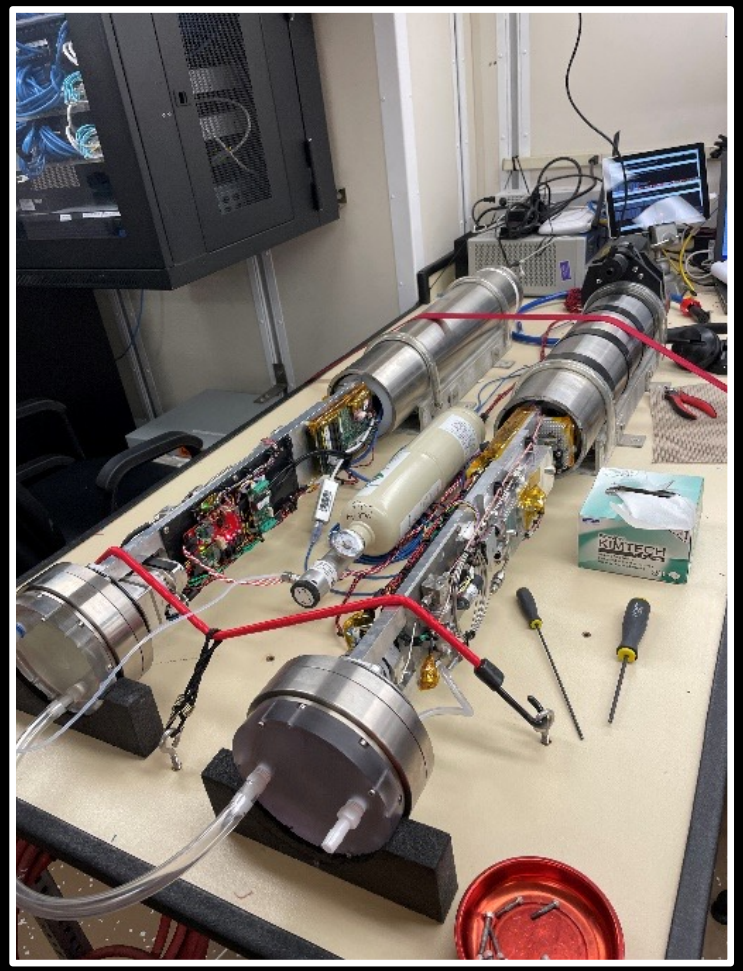
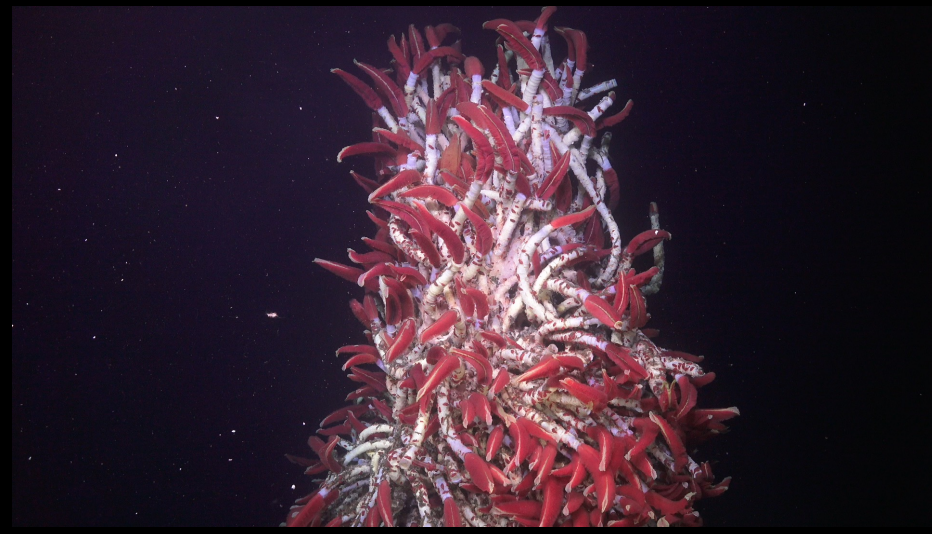
RR2017 – Michel – Guaymas Basin

