

Sedimentation Event Sensor



Monterey Bay Aquarium
Research Institute

- can do now Monitor sinking particles responsible for deep-sea carbon sequestration
- in development Autonomously sense important sequestration events, and trigger other robots
- future plans Onboard decision making to trigger fleets of lower-cost Lagrangian sensors

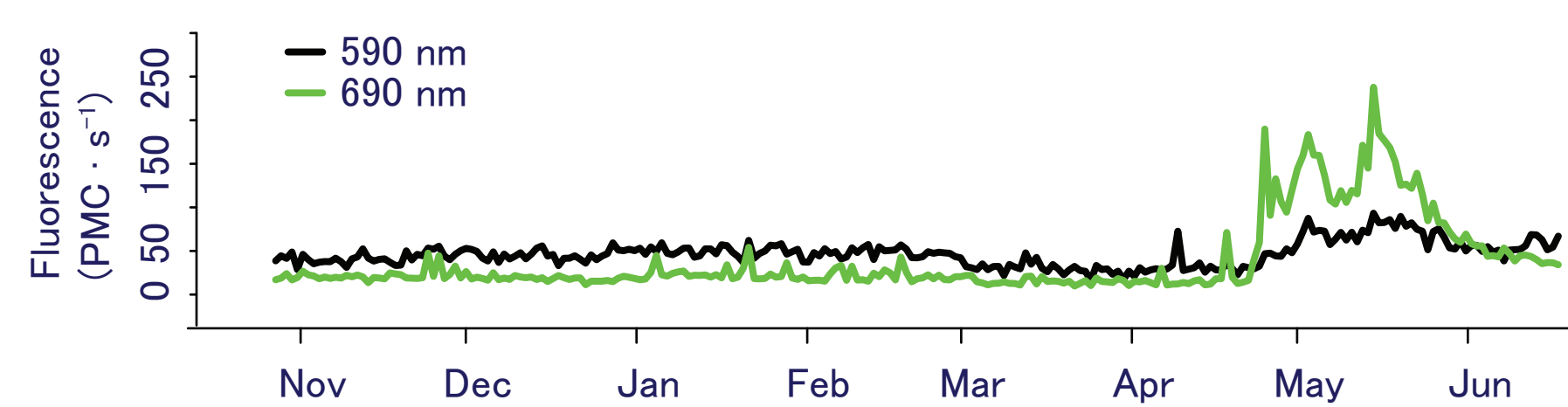
Current capabilities

Monitor sinking particles

