



**UCC**

Coláiste na hOllscoile Corcaigh, Éire  
University College Cork, Ireland



*Marine Institute*  
*Fóras na Mara*



**National Oceanography  
Centre, Southampton**

UNIVERSITY OF SOUTHAMPTON AND  
NATURAL ENVIRONMENT RESEARCH COUNCIL



**NATIONAL  
GEOGRAPHIC**

# **Smoking chimneys: the newly discovered Moytirra hydrothermal vent, mid-Atlantic Ridge**

**Dr. Andy Wheeler, University College Cork, Ireland  
Dr. Bram Murton, NOCS, UK  
& the VENTuRE survey scientific team**

# Irish-British multidisciplinary expedition

## Partner institutes:

Uni. Coll. Cork (IRE)

Nat. Uni. Ire, Galway (IRE)

Geol. Surv. Ireland (IRE)

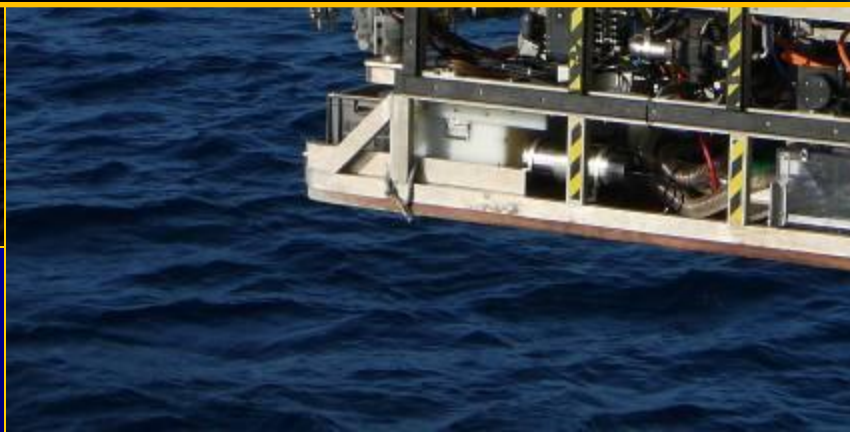
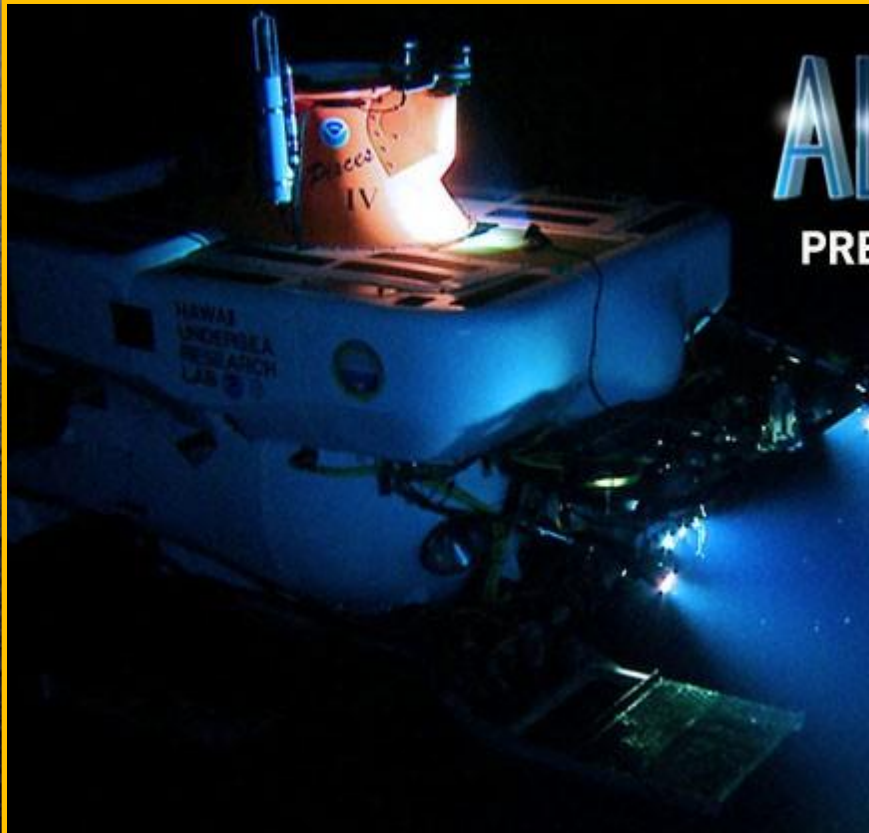
Nat. Oceanog. Centre (UK)

Uni. Southampton (UK)