Development of an In situ Deep Sea Methane Sensor

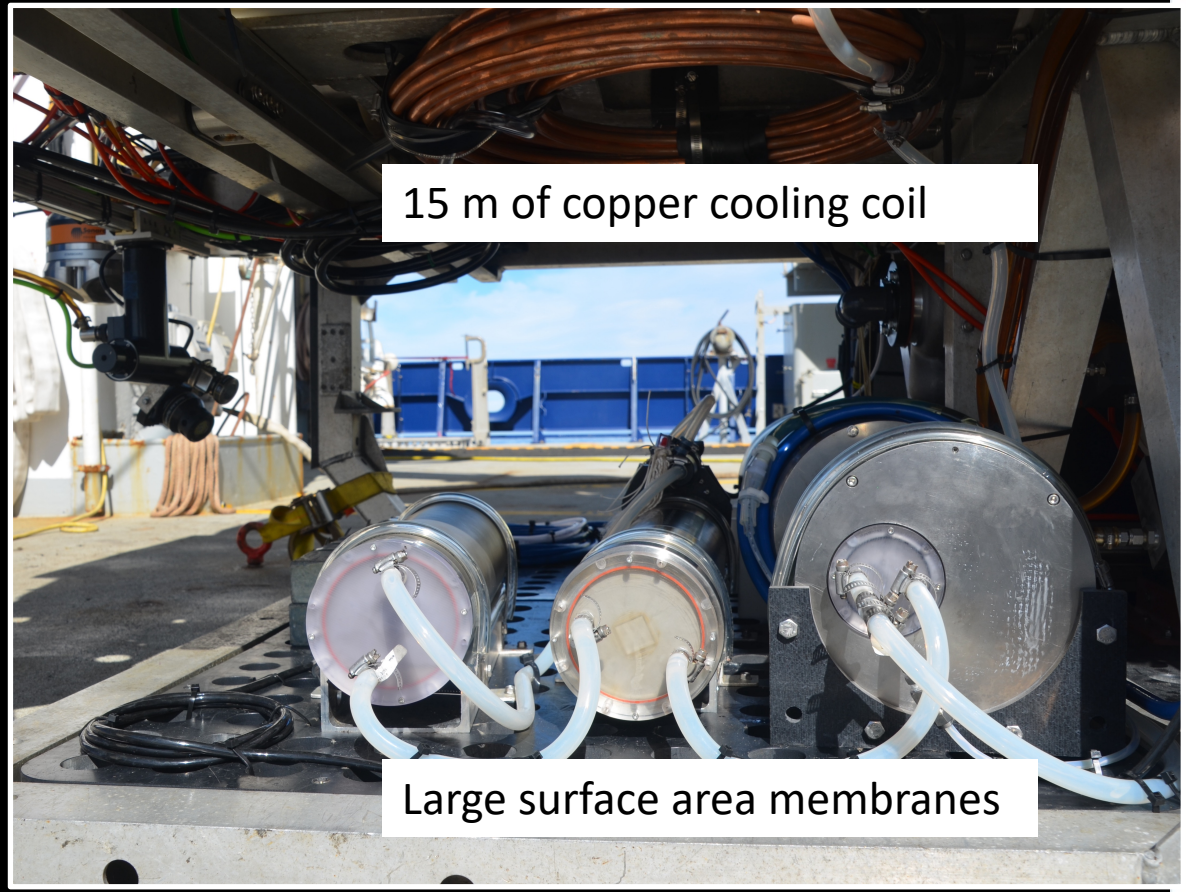


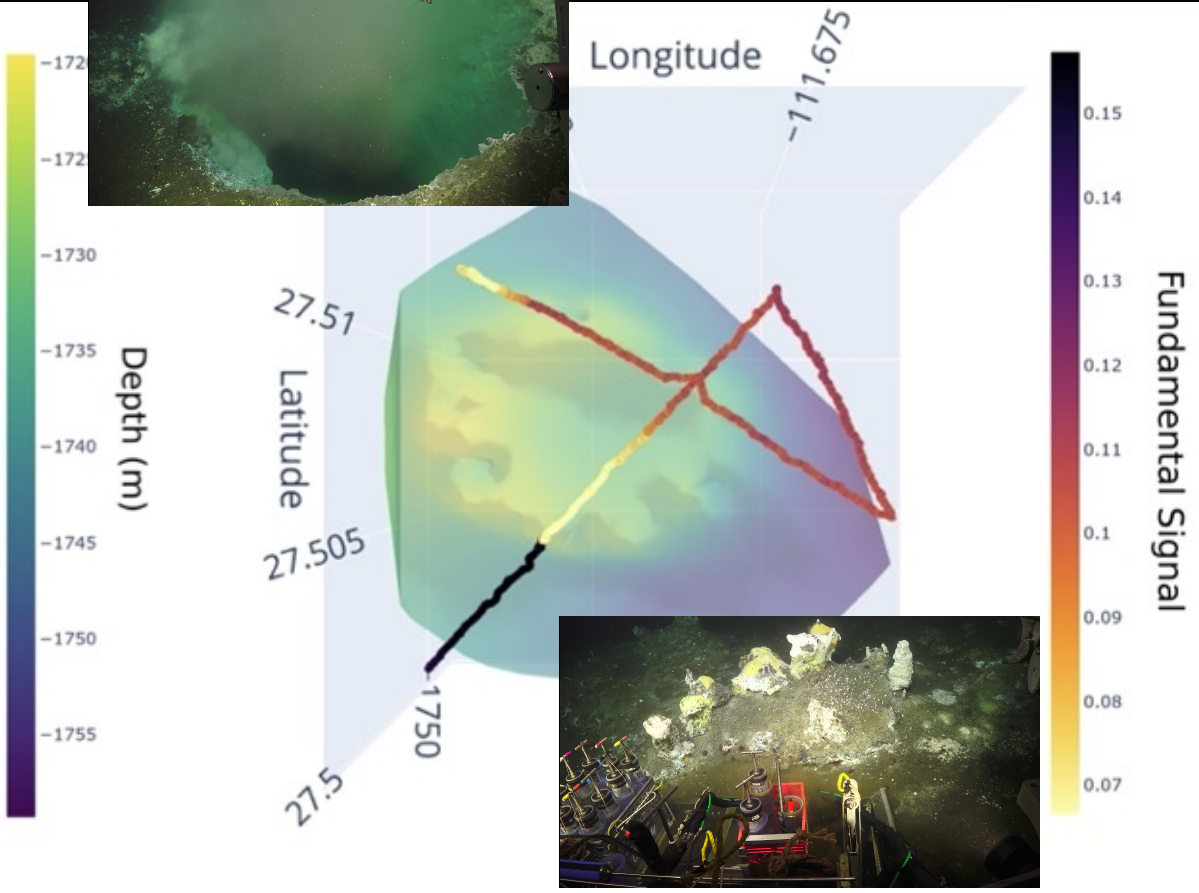


Presented by Victoria Preston – MIT-WHOI Program Graduate Student

