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Enabling the quantitative study of time-resolved, small-scale (mm to cm) animal-fluid interactions, predator prey dynamics, particle distributions, and plankton abundance through the use of *in situ* 3D imaging

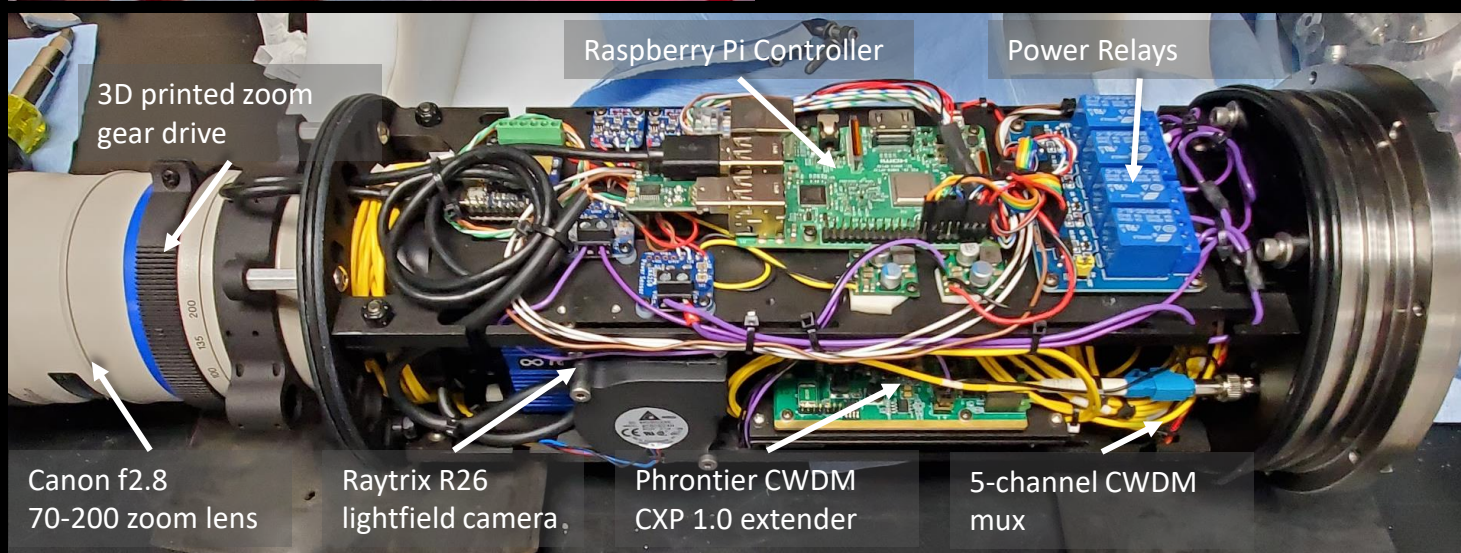
EyeRIS - Remotely Operated Vehicles

4000 m lightfield camera with real-time 3D visualization



Key Features:

- 4000 m depth rating
- Real-time 3D visualization
- Imaged volume: 60 ml to 2 l
- Resolution:
 - x/y: 20 μ m to 60 μ m
 - z: 200 μ m to 600 μ m
- Interface:
 - Wide range AC/DC
 - < 300 W (with lights)
 - Single-mode fiber



AyeRIS - Autonomous Underwater Vehicles

300 m autonomous camera array with real-time processing



Key Features:

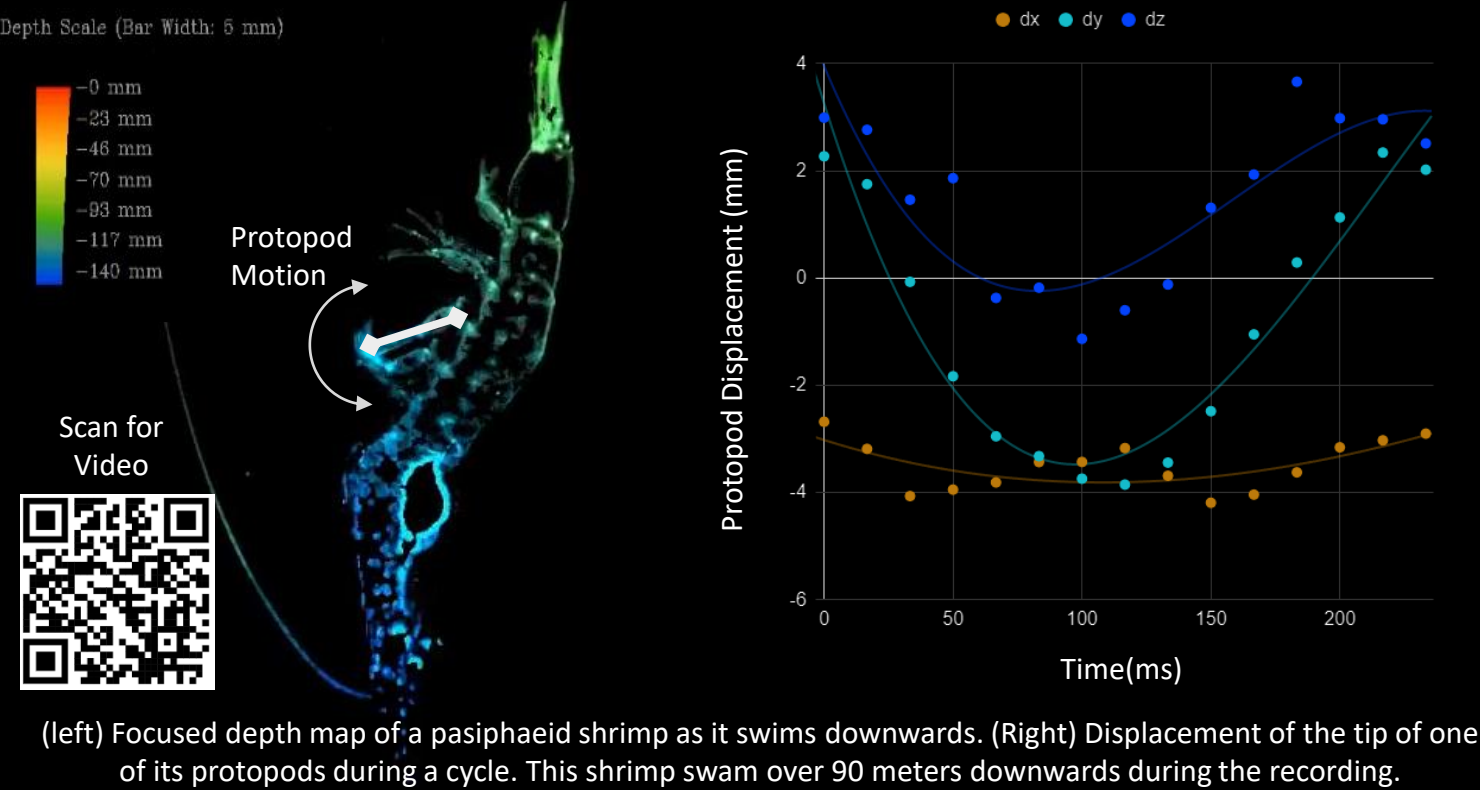
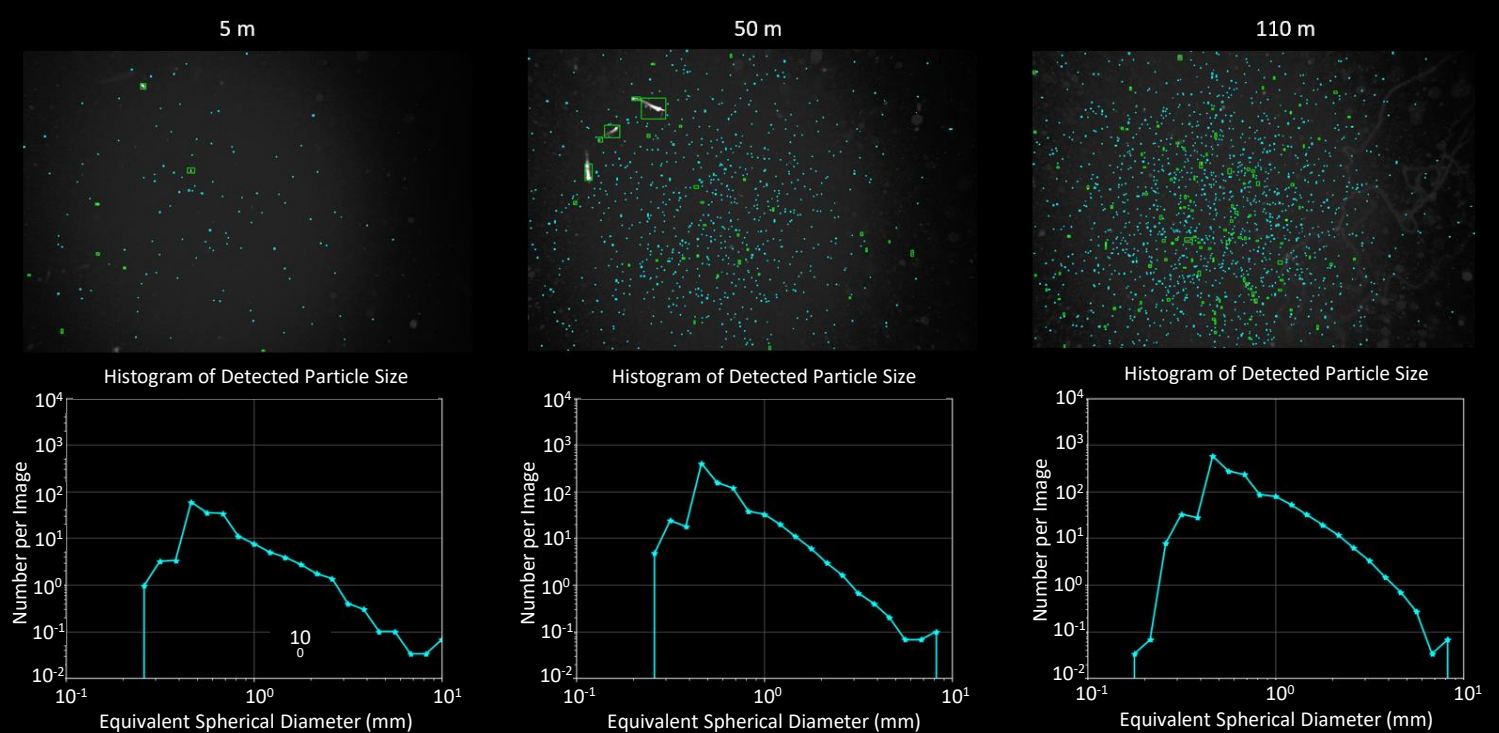
- 300 m / 1500 m depth rating
- Real-time object detection
- Imaged volume: 2 l to 10 l
- Resolution:
 - x/y: 50 μ m
 - z: 400 μ m
- Interface:
 - 24 VDC
 - < 25 W (at 1 FPS)
 - Gigabit ethernet