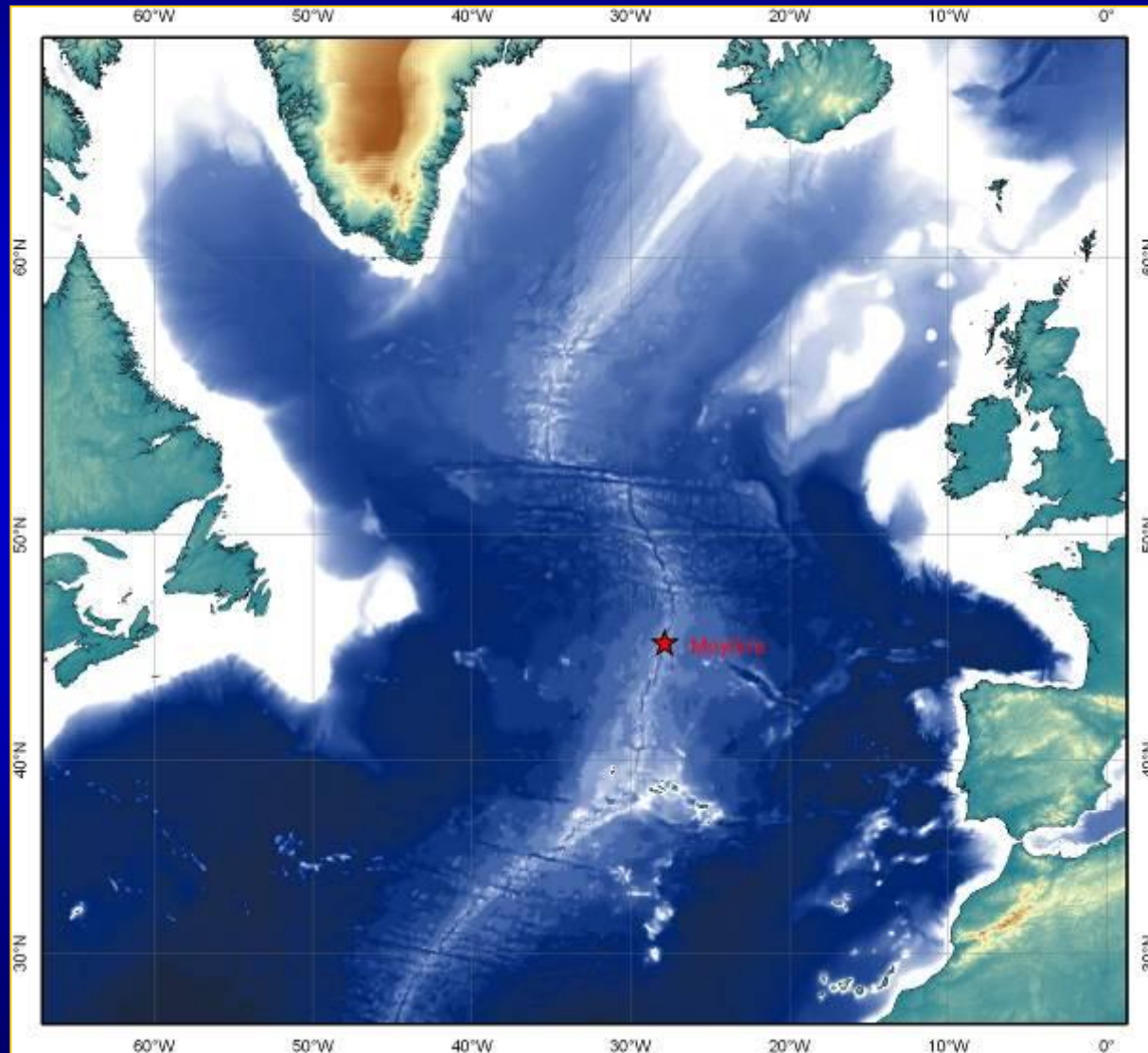


# ALIEN DEEP

PREMIERES SUN SEP 16 at 7P



# A new discovery 3000m deep in the middle of the Atlantic

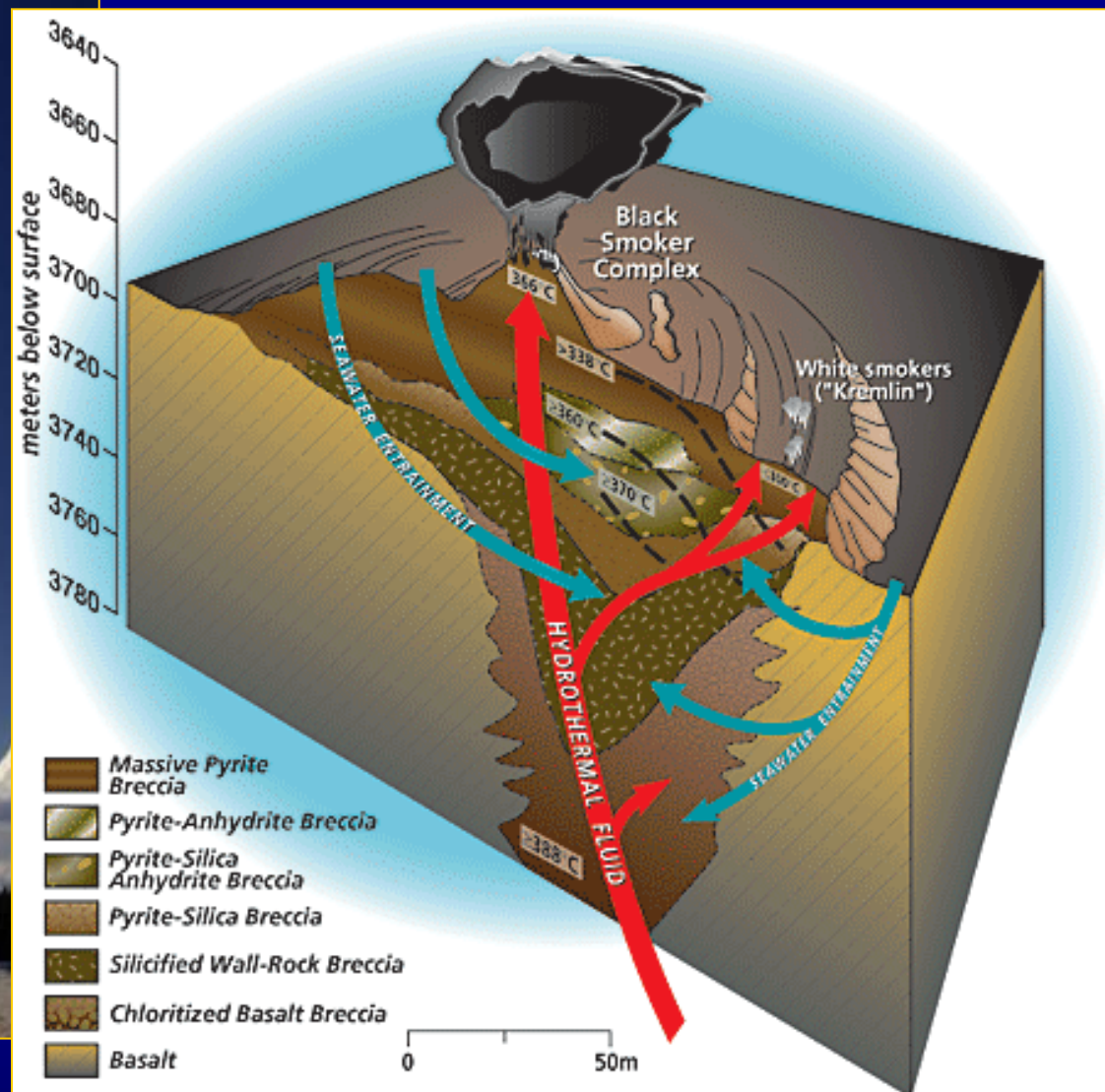


# Motivation

The background image shows a deep-sea hydrothermal vent field. A diver in a white wetsuit is visible in the upper center, looking down at the seafloor. The seafloor is covered in dark, mineral-rich structures, likely hydrothermal vents, with some lighter-colored mineral deposits. The overall scene is dimly lit, typical of an underwater environment.

- to discover the only known vent field between Azores and Iceland
- to test vent biogeography models
- and explore the relationship of hydrothermal fluid venting to volcanic and tectonic structures.

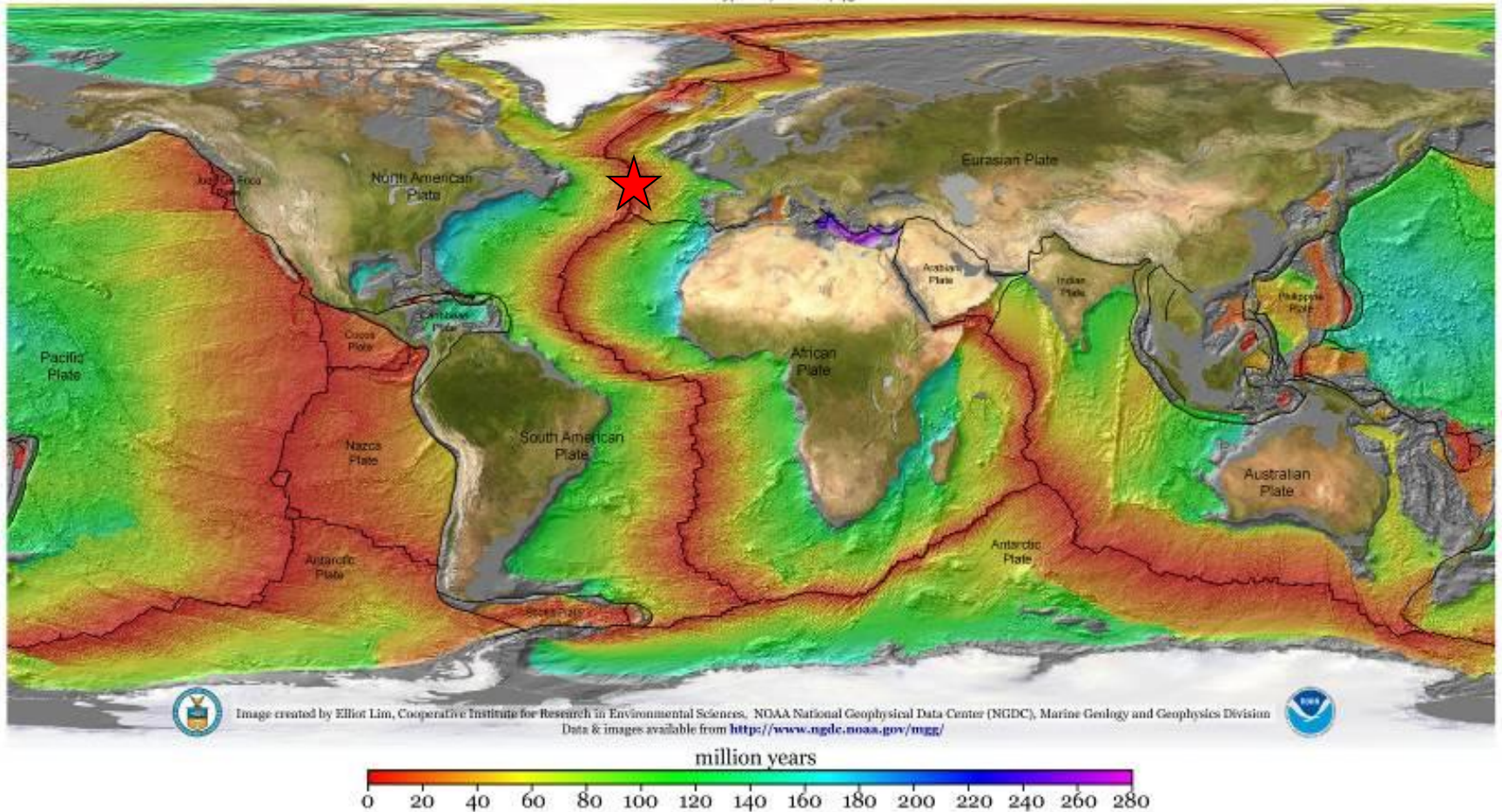
# Hydrothermal vents or "black smokers"