OCE OTIC #184-2053

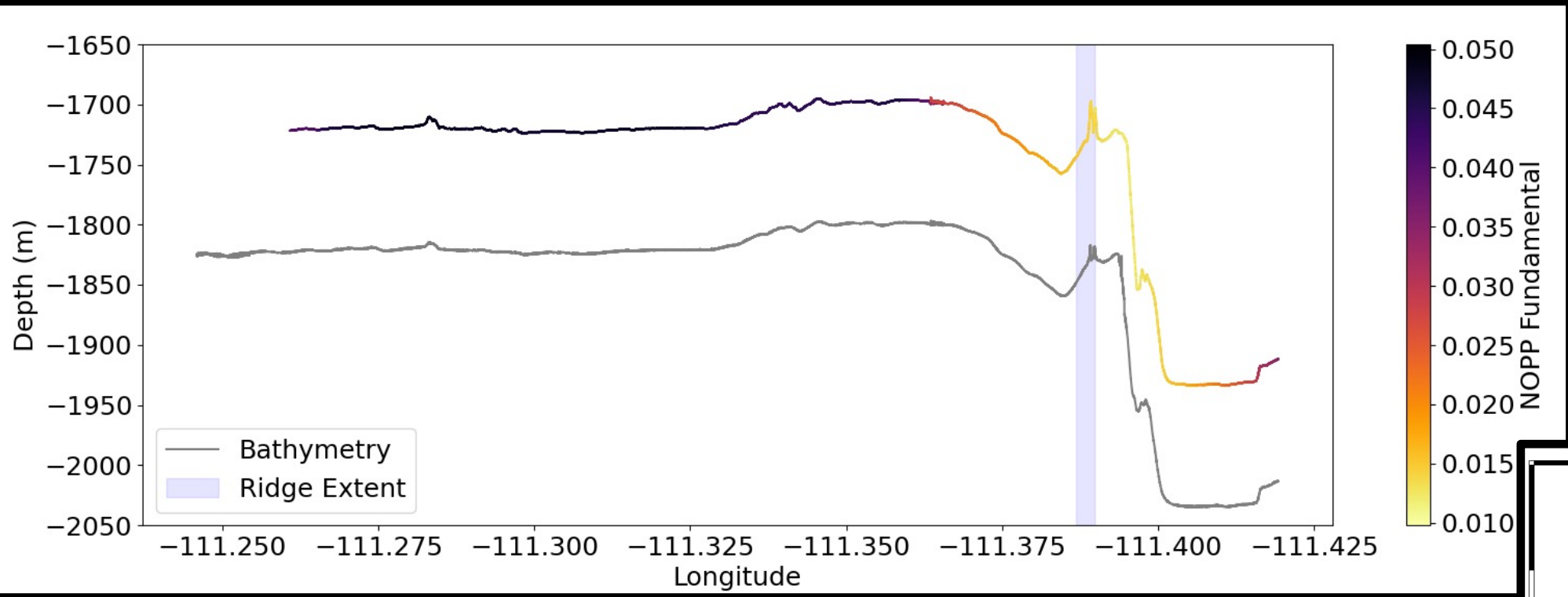
ROV Jason - Ring Vent

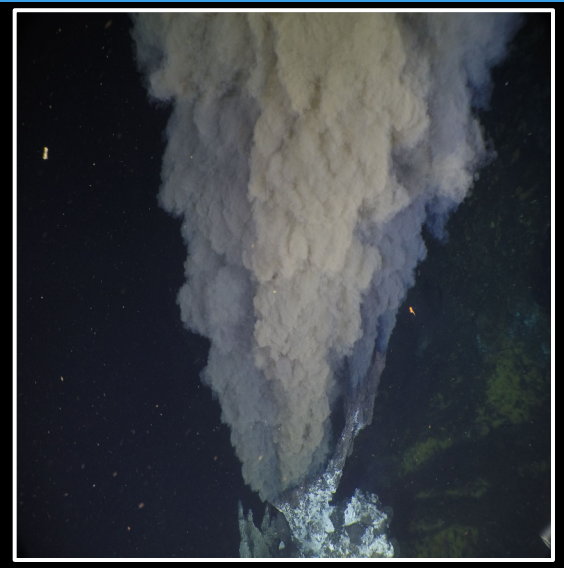


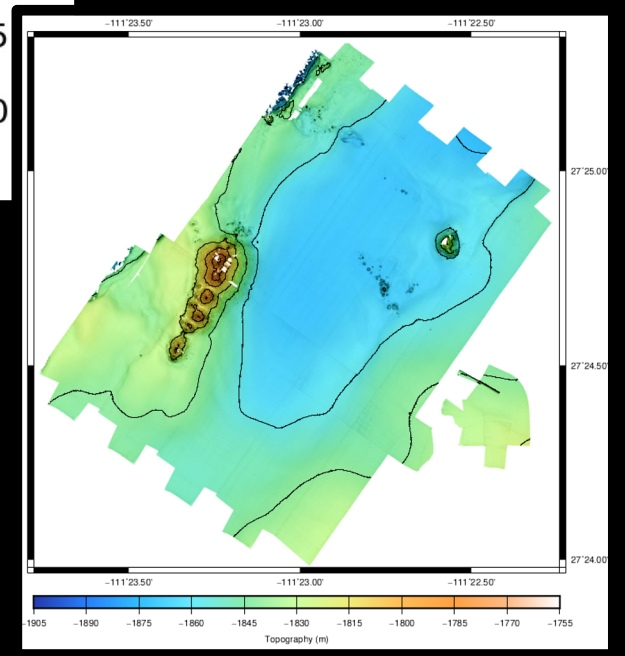


AUV Sentry – Exploration / Plume Hunting