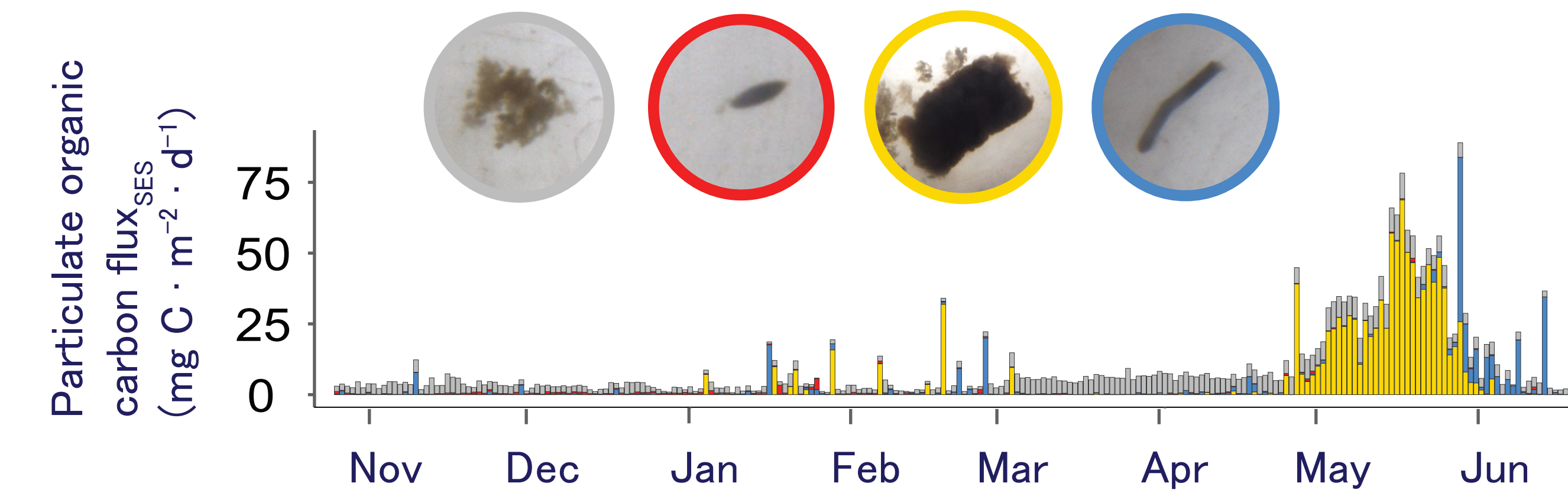
Front- and
back- lit images



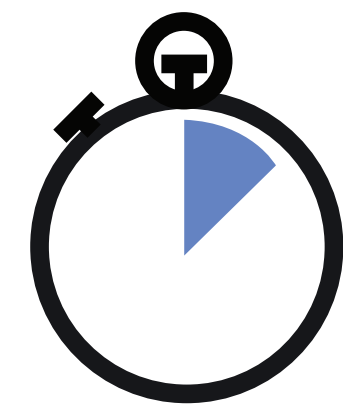
Fluorescence



Use images from SES to model particle-specific carbon sequestration



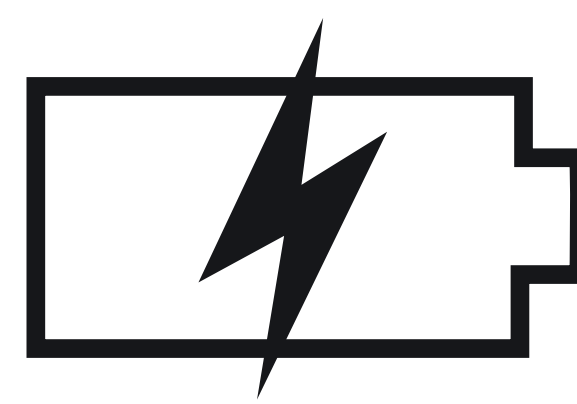
Robust engineering



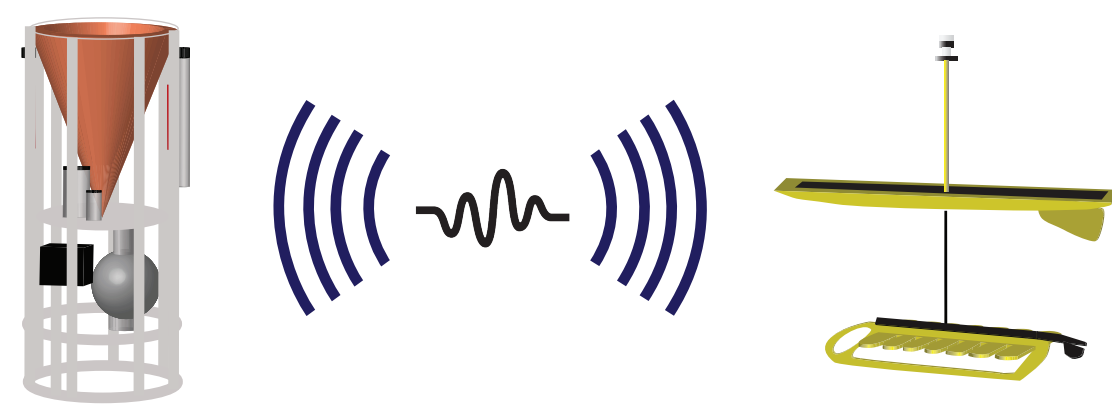
High temporal resolution
(minutes to hours)
captures short-lived
events



Monitors the most
valuable carbon
sequestered
(4000 m rated)