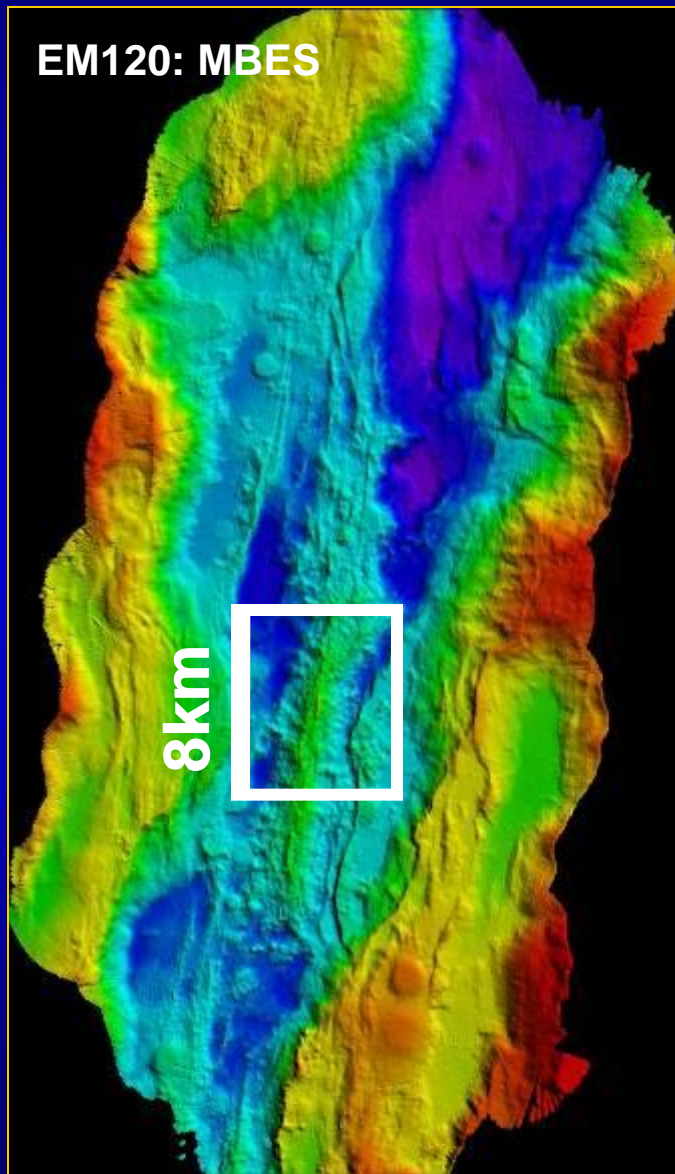
# Age of Oceanic Lithosphere (m.y.)

Data source:

Muller, R.D., M. Sdrolias, C. Gaina, and W.R. Roest 2008. Age, spreading rates and spreading symmetry of the world's ocean crust, *Geochem. Geophys. Geosyst.*, 9, Q04006, doi:10.1029/2007GC001743.