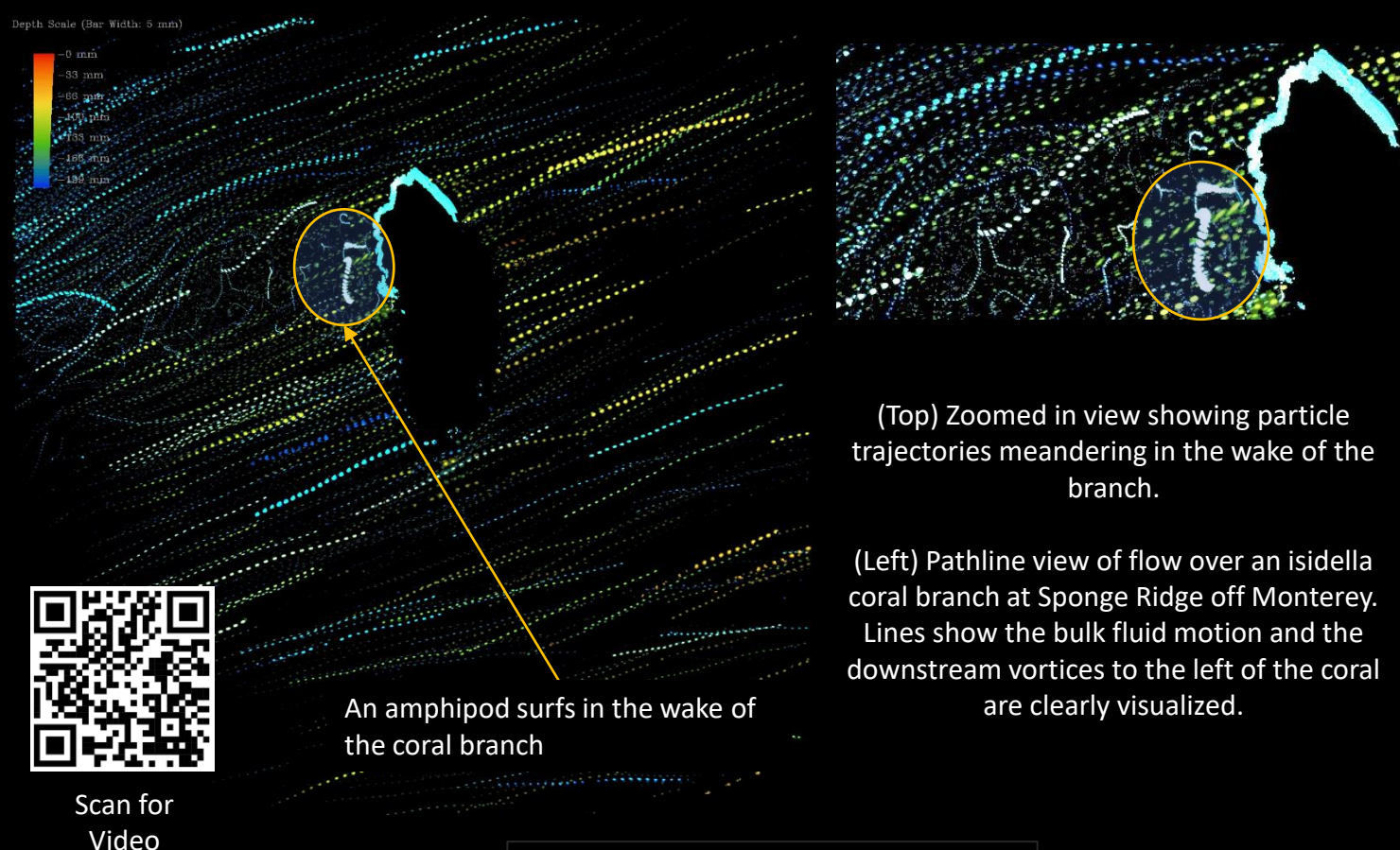
Midwater Kinematics

Particle Size Estimation

Examples of raw images from AyeRIS and estimated particle size spectrum averaged over 10 m depth depths at three distinct depths in one profile. An overall increase in particle abundance with depth and change in size spectrum slope can be seen.



Benthic Flow Studies



(Right) Map of Monterey Bay showing a transect line between waypoints in the Monterey Bay Time Series. ROIs and particle size data were recorded continuously during the transect and saved to local storage.

(Bottom) Visualization of particle size spectrum slope along the transect between (M2) to near-shore (C1). Size spectra are computed over 10 m depth bins and the slope is estimated for particle sizes in the range 0.8 mm to 8 mm. The plot shows a large patch of relatively flatter size spectrum that intrudes into the shallower water near-shore.



Benthic Biomechanics