AUV Sentry – Exploration / Plume Hunting

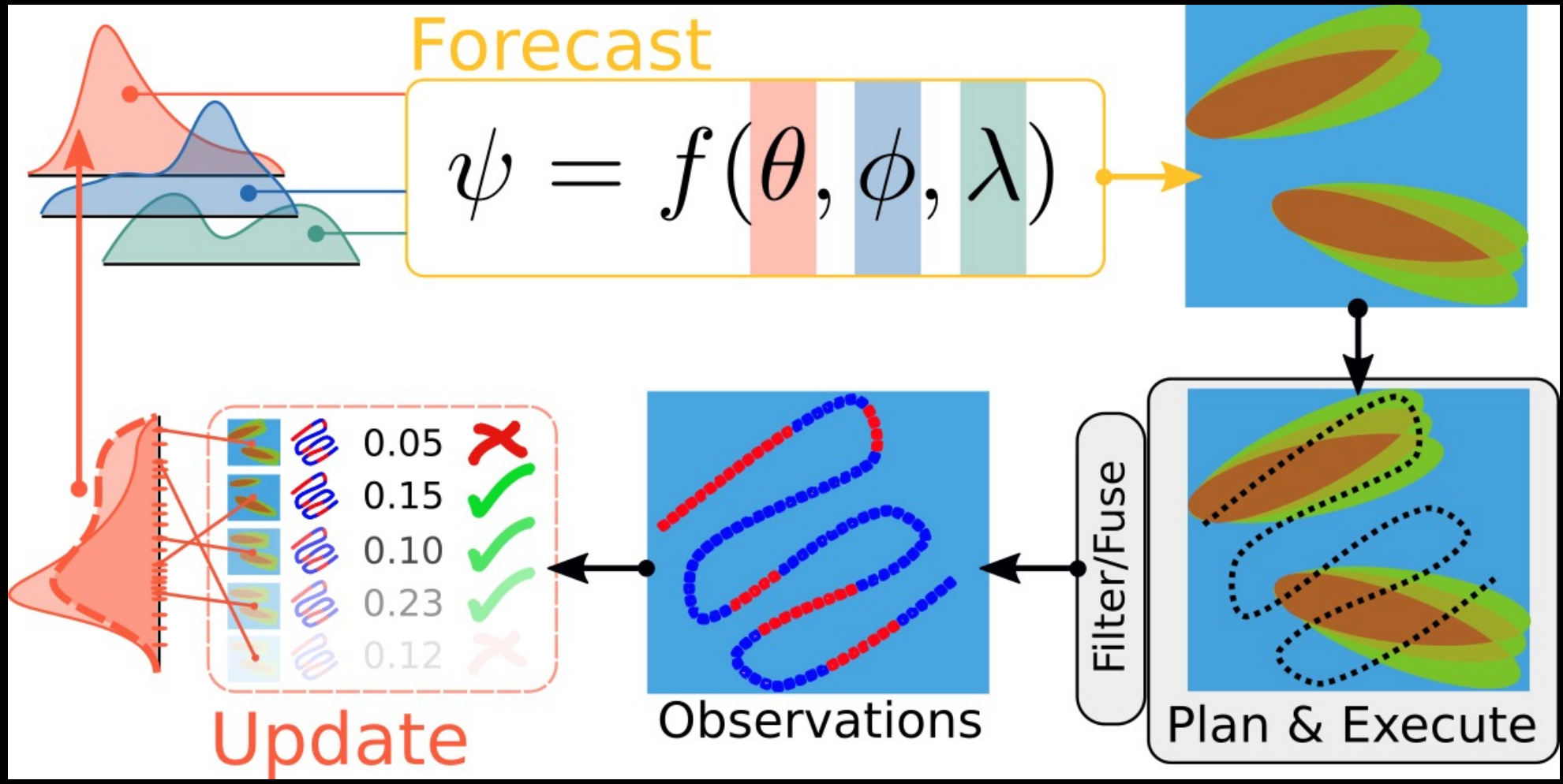






- Methane detection at 7.5 km from the ridge
- Very strong methane signal as approach the ridge (~2km away)