# AVR: dominated by hummocky pillow lavas and faults

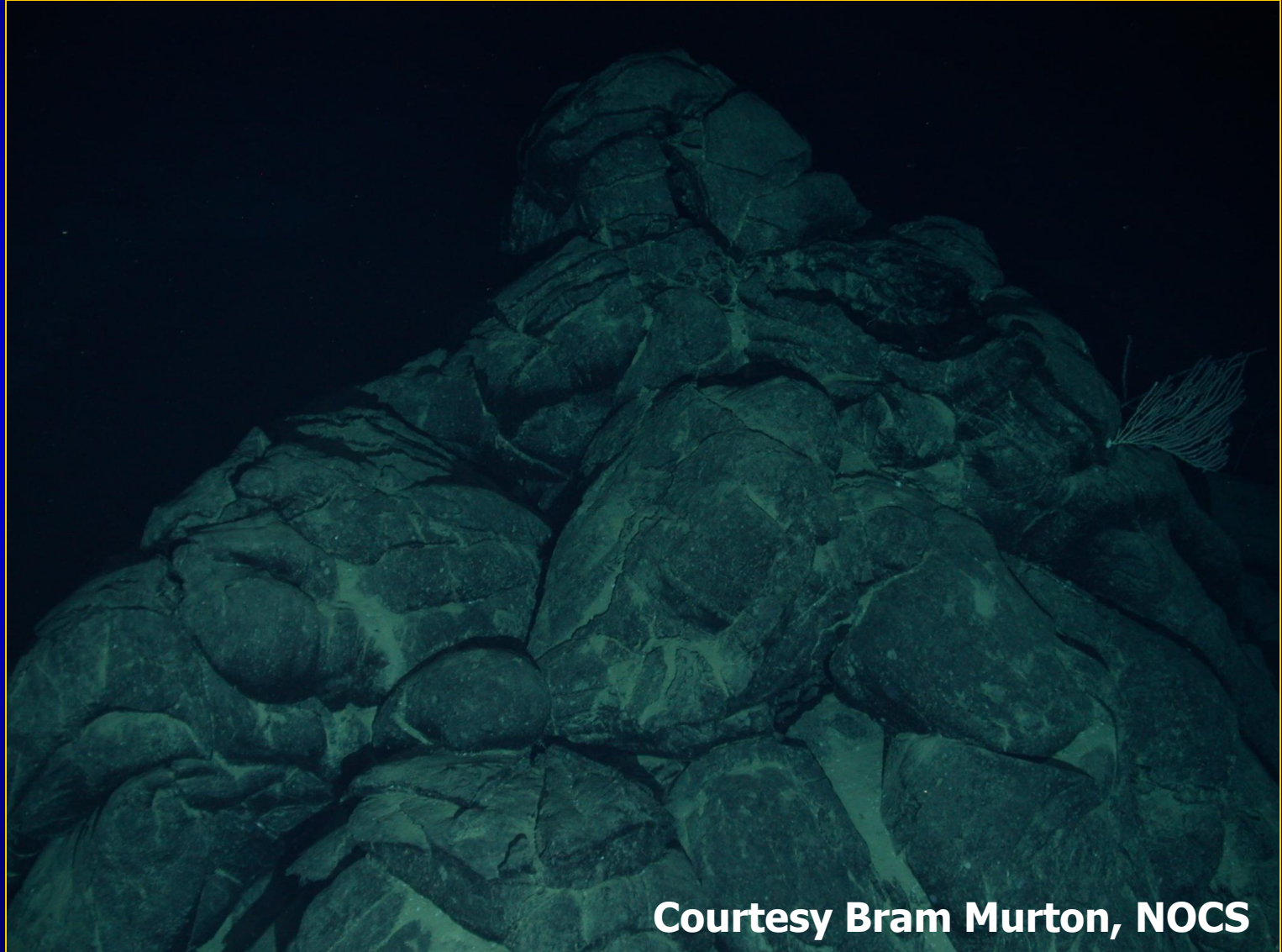


Courtesy Bram Murton, NOCS



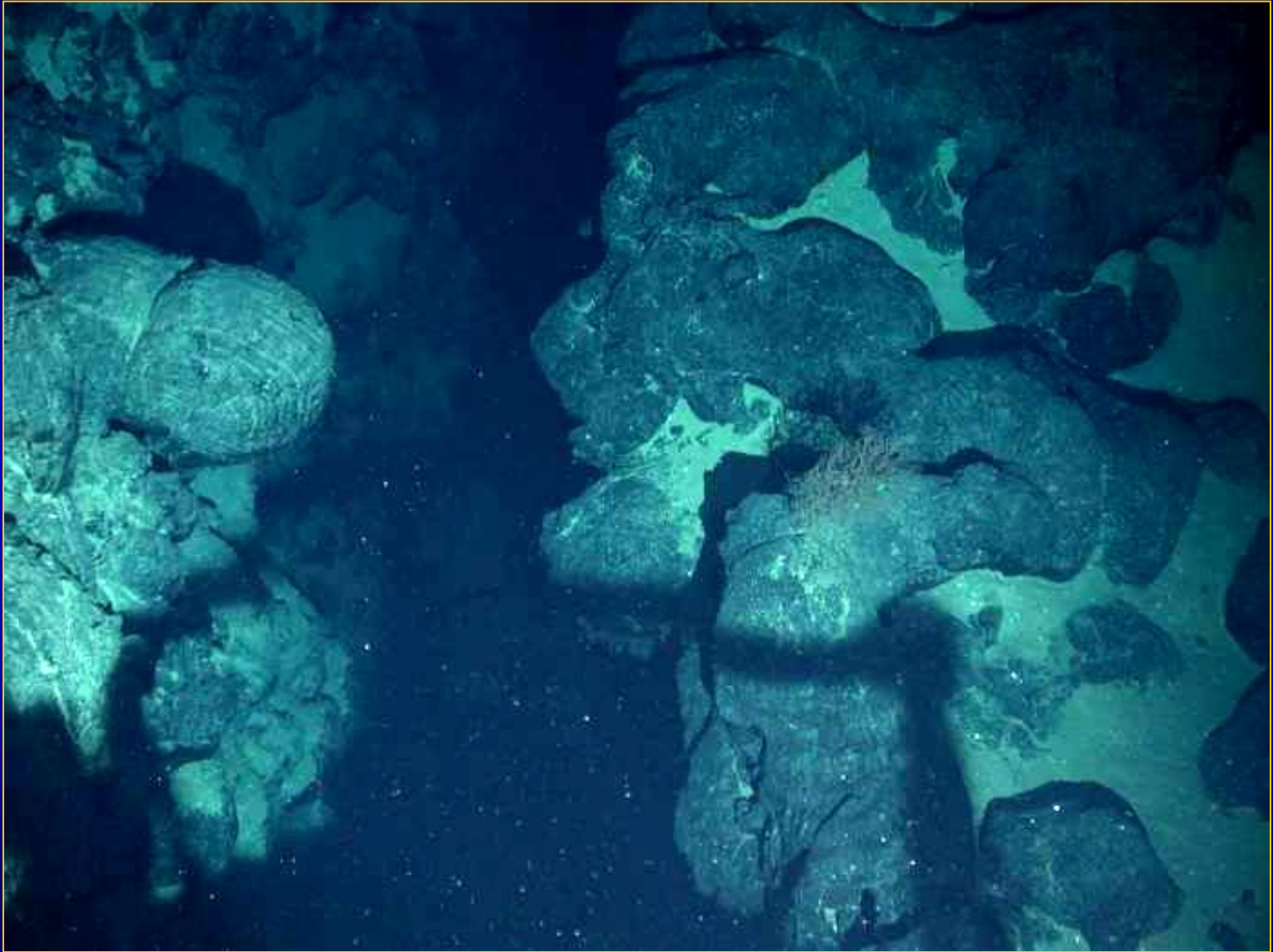
# AVR crest: conical pillow lava volcanoes