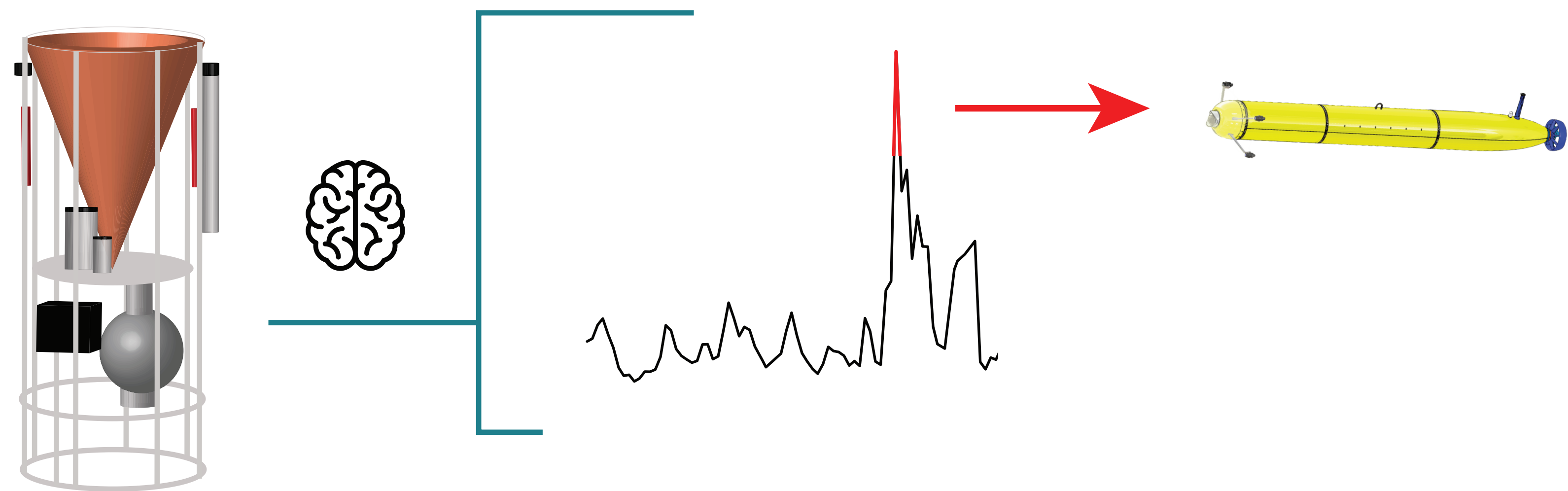
1.4 year battery
@ 6 samples x per day
monitors unpredictable
events over >1 year
long deployments