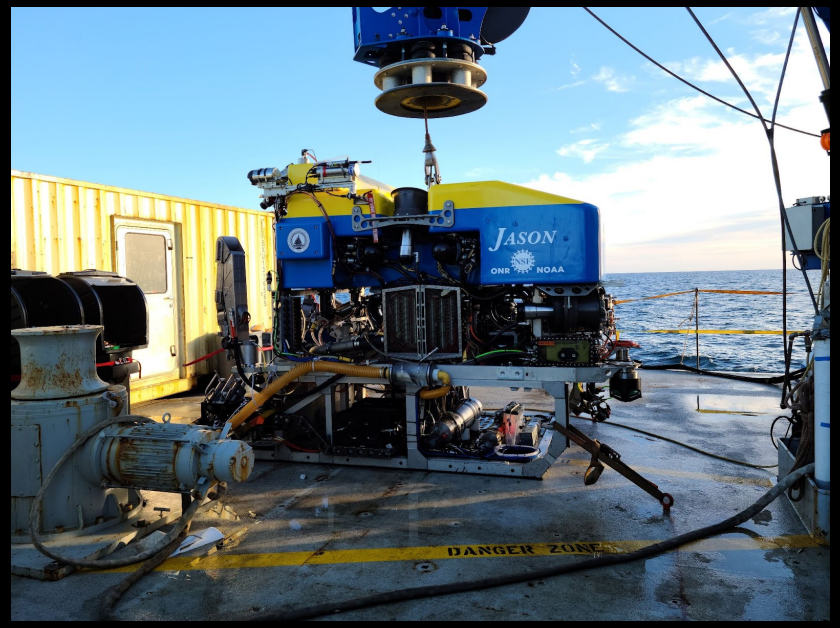
Physically Informed Models

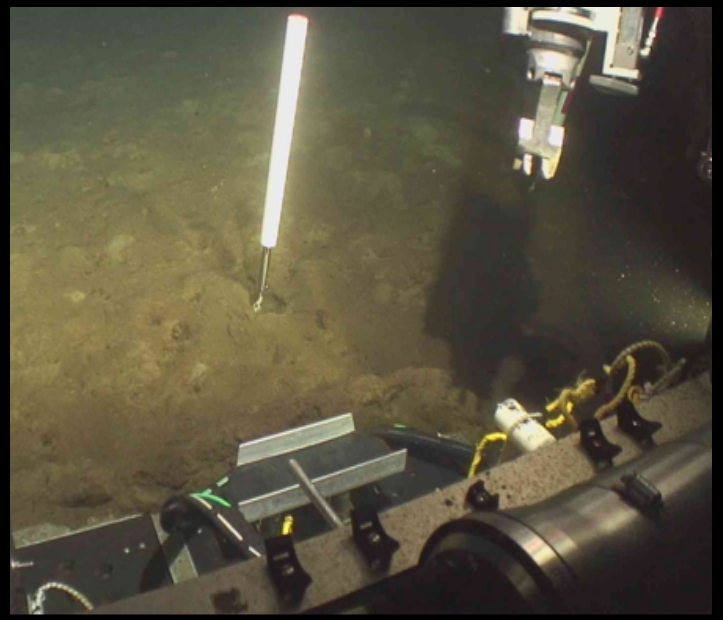


- RR2107 served as a laboratory for new modeling and decision-making algorithms for hunting hydrothermalism.

Physically Informed Models

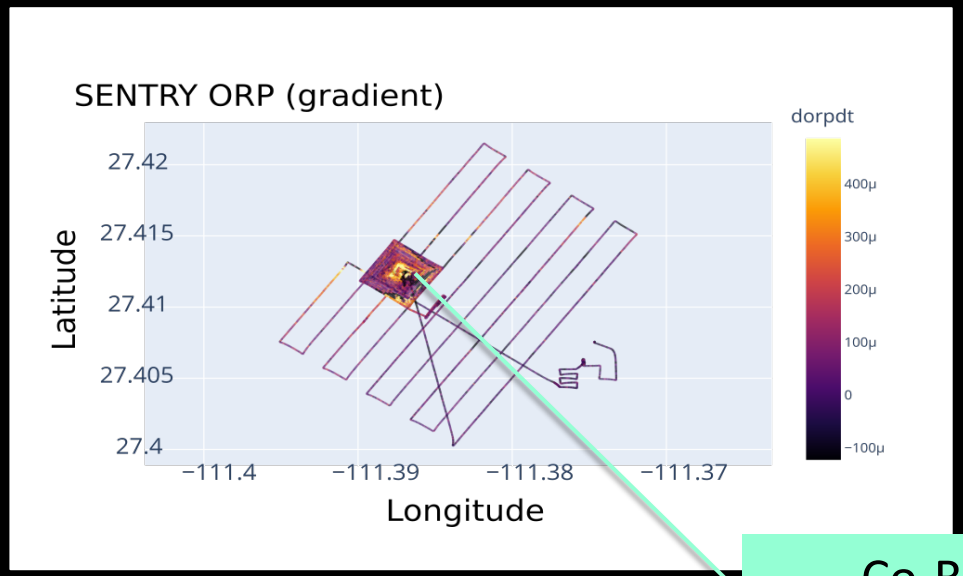
- The method can leverage any available sensors for model simulation.