Primary eruptive slopes often exceeds  $60^\circ$



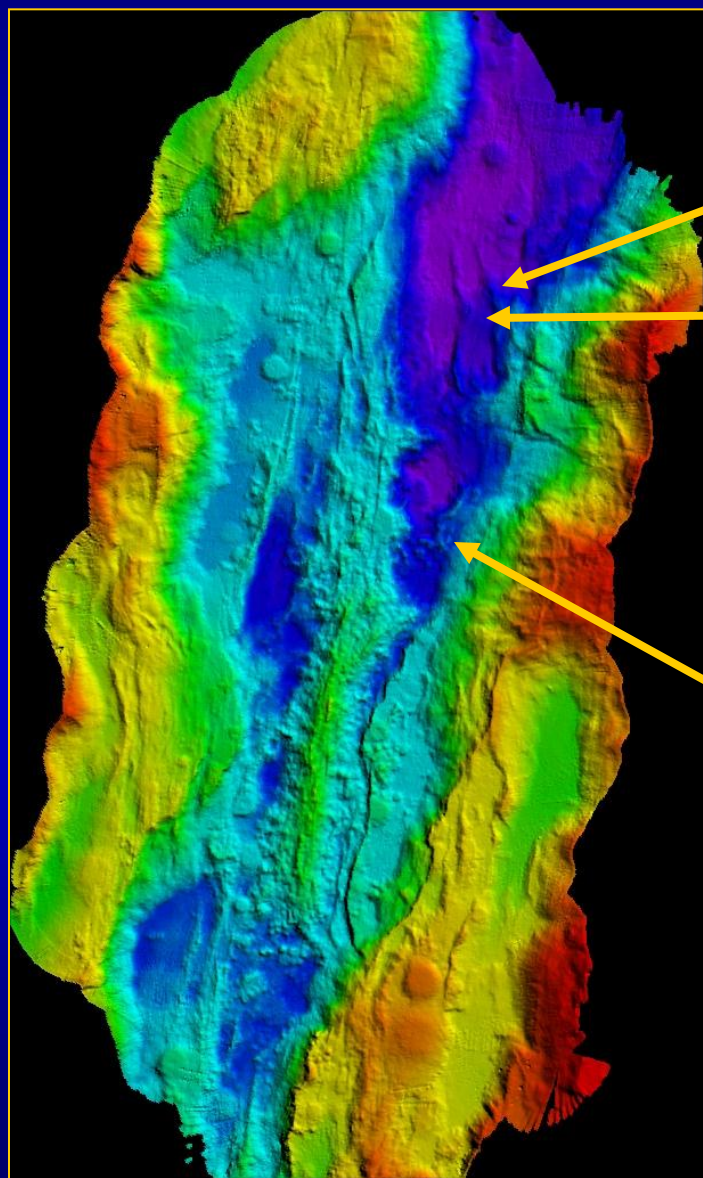
Courtesy Bram Murton, NOCS

# AVR crest: rifting and eruptions

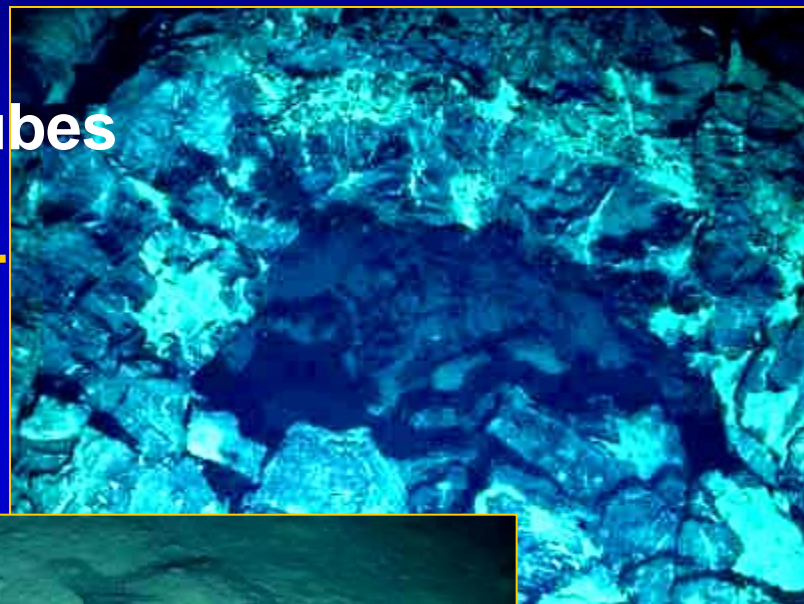


Courtesy Bram Murton, NOCS

**Lava tubes feed the massive flows that and cover the axial floor and onlap the AVR flanks.**



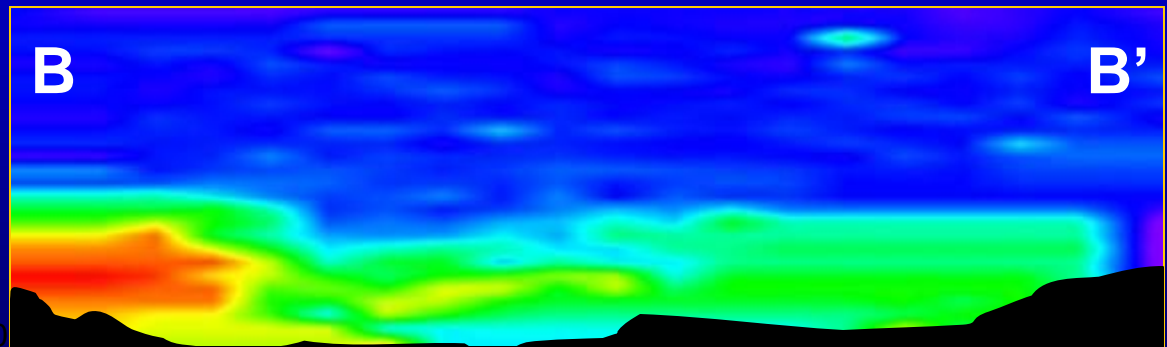
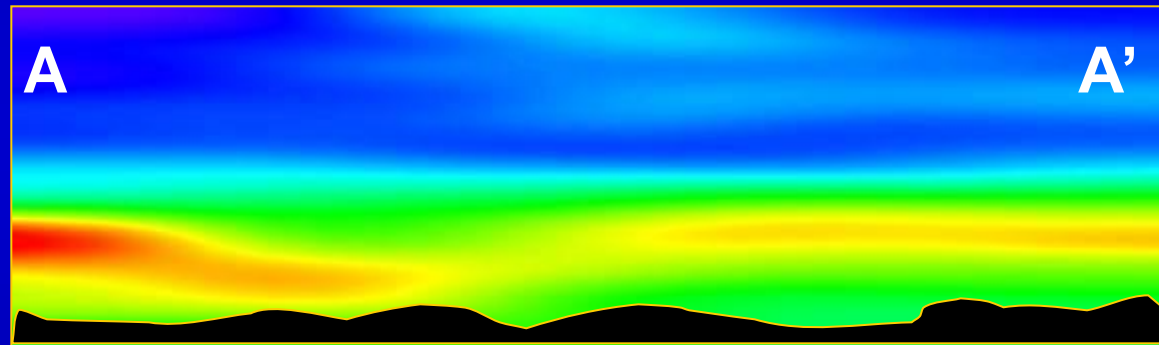
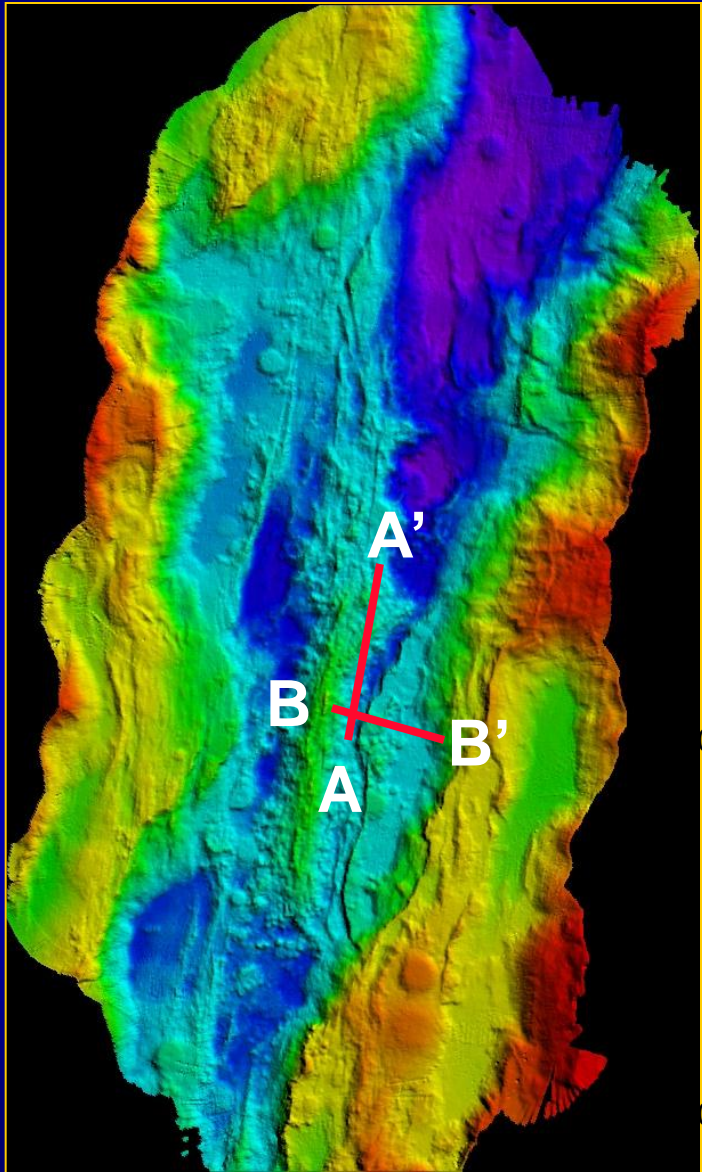
**Lava tubes**