Acoustic modem
enables communication
with other robotic
instruments

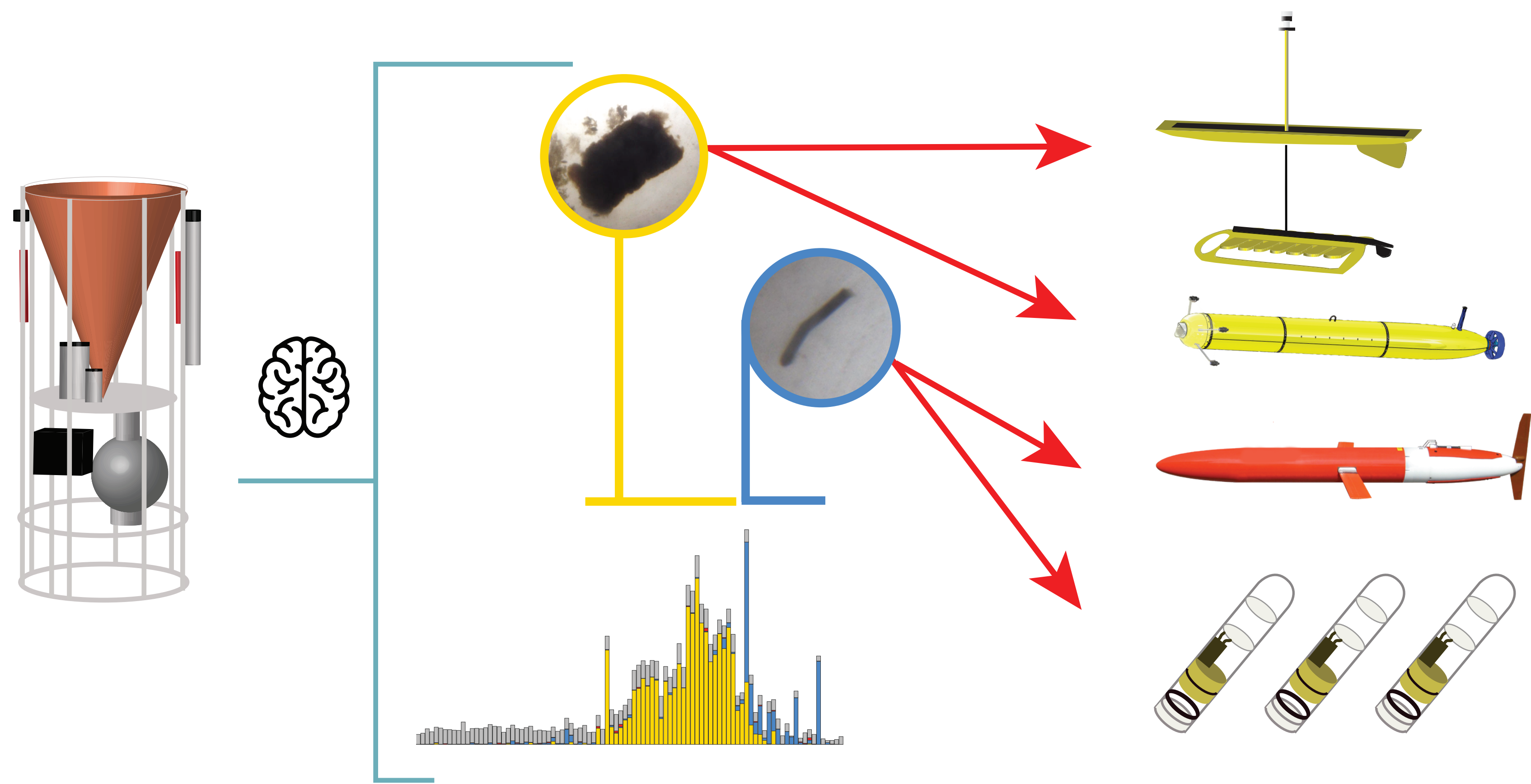
Sensor advancements

IN DEVELOPMENT



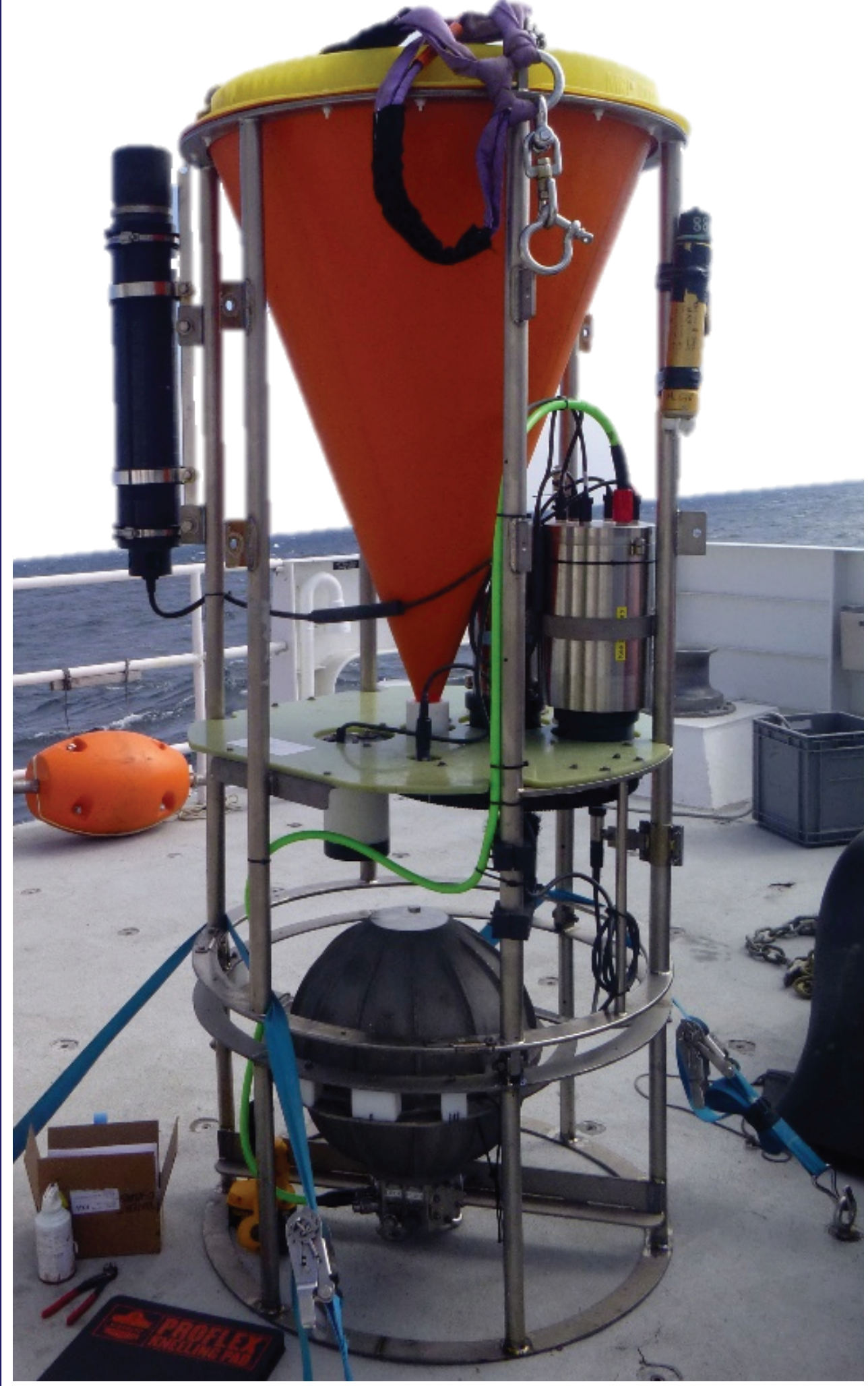
Adding onboard image analysis to autonomously detect large sequestration events and trigger another autonomous instrument

PROPOSED



SES will serve as low-power central command unit conducting onboard AI image analysis to measure particles responsible for sequestration events, guide autonomous decision making, and trigger robotic fleets of low-cost Lagrangian sensors, to collaboratively quantify spatiotemporal scale and magnitude of carbon sequestration.

SES sensor package on
