DESSC report

Biogeochemical sampling system integration with *Sentry*: AT50-15 Main Endeavor Hydrothermal Plume Study

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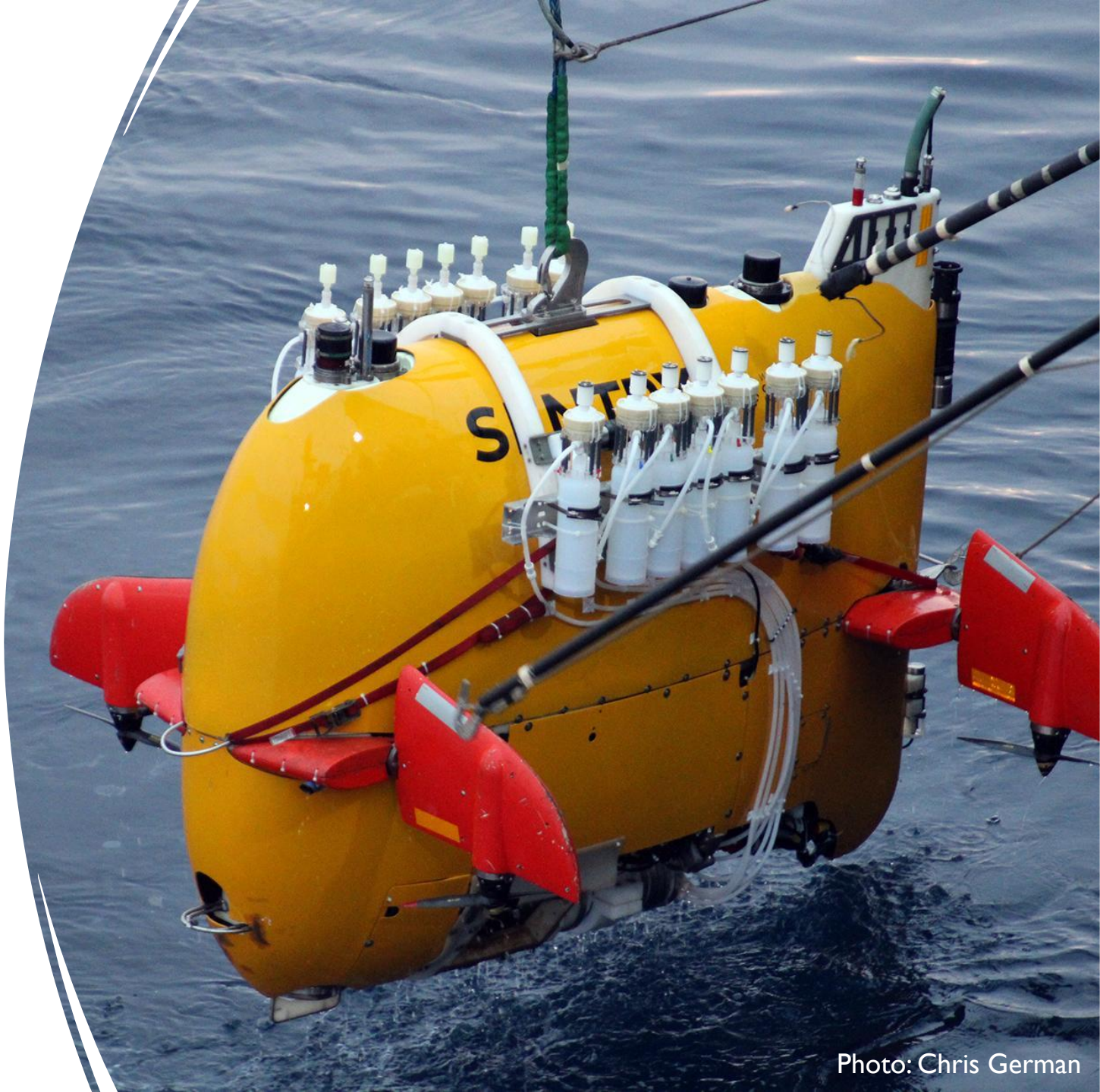
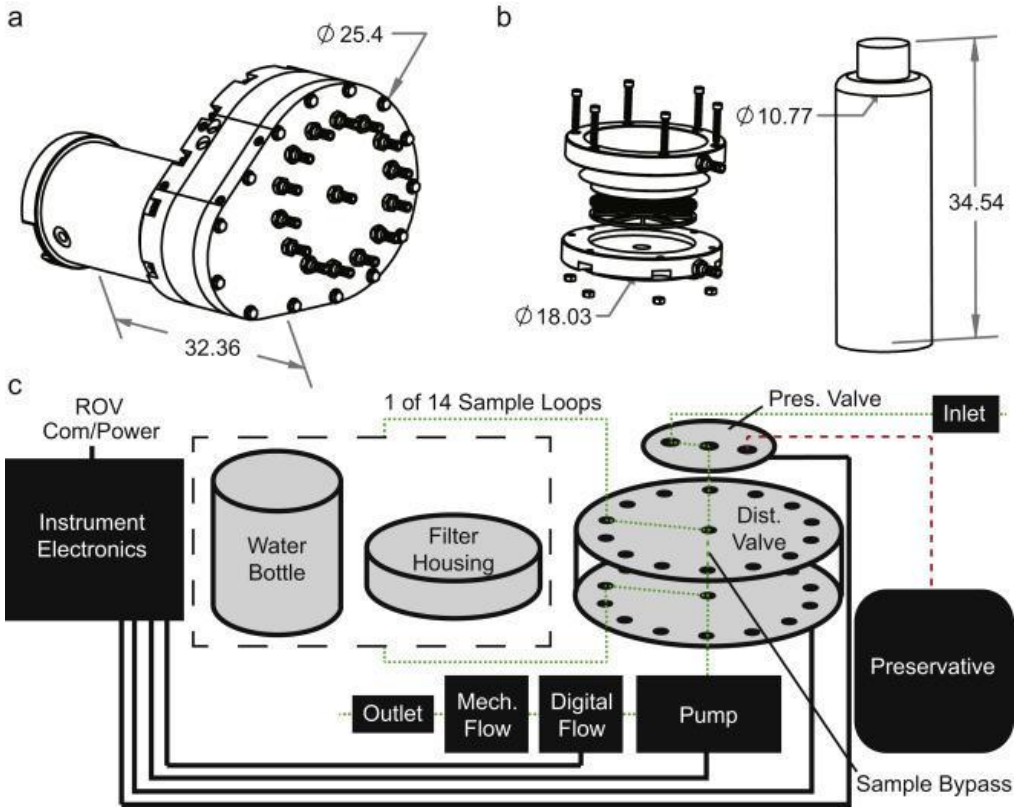