**Courtesy Bram Murton, NOCS**

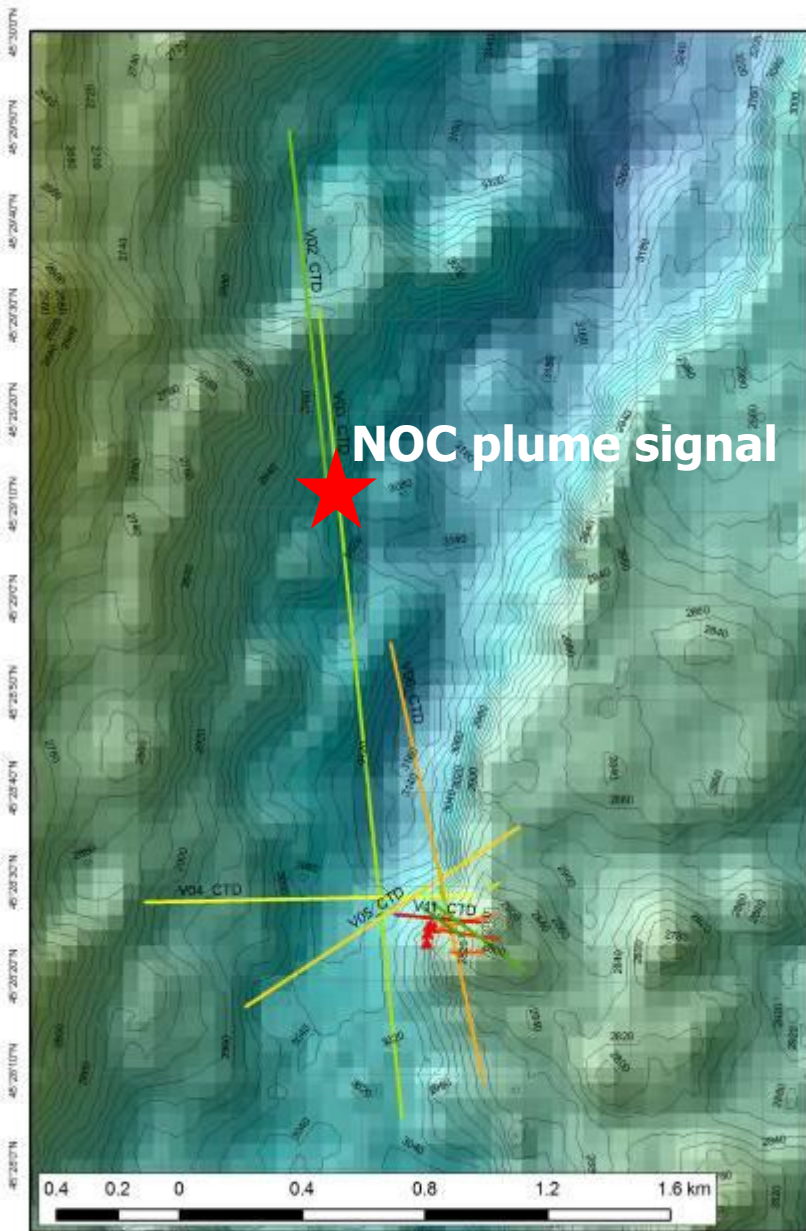
# Hunting the plume

A suspected hydrothermal plume was found over the central-eastern flank of the AVR in 2008



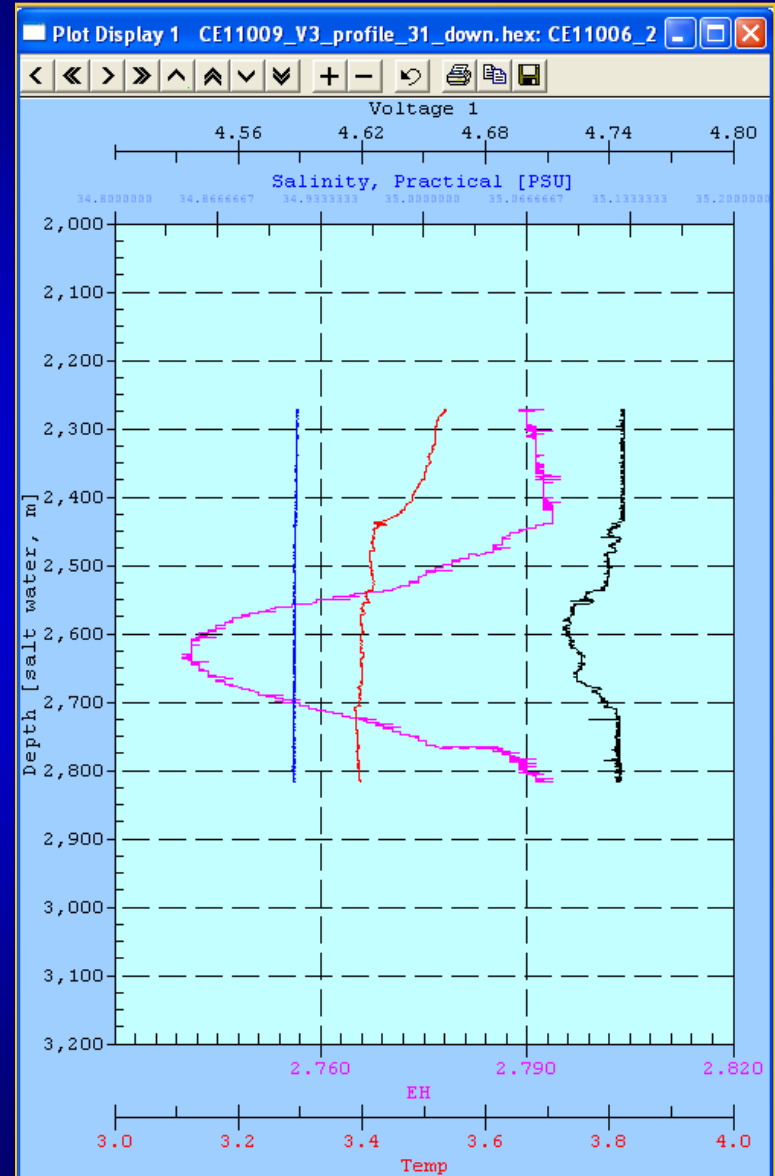
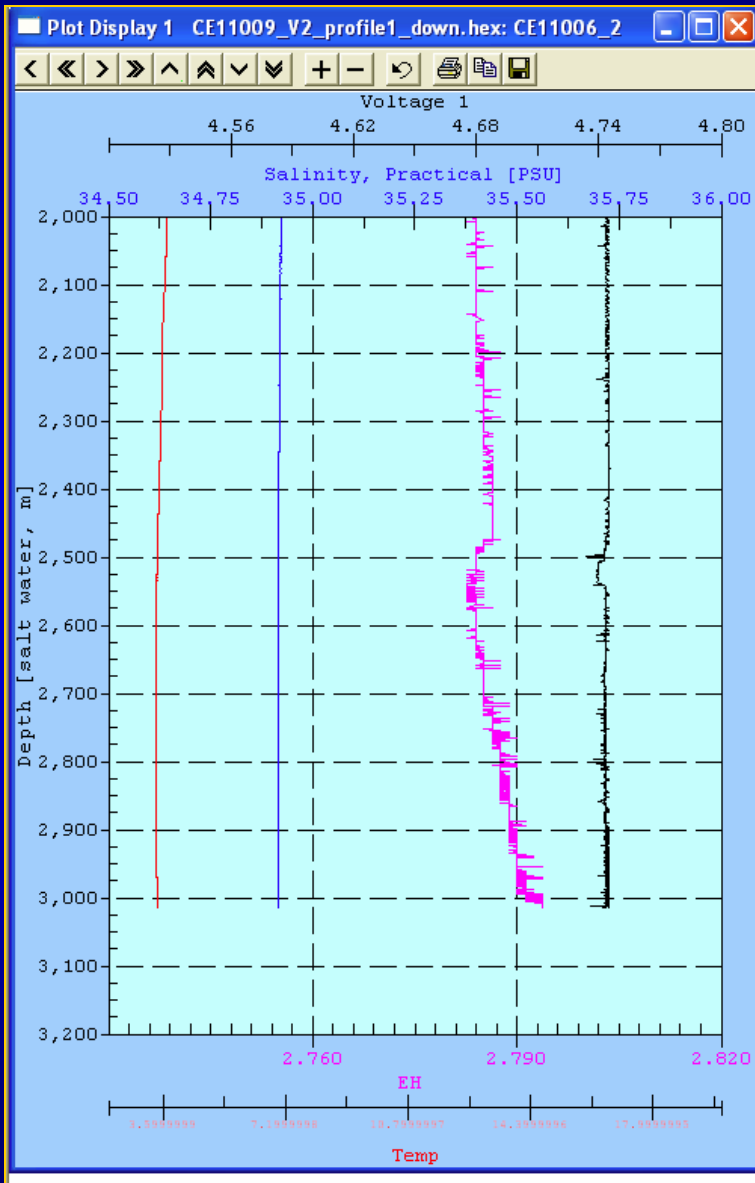
Courtesy Bram Murton, NOCS