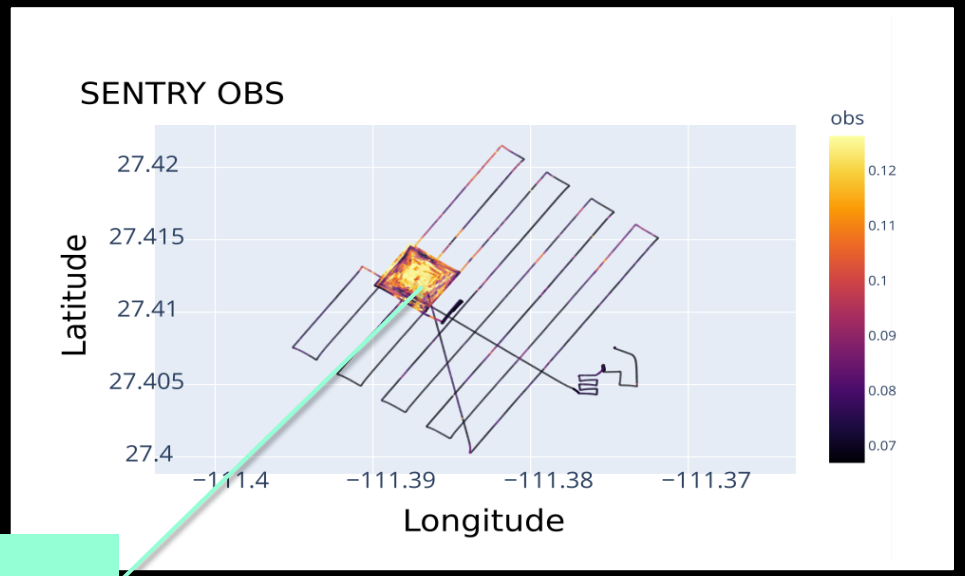




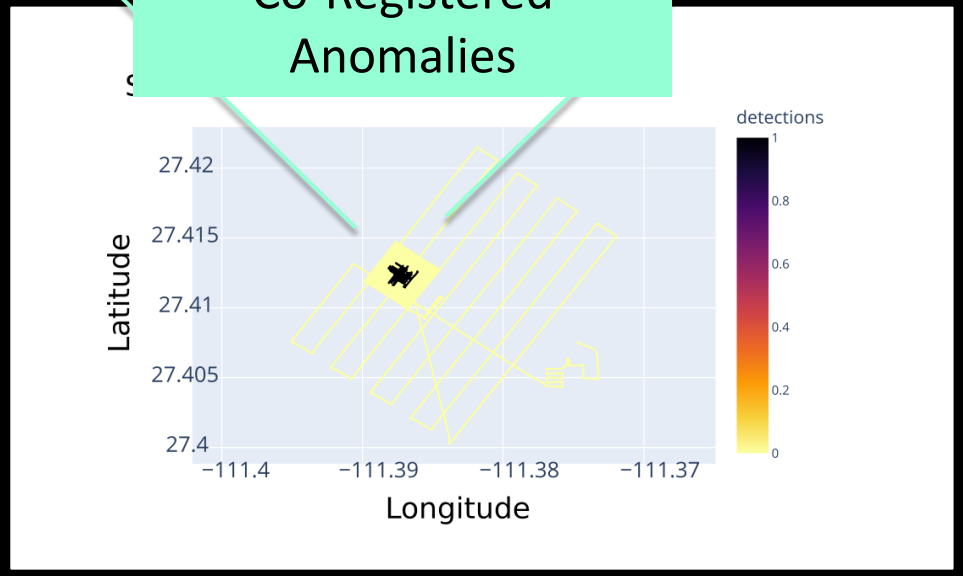
- Initial condition priors:
  - Vent temperature
  - Orifice area
  - Exit velocity
- Set current function:
  - Magnitude
  - Heading
- Background reference:
  - Temperature
  - Turbidity
  - Oxygen