Photo: Chris German

Robotic Sampling Instruments

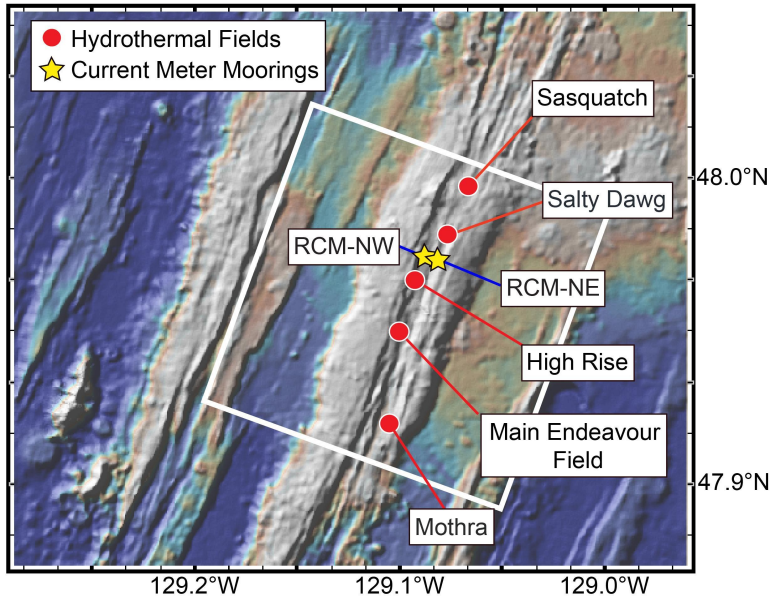


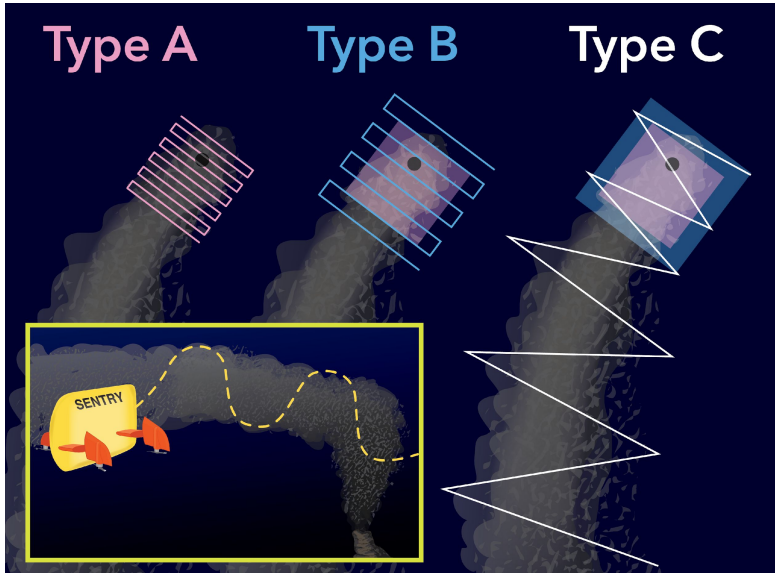
Clio Sampling Payload

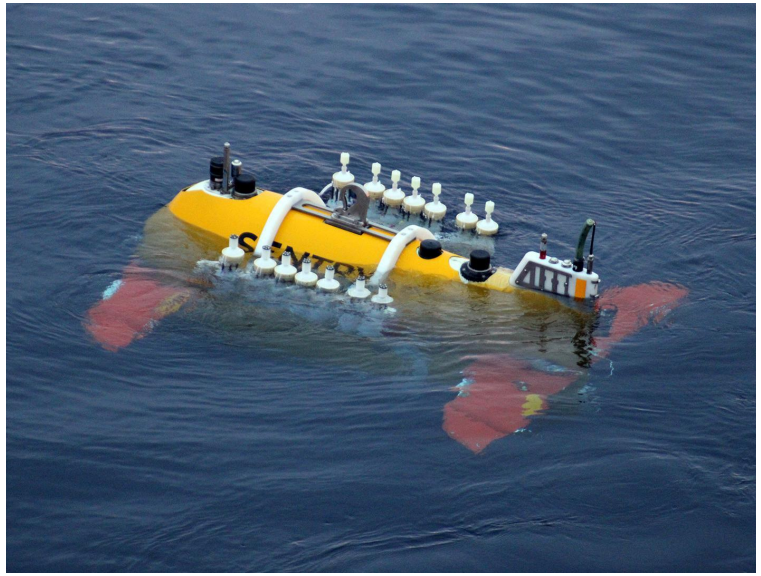
	Two bays typically used		Two open payload bays	
	Bay 1	Bay 2	Bay 3	Bay 4
	Exists	Proposed Mod	Dev: Incubation	Proposed
	Particles	Particles	Whole Water	Whole Water
	(~150 L)	(~20 L)	(~250 mL)	(~500 mL)
Media	0.2 um PES 142 mm	GF/F (47 mm)	bags	-
	Proteomics	POC		DIC
	Metagenomics		See Moore	
	Transcriptomics		OT43A-06	Nutrients
	Part. Metals			Dissolved O2
				pH
Samples	10	10	3 (6 reps)	
	up to 18	up to 18		up to 18

Breier et al. Deep Sea Research 2014, Breier et al Science Robotics 2020

Sentry + Sampling: enables high resolution regional scale biogeochemical studies







- Makes the SUPR sampling instrument from *Clio* useable on *Sentry* (see OT11A-06)
- Enables similar sampling with greater spatial control
- Greater degree of targeting within a smaller region (see German OB41C-08)

Breier et al. 2014, 2020; Valentine et al. 2016;
Hydrothermal Estuaries Cruise (German, Toner, Fitzsimmons, Xu, Breier)

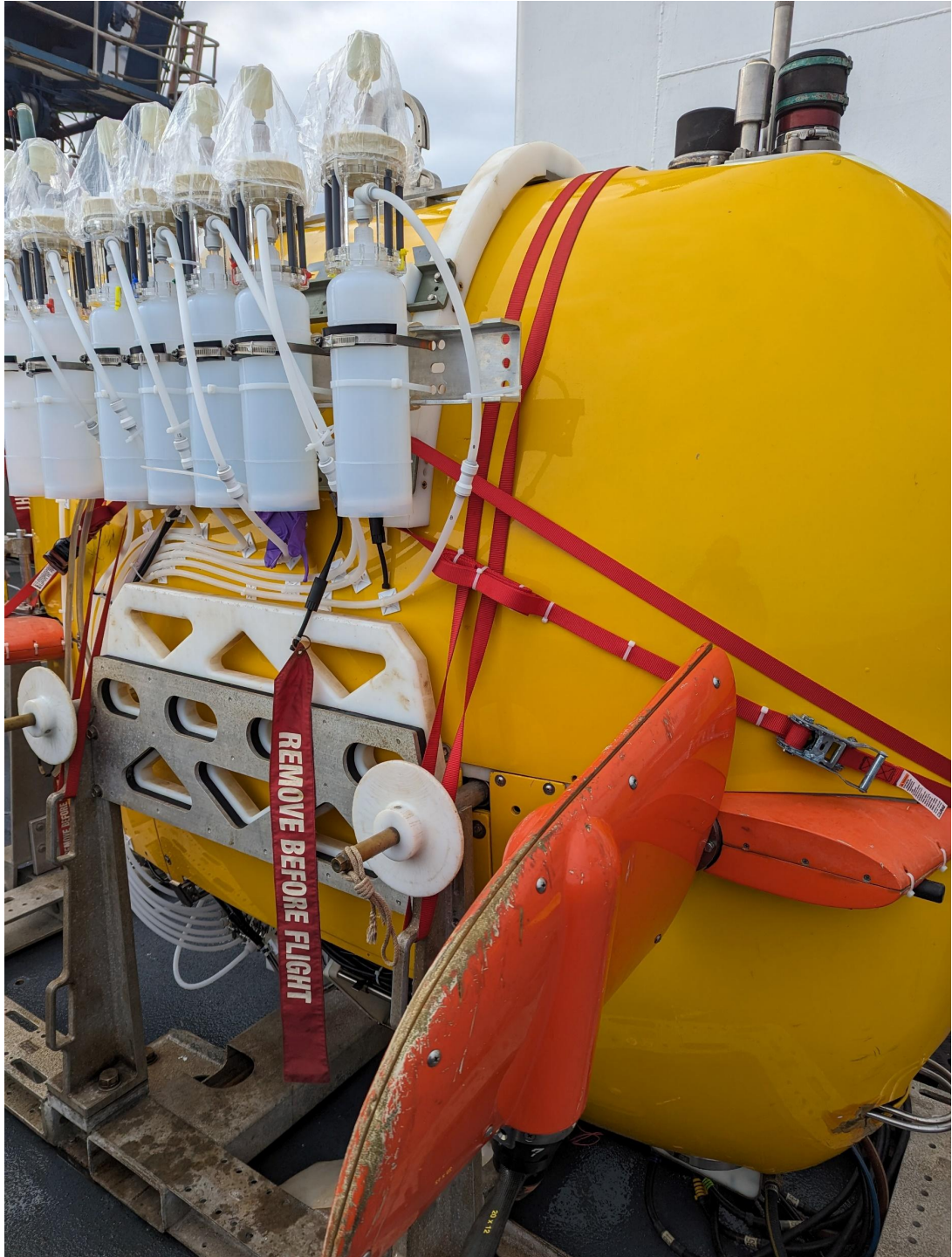
Sentry: Targeting Discrete Features in the Deep-Sea

Sentry + SUPR Capabilities:

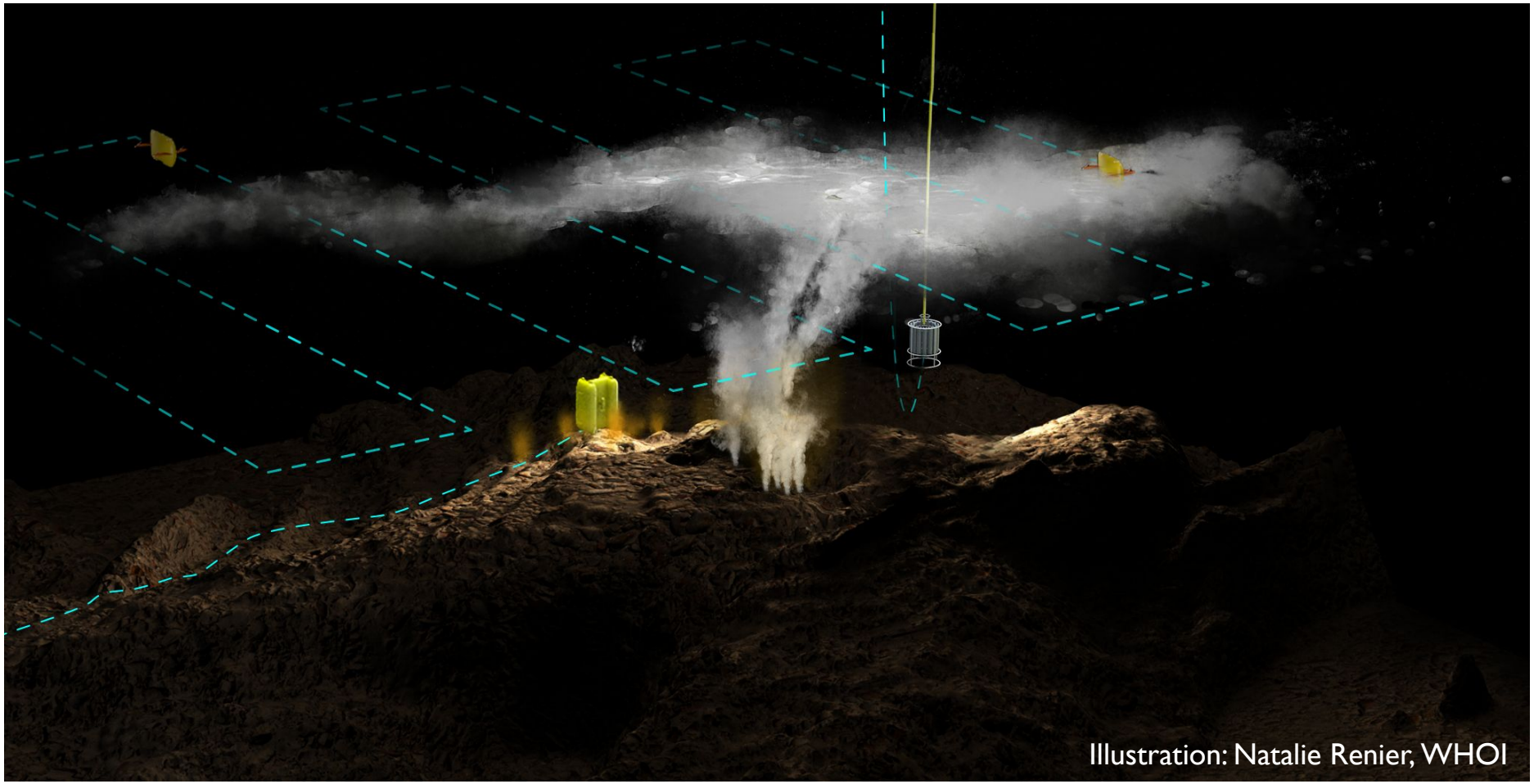
- ❑ Core: increase observational capacity
- ❑ Core: dissolved and particle phase samples
- ❑ Core: 14 (up to 18) sample sets per dive
- ❑ Core: modes of control: time-series, waypoint based, acoustic remote control
- ❑ Future: adaptive sampling

Sentry + SUPR Stats:

- 2 cruises:
- Santa Barbara Basin (Valentine lead)
- Hydrothermal Estuaries, Juan de Fuca Ridge (C. German lead)
- Hydrothermal Estuaries: 5 dives
- 70 sample sets collected



Robotically Enabled Studies to Target Biogeochemical Hotspots and Processes



Conclusions

- Many ecologically and biogeochemically relevant parameters require returned samples for analysis
- For many applications, the samples require filtering large volumes of seawater
- The tools to do this are mature with numerous uses on:
  - ROVs Jason and Hercules
  - Nereus
  - AUVs: Clio (50 dives) and now Sentry.
- They have the potential to expand the user base of these robotic platforms to new communities
- These tools are ready for further extension through:
  - fusion with sensor-driven adaptive sampling
  - autonomous mission planning techniques
  - and use by members of the community

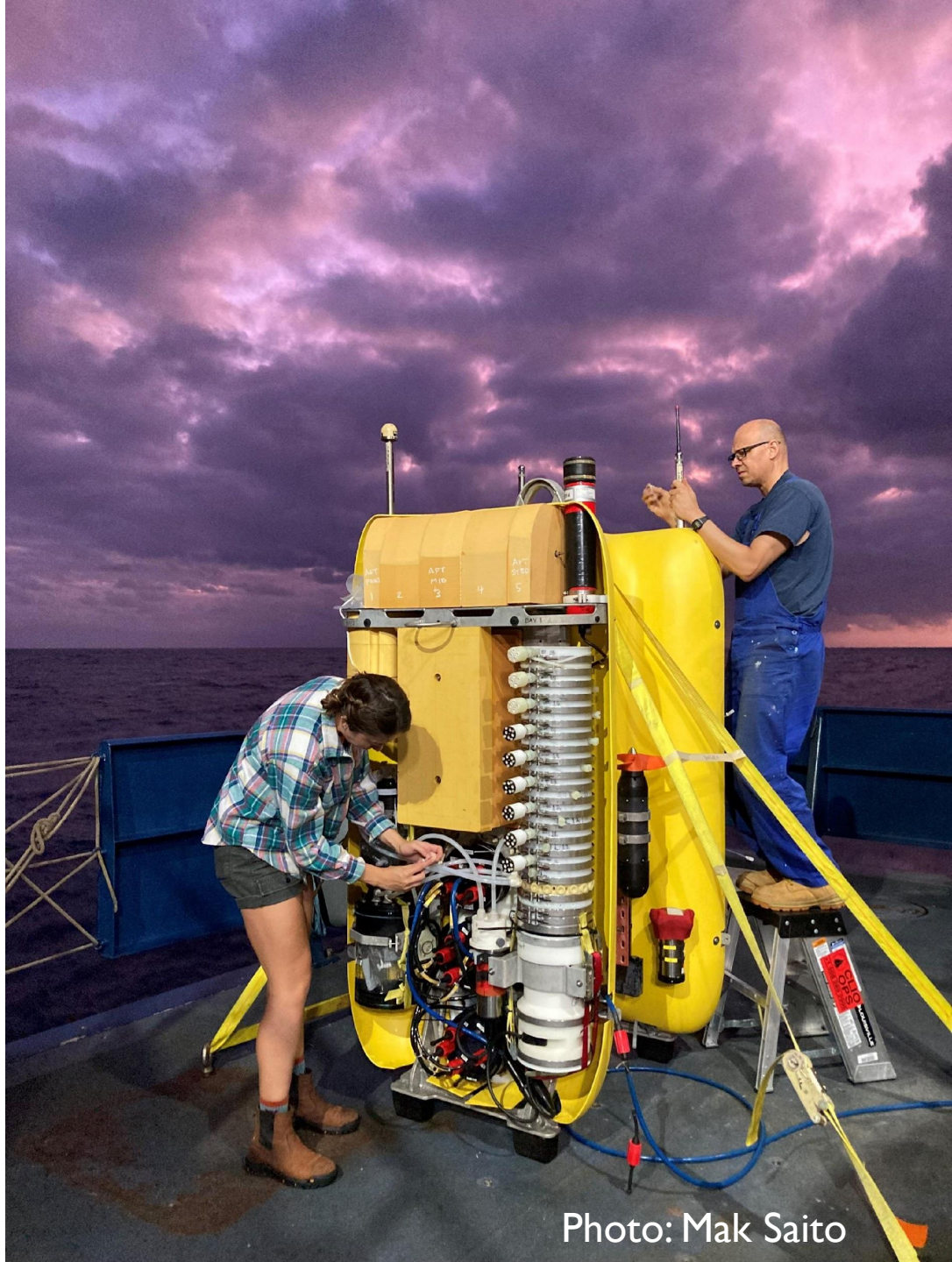
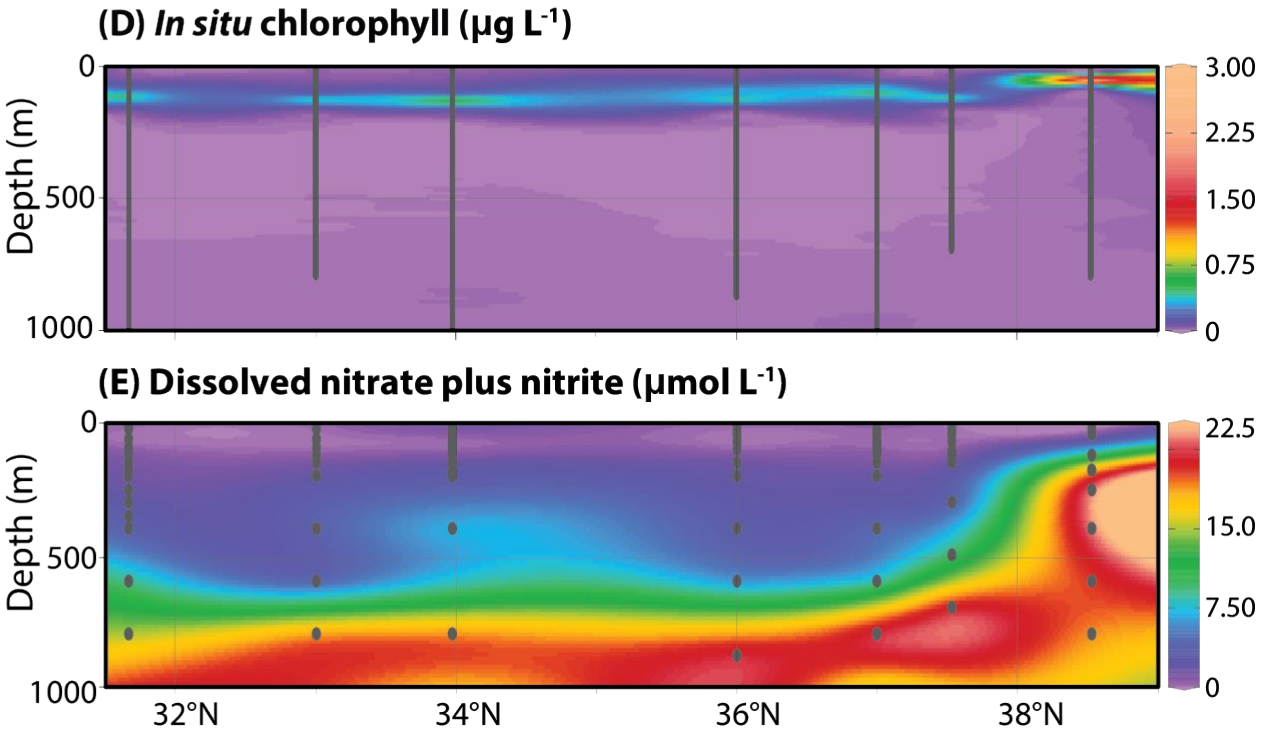


Photo: Mak Saito

Supplemental Slides Follow

Clio: designed for basin scale biogeochemical and biochemical sectional studies



Breier et al 2020; Cohen et al. submitted, Saito et al. 2017; Jakuba et al. 2018

Bermuda: Woods Hole (Saito, Breier, Jakuba, Johnson)

CliOMZ (Santoro, Saito, Breier, Jakuba)