# Hunting the plume



27°51'40"W 27°51'30"W 27°51'20"W 27°51'10"W 27°51'00"W 27°50'50"W 27°50'40"W 27°50'30"W 27°50'20"W 27°50'10"W 27°50'00"W

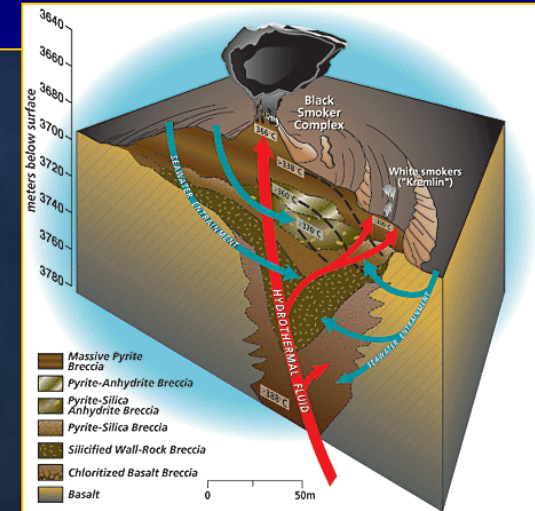
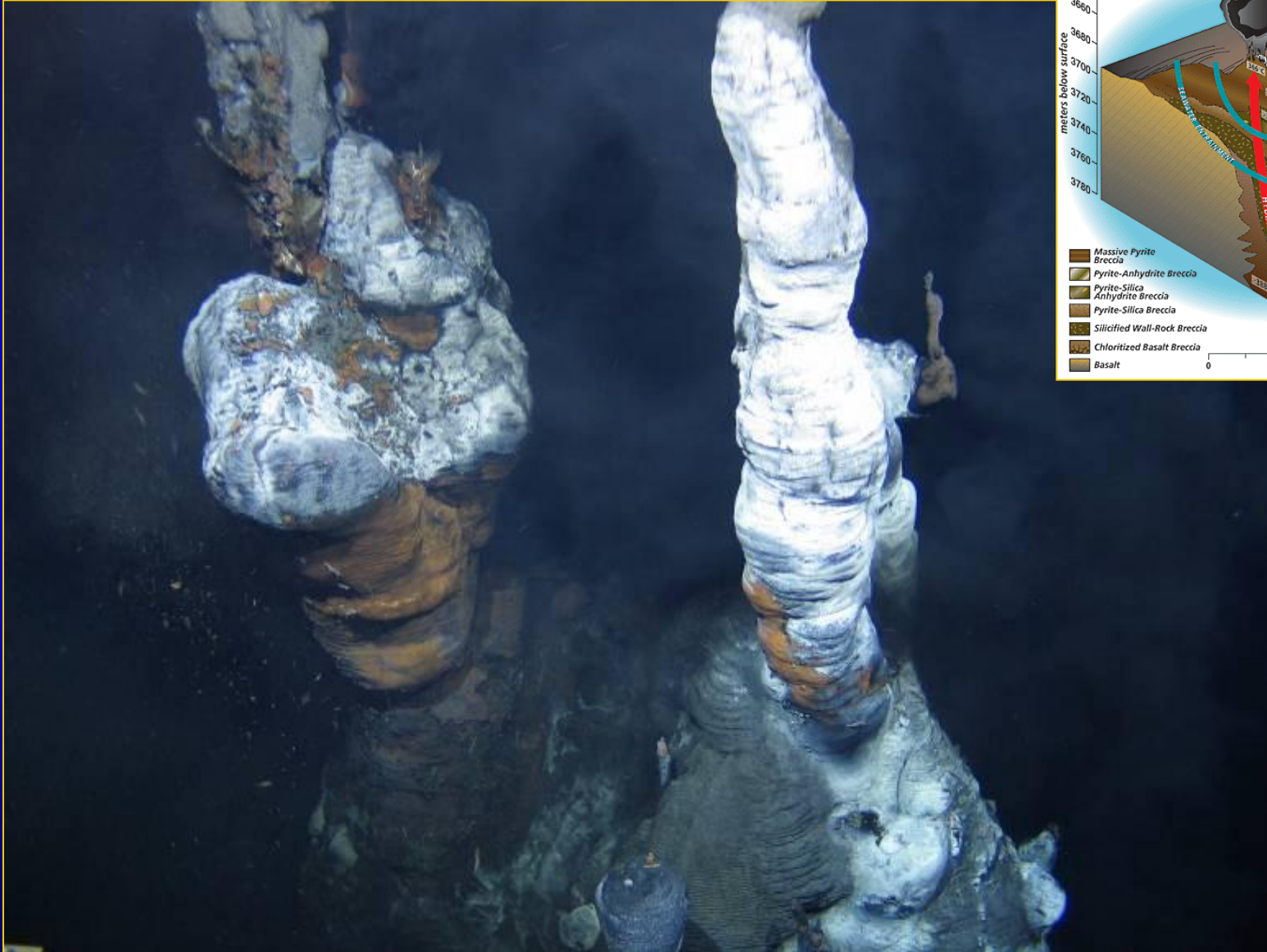
# Hunting the plume