Physically Informed Models



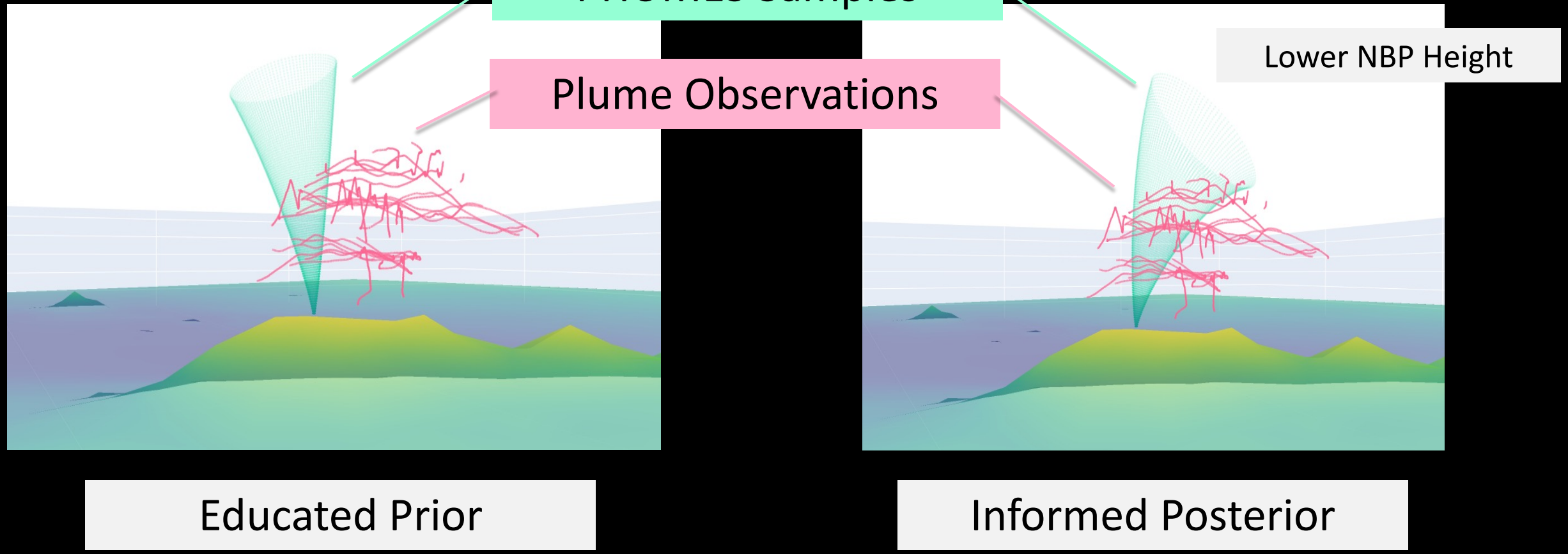


Co-Registered Anomalies



- Sentry observations are treated as "plume" observations for model updates.

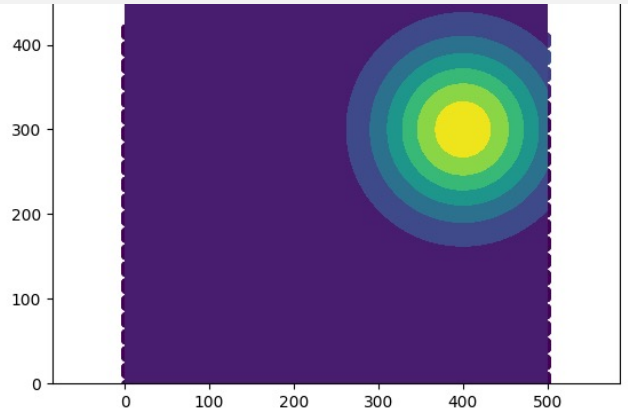
Physically Informed Models



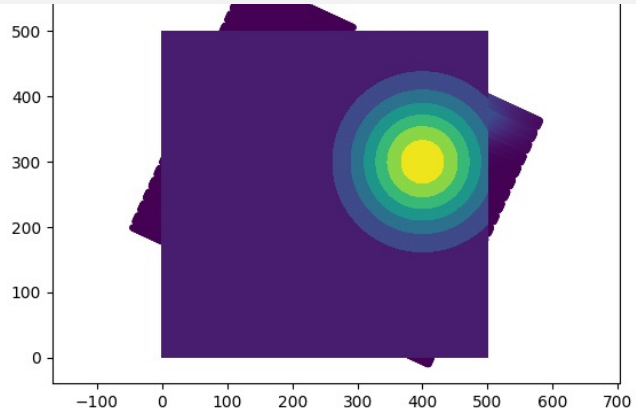
- Using data from multiple instruments we could train a model of hydrothermalism in the basin that could be used for iterative missions.