modified commercially
available McLane
Sediment Trap



Proven endurance:

Regular >1 yr long
deployments to 4000 m
depth in the NE Pacific
with seasonal Wave
Glider communication



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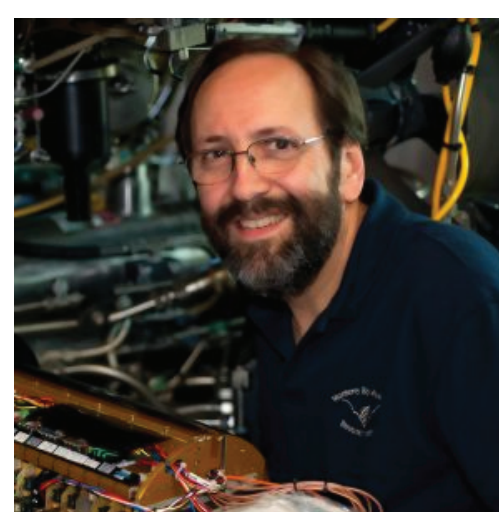
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SCIENCE

ENGINEERING

McGill et al. (2016) Sedimentation Event Sensor: new ocean instrument for in-situ imaging and fluorometry of sinking particulate matter. L & O Methods 14(12):853-863

Huffard et al. (2020) Temporally-resolved mechanisms of deep-ocean particle flux and impact on the seafloor carbon cycle in the northeast Pacific. Deep-Sea Res. II. 173: 104763.