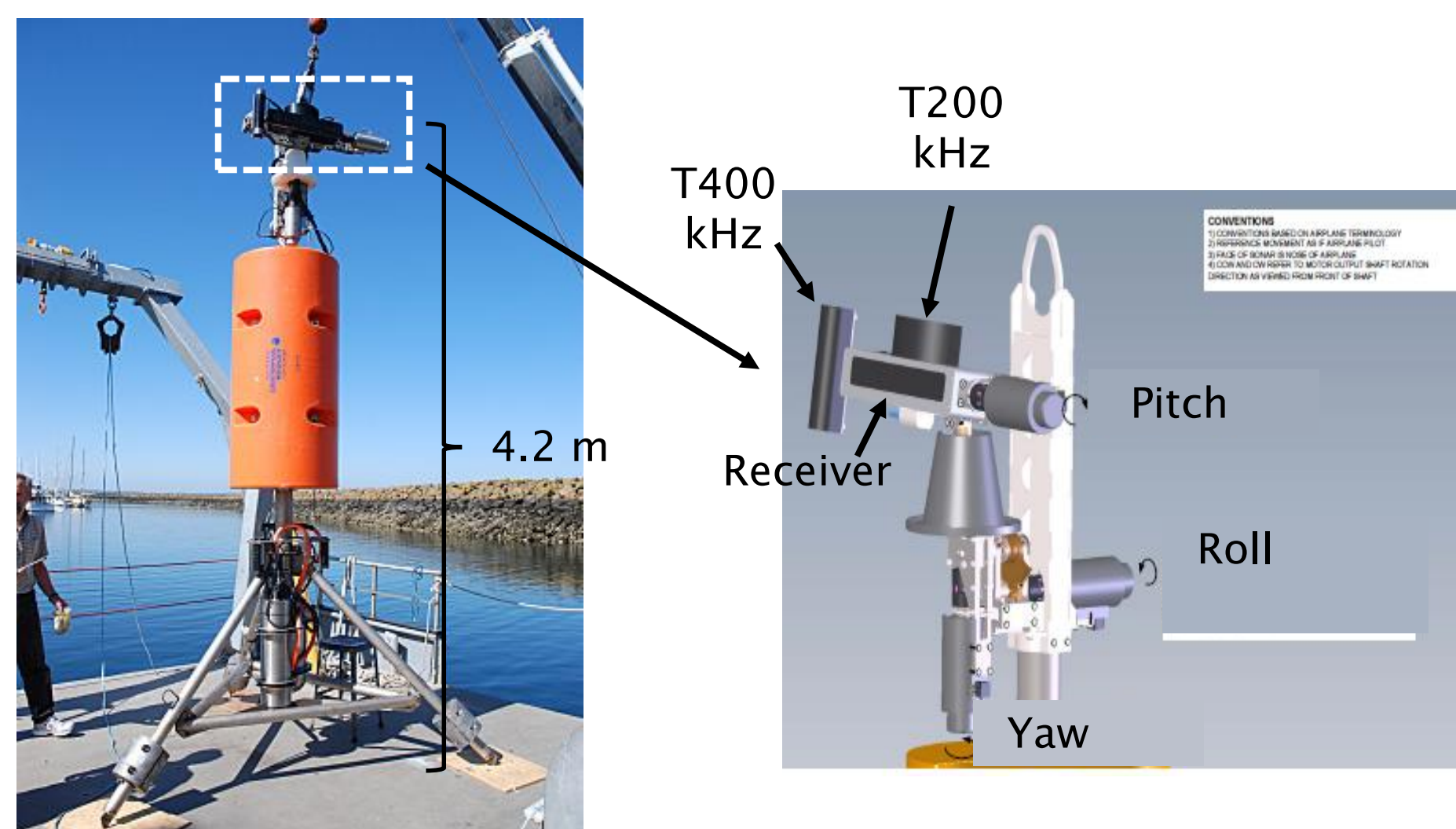
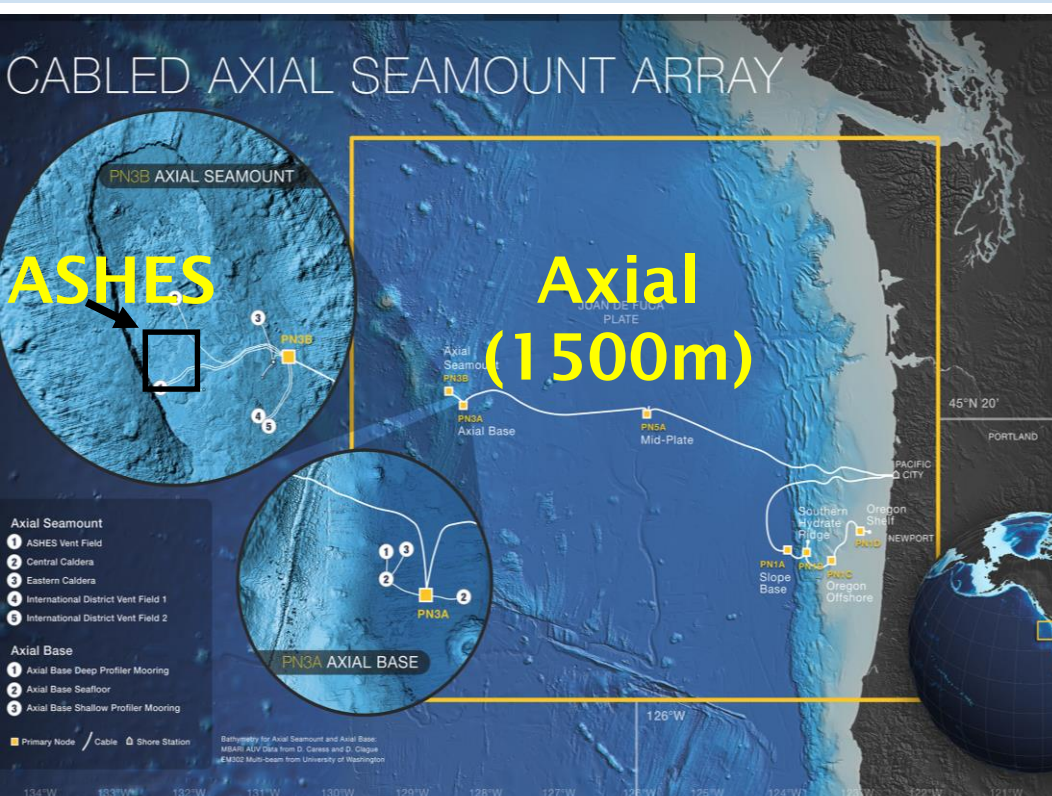


Cabled Observatory Vent Imaging Sonar (COVIS)

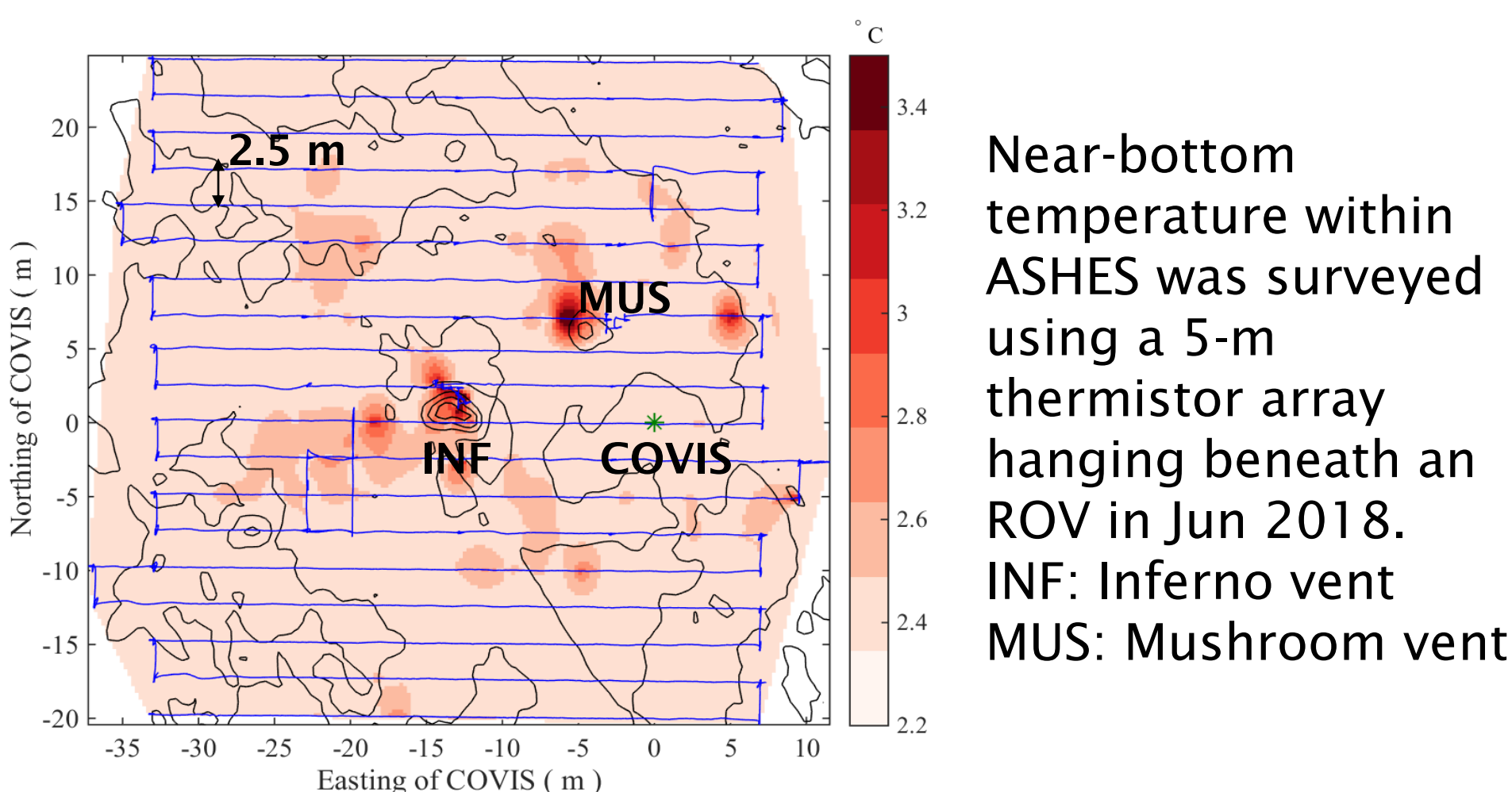
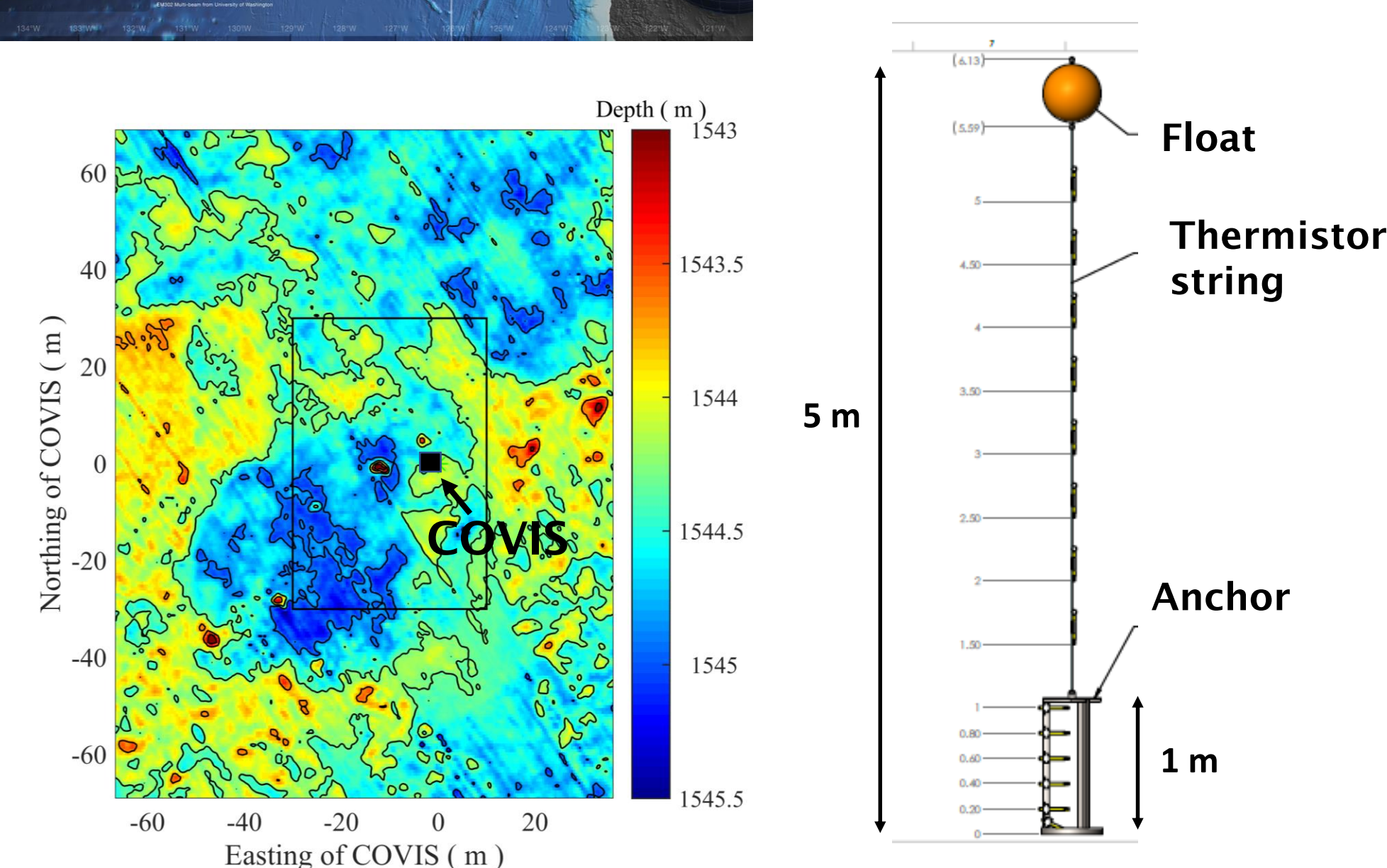


Dual frequencies: 200 kHz and 400 kHz.
Sonar orientation adjustable in three dimensions

COVIS Field Operations Summer 2018 at ASHES, Axial Seamount



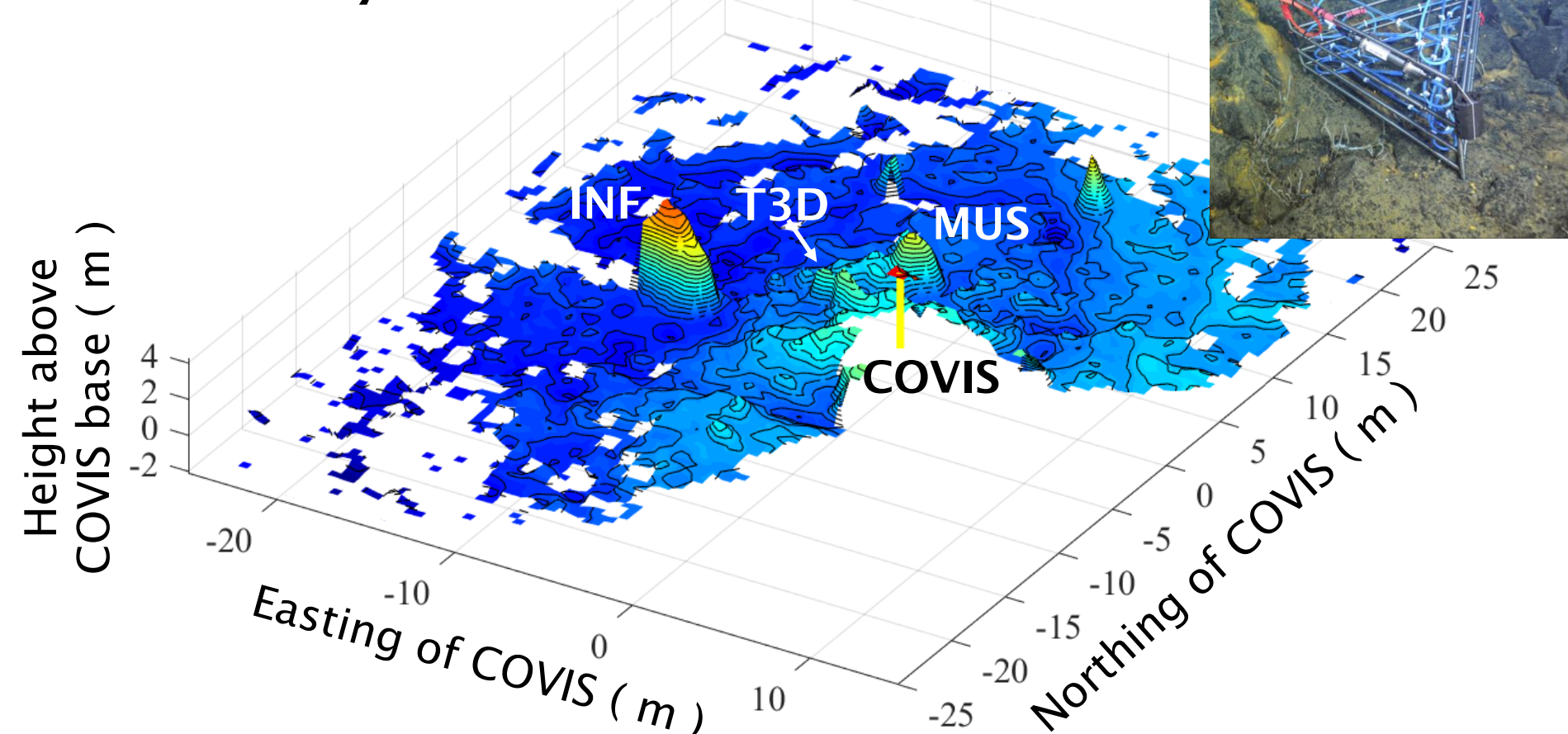
COVIS was connected to the Ocean Observatories Initiative's Regional Cabled Observatory (OOI-RCA) at ASHES hydrothermal vent field on Axial Seamount in July 2018.



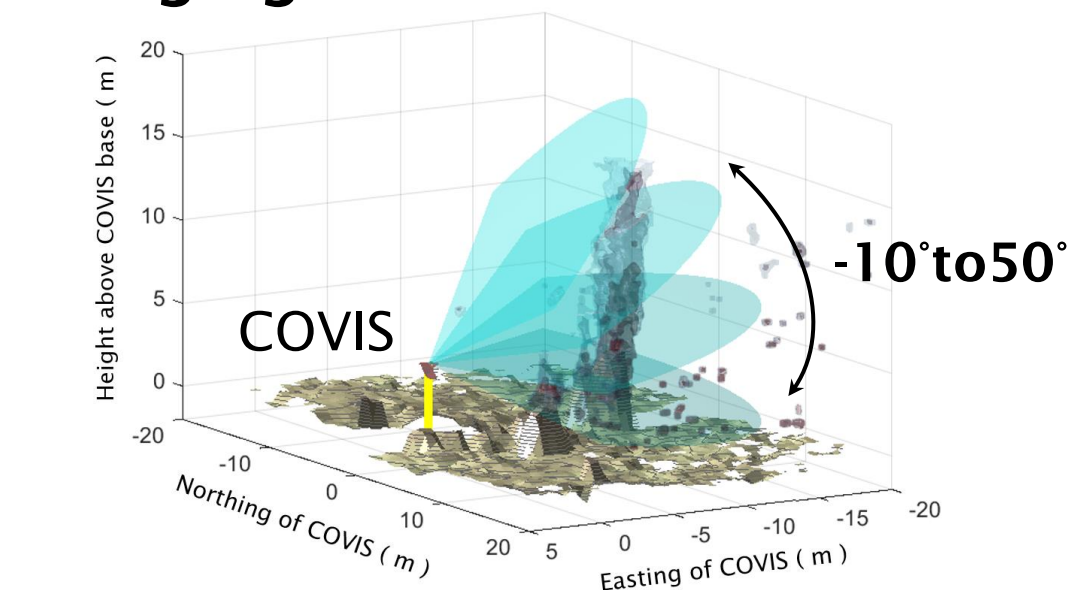
Near-bottom temperature within ASHES was surveyed using a 5-m thermistor array hanging beneath an ROV in Jun 2018.
INF: Inferno vent
MUS: Mushroom vent

COVIS Data Collection and Analysis

Seafloor Topography Measured by COVIS

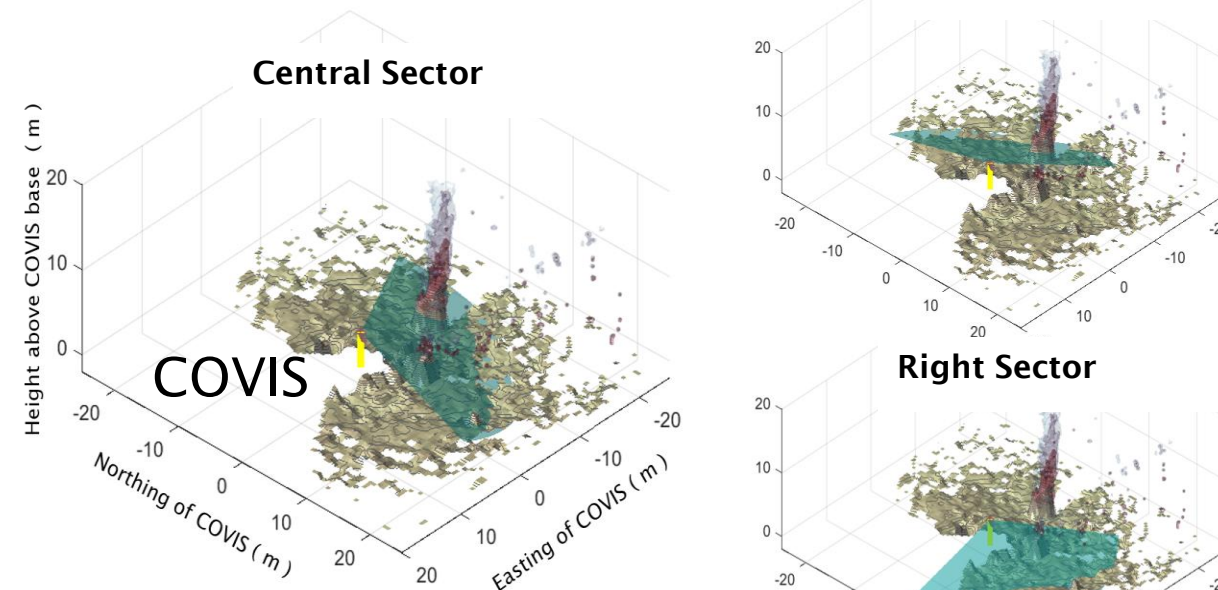


Imaging Mode

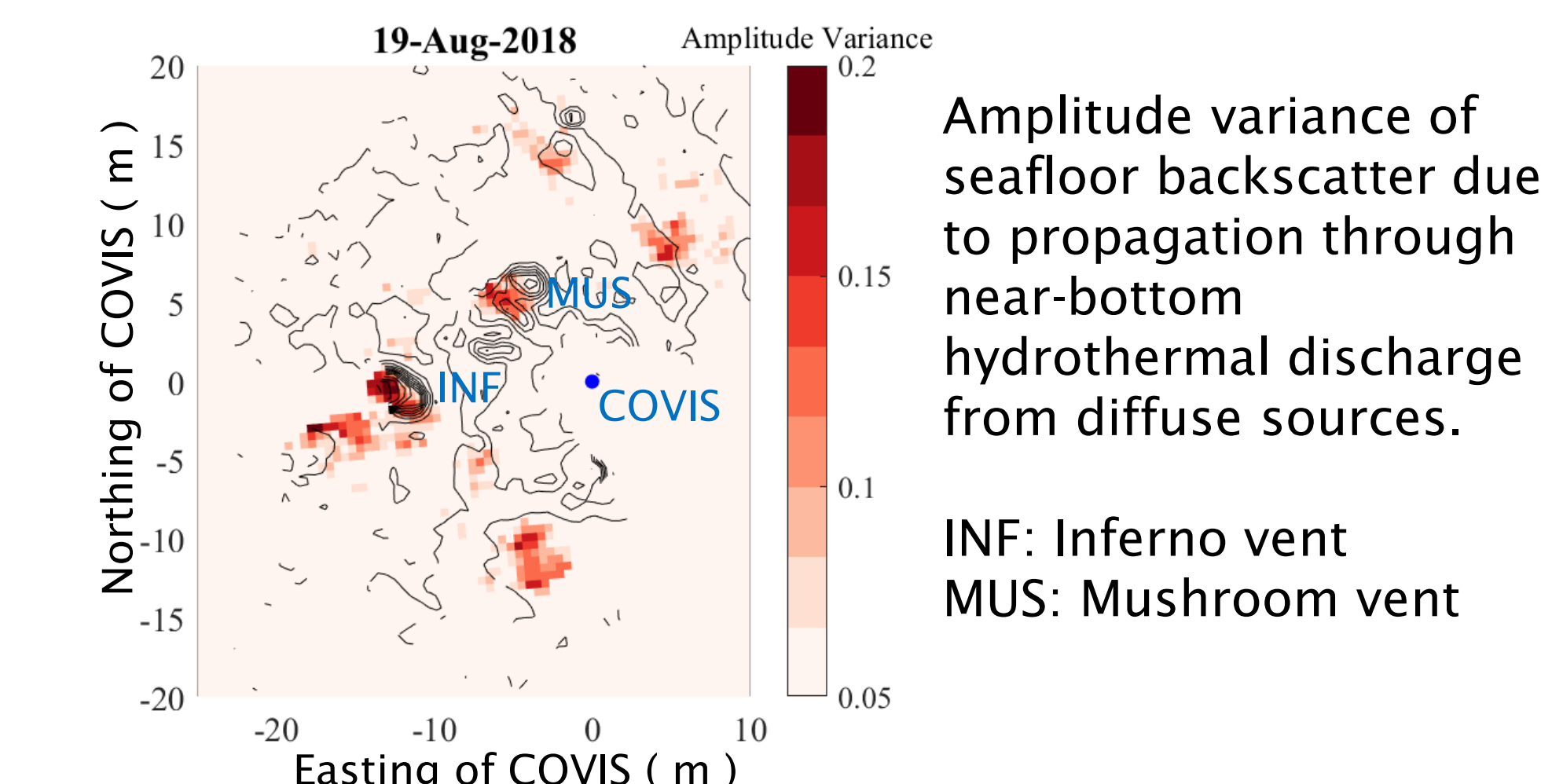
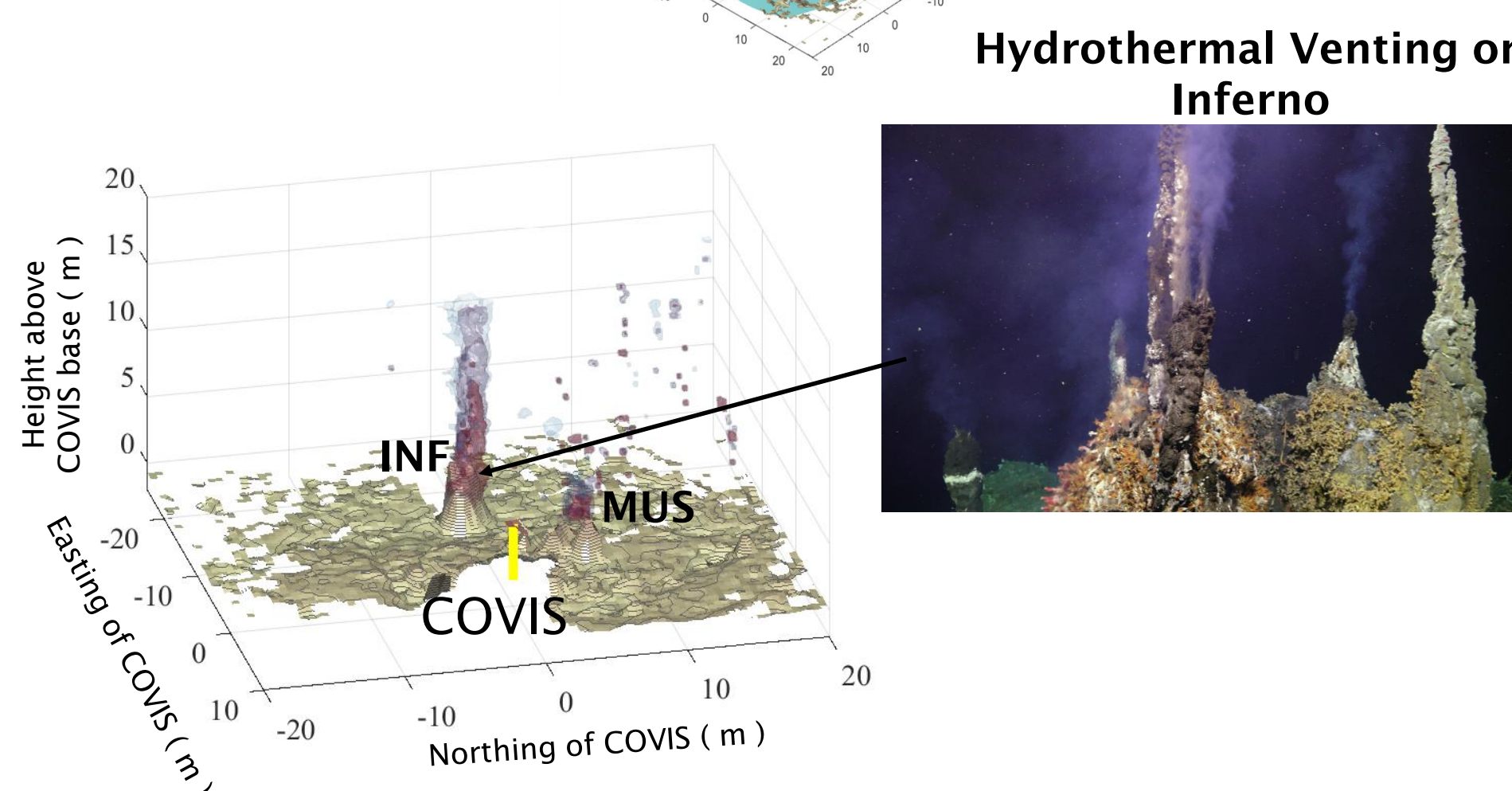


