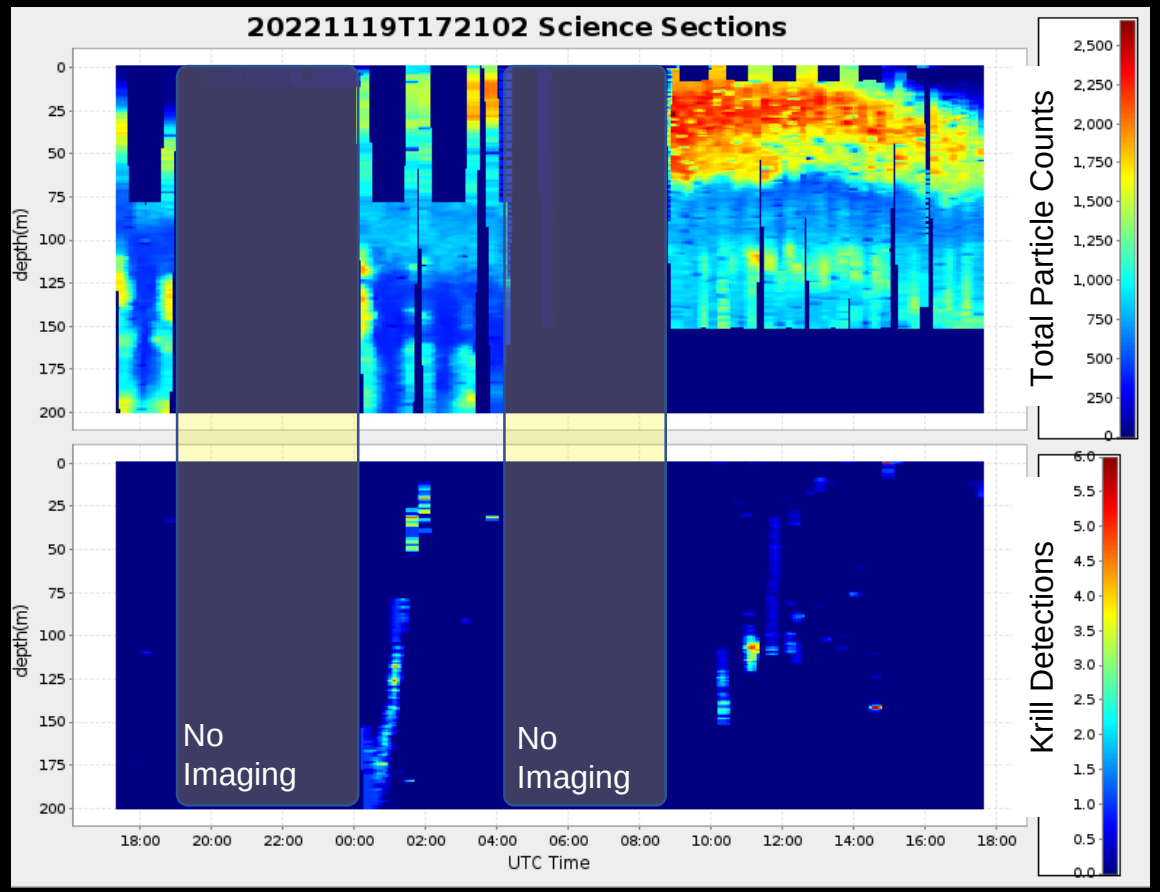


Integration Into Standard Data Products



Krill detection





Summary and Future Applications

- Chiton on the LRAUV enables dense sampling of particle size slopes over large areas
- Coarse on-board classification in the experimental phase
- On-going work to classify particles on shore
- Fully leveraging 3D localization will enable improved size estimates and distance measurements

Thank you!

Paul Roberts
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