# The first views of a newly discovered hydrothermal vent system

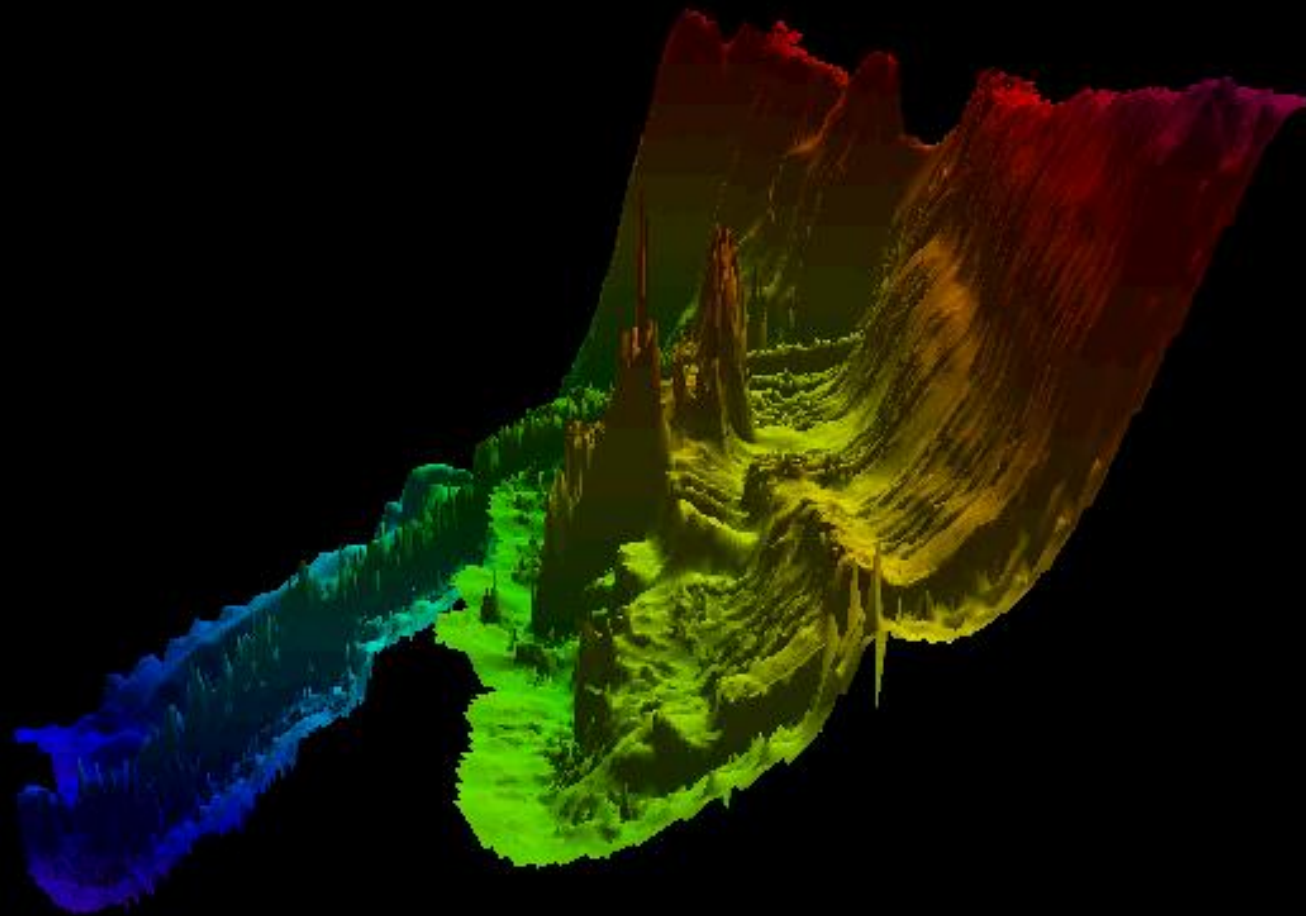


# Moytirra Vent Field

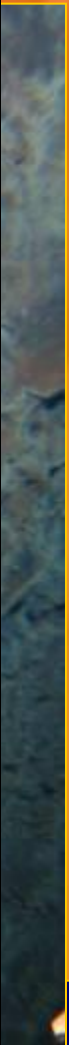




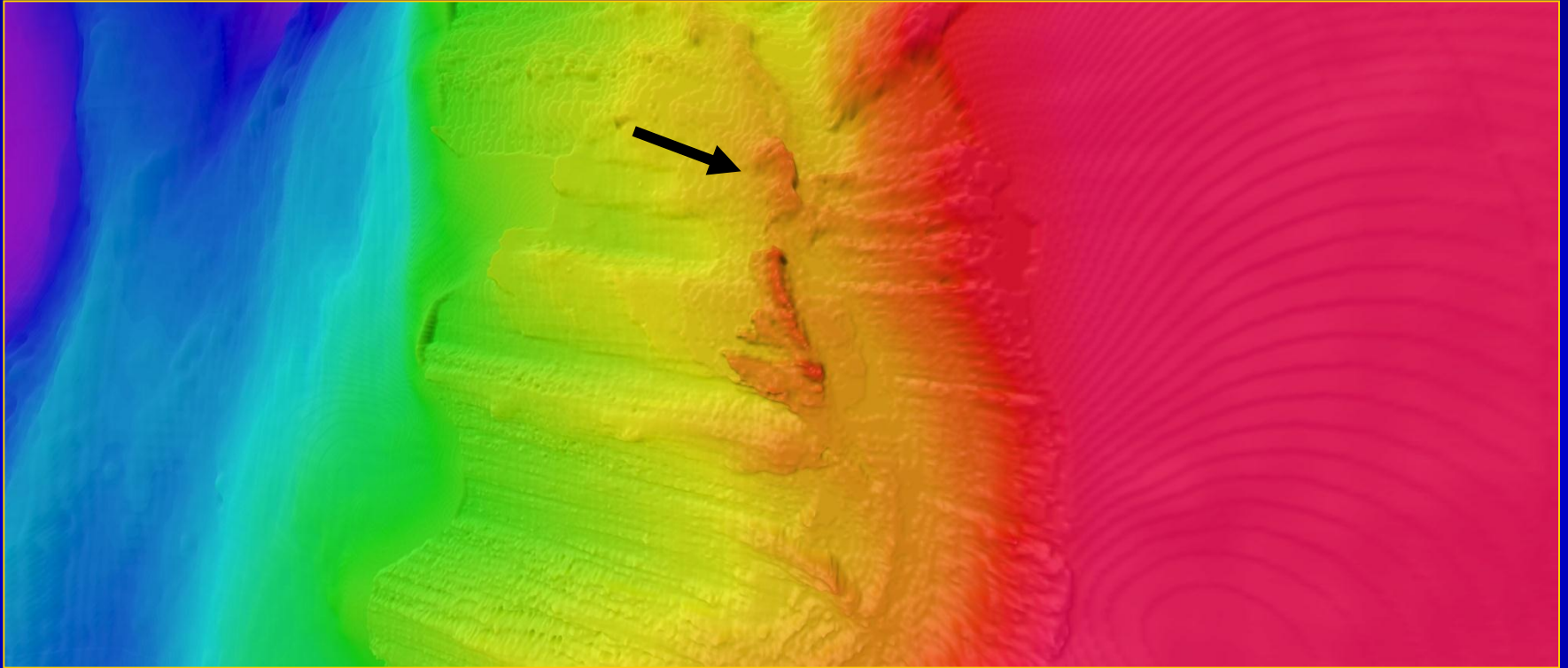
# ROV-based multibeam bathymetry