INF: Inferno vent
MUS: Mushroom vent
T3D: 3D Thermistor Array

Diffuse Mode



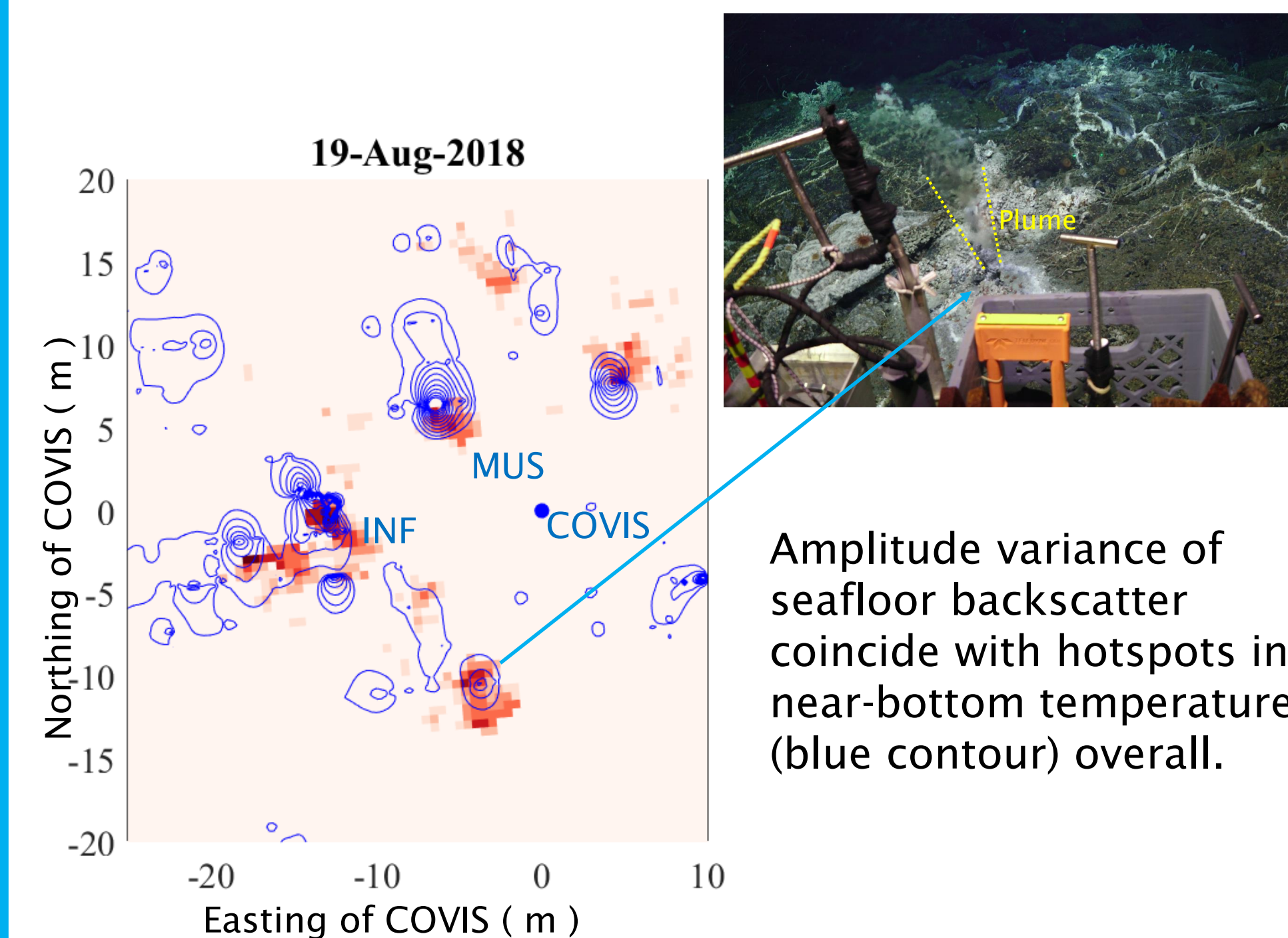
COVIS operates alternately in Imaging and Diffuse-flow modes for imaging and mapping of hydrothermal discharge from focused and diffuse sources, respectively



Amplitude variance of seafloor backscatter due to propagation through near-bottom hydrothermal discharge from diffuse sources.

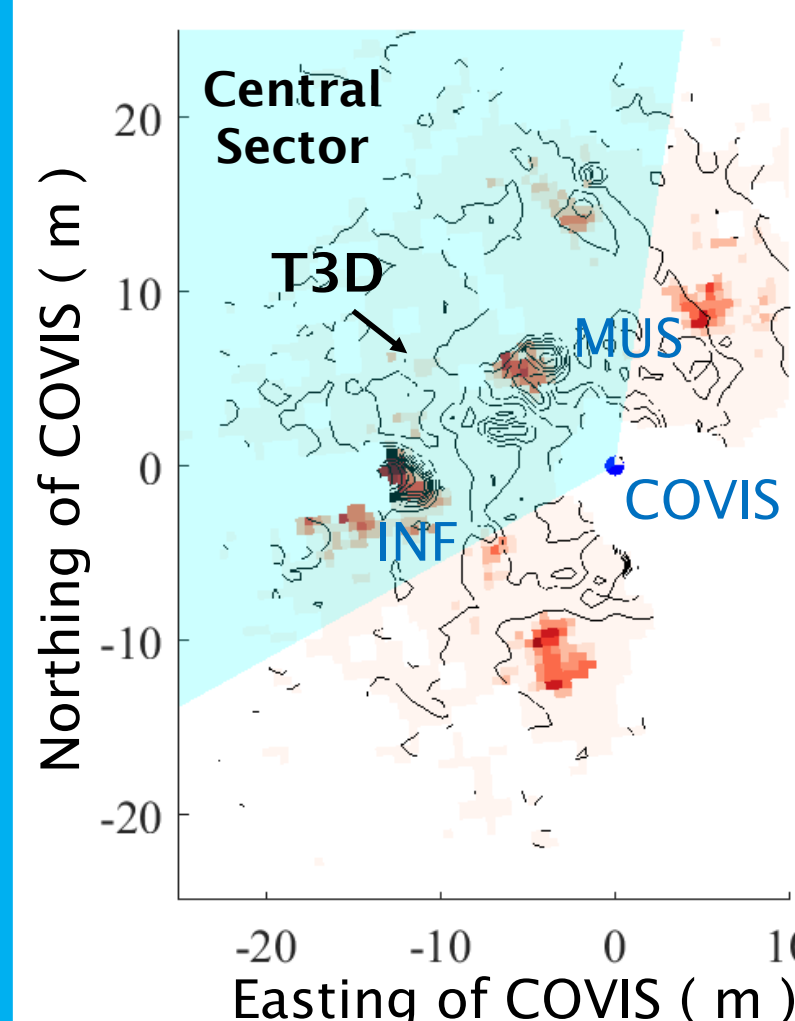
INF: Inferno vent
MUS: Mushroom vent

Comparison with Ground Truth

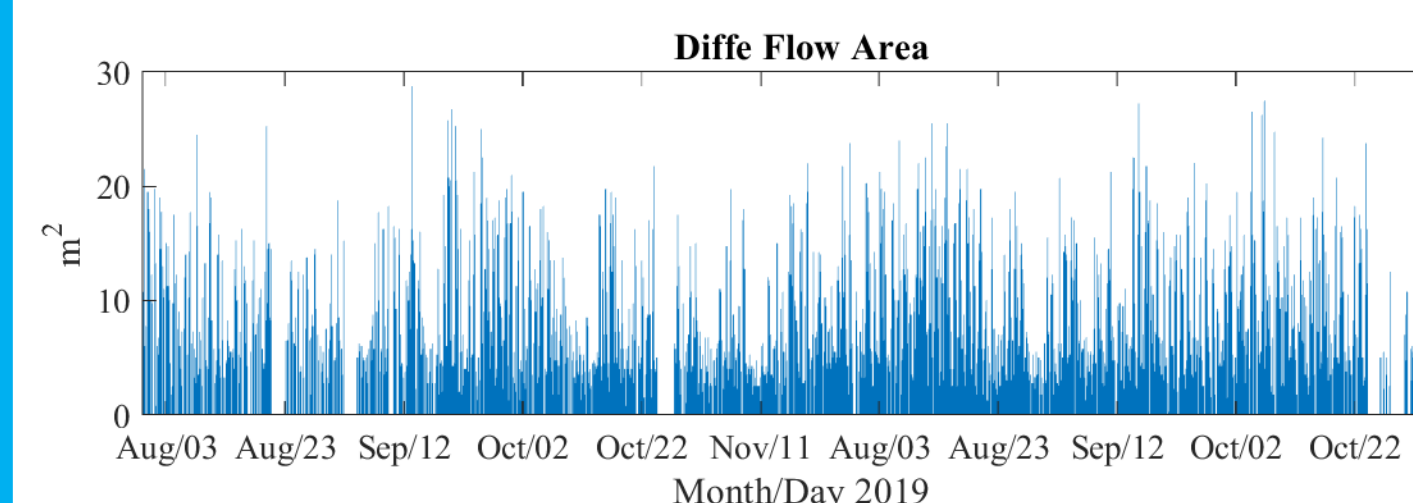


Amplitude variance of seafloor backscatter coincide with hotspots in near-bottom temperature (blue contour) overall.

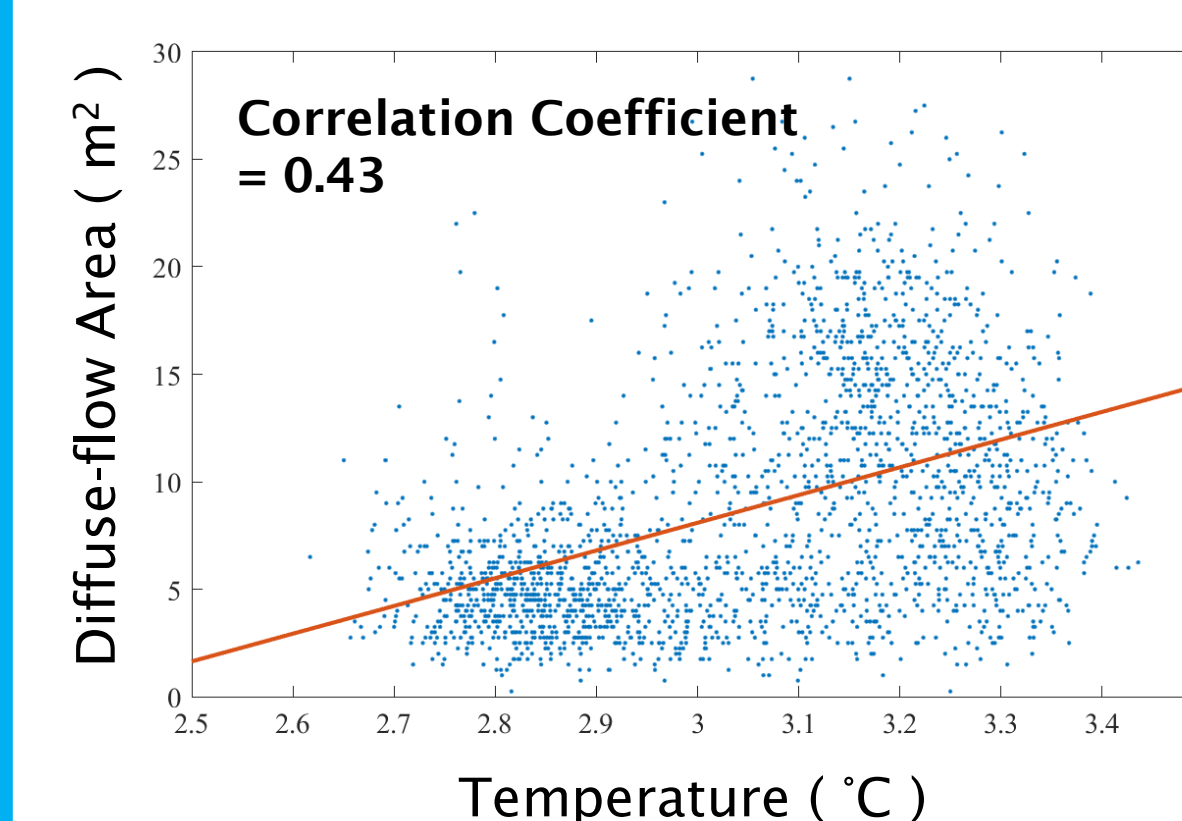
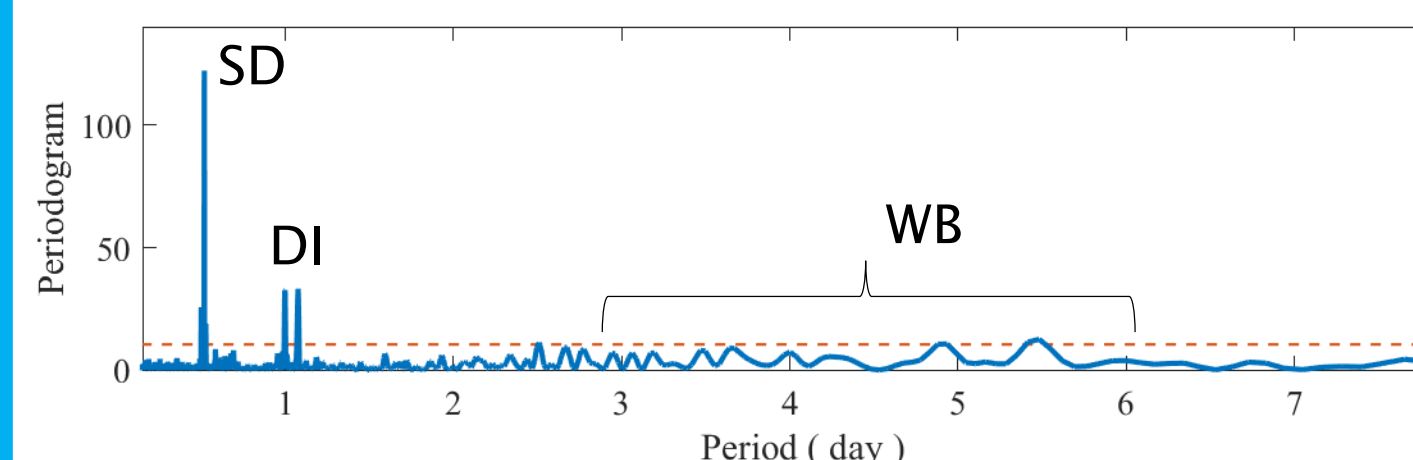
Temporal Variation of Diffuse Hydrothermal Venting at ASHES



The areal extent of discharge from diffuse sources in the central sector, determined as where amplitude variance >0.2, shows substantial temporal variations. The periodogram show significant peaks at tidal (SD, DI), and the 3-6-day weather-band (WB) periods. Seafloor pressure and bottom currents are potential sources of tidal and WB signals.



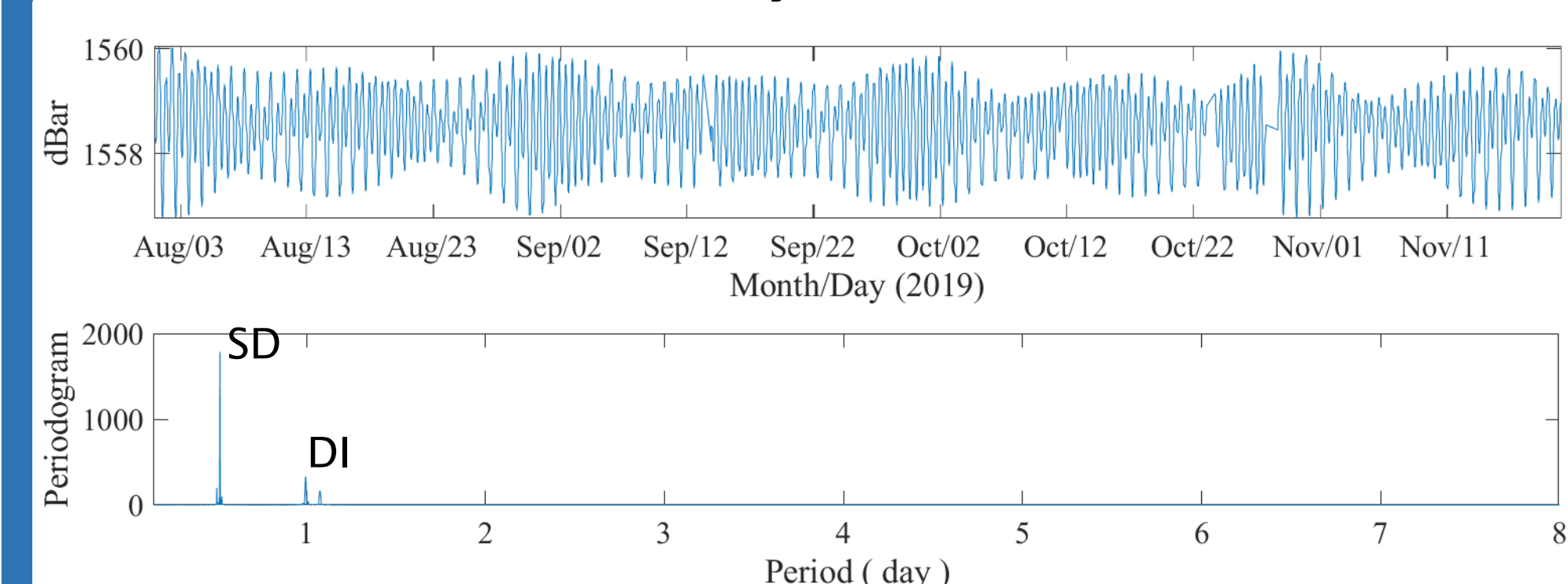
SD: Semi-diurnal
DI: Diurnal
WB: weather-band



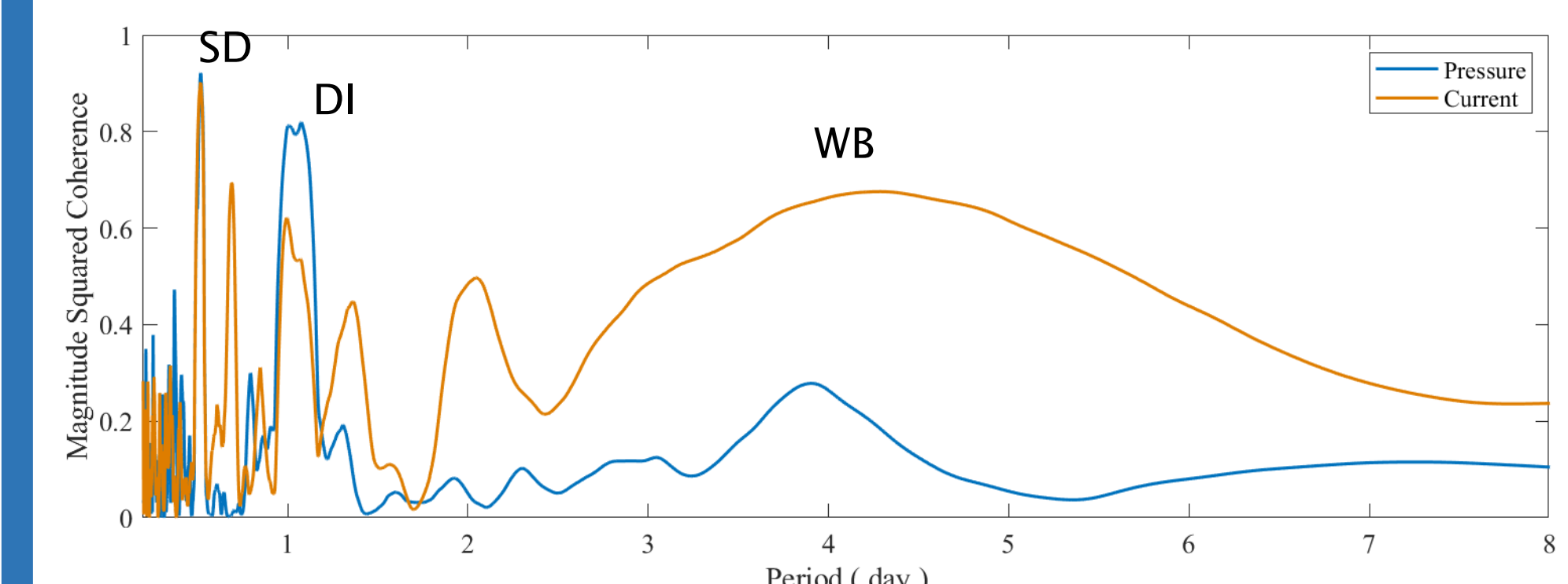
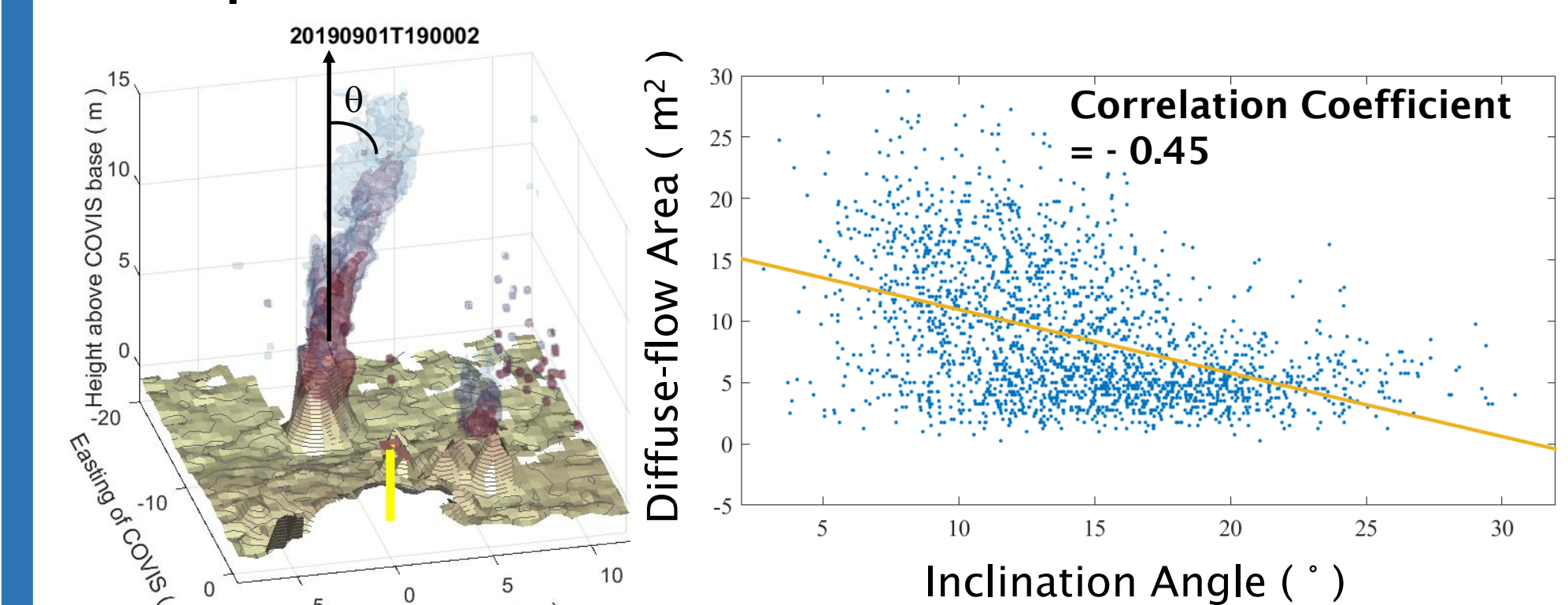
The areal extent of discharge from diffuse sources in the central sector has significant correlation with the temperature measured by the 3D thermistor array.

Source of Periodic Oscillations in Diffuse-flow Venting: Seafloor Pressure vs Bottom Currents

Seafloor Pressure Measured by CTD in ASHES

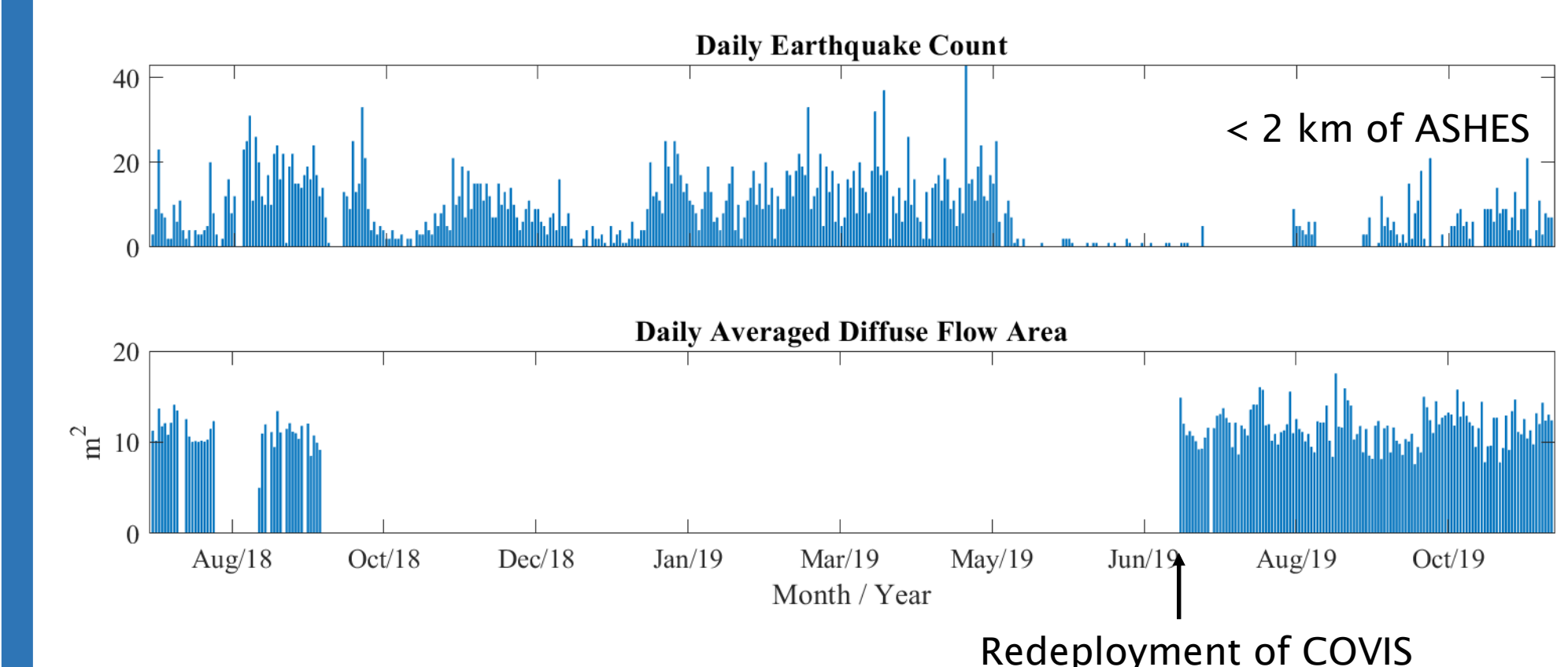


Plume Inclination Angle (θ) as a Measure of Background Flow Speed



Coherences of diffuse-flow area with measured seafloor pressure and inferred background flow speed potentially suggests both pressure and currents contribute to tidal oscillations in diffuse-flow area. Currents are the dominant source of the WB signals.

Seismicity vs Diffuse-flow Venting



Diffuse-flow venting in ASHES appears to be relatively stationary between 2018 and 2019, not responding to variation of local seismicity.