AUV Sentry – Trajectory Optimization

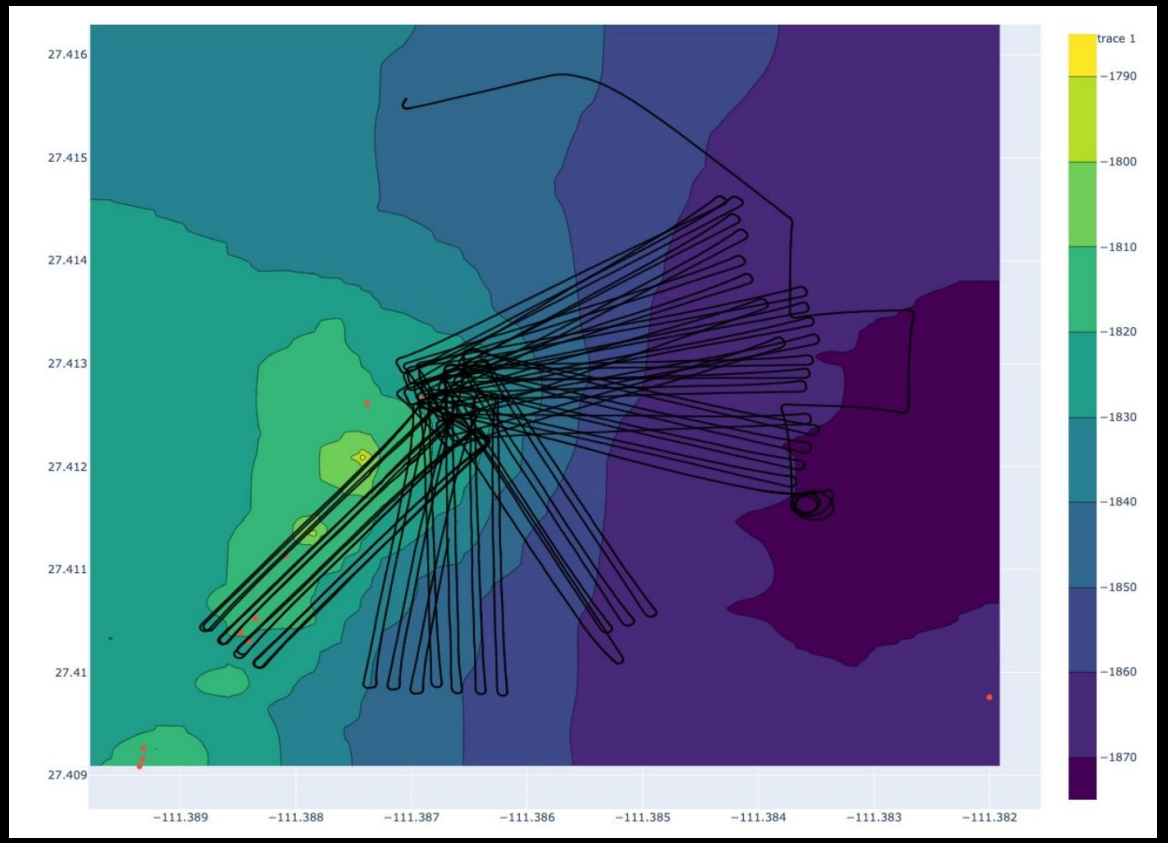
Naive



Optimized

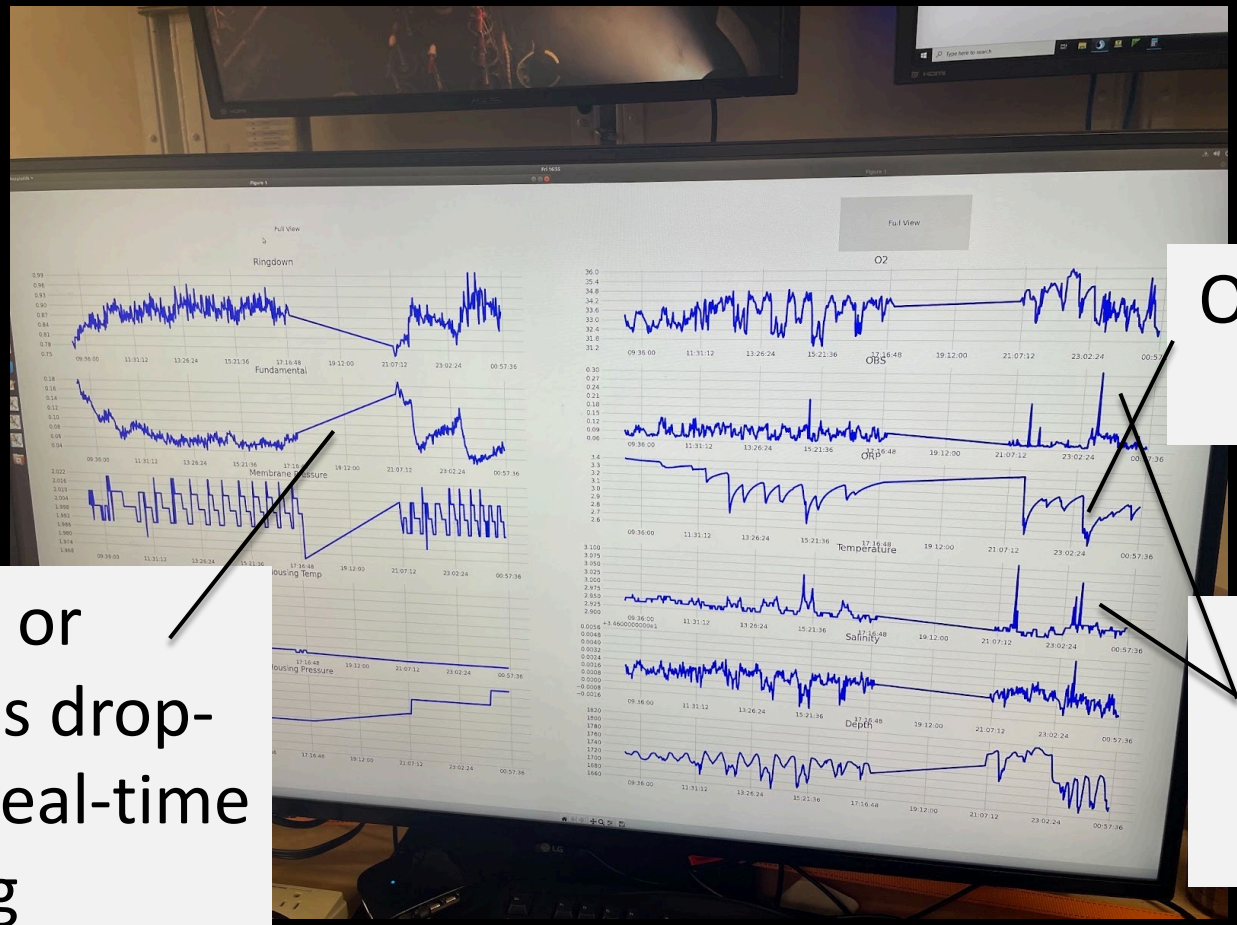


- Trajectory optimization over predicted plume waters placed Sentry lawnmowers along-current directions to collect a diversity of near-plume observations.



AUV Sentry – Acoustic Science Monitor

- Acoustic messages with science-sensor status on Sentry were scraped over network UDP
- Data was parsed and data displays updated in real-time with a dive



ORP dips indicate plume intersections

Instrument or communications drop-out detected in real-time for debug

Co-registered OBS and temperature spikes observable

Data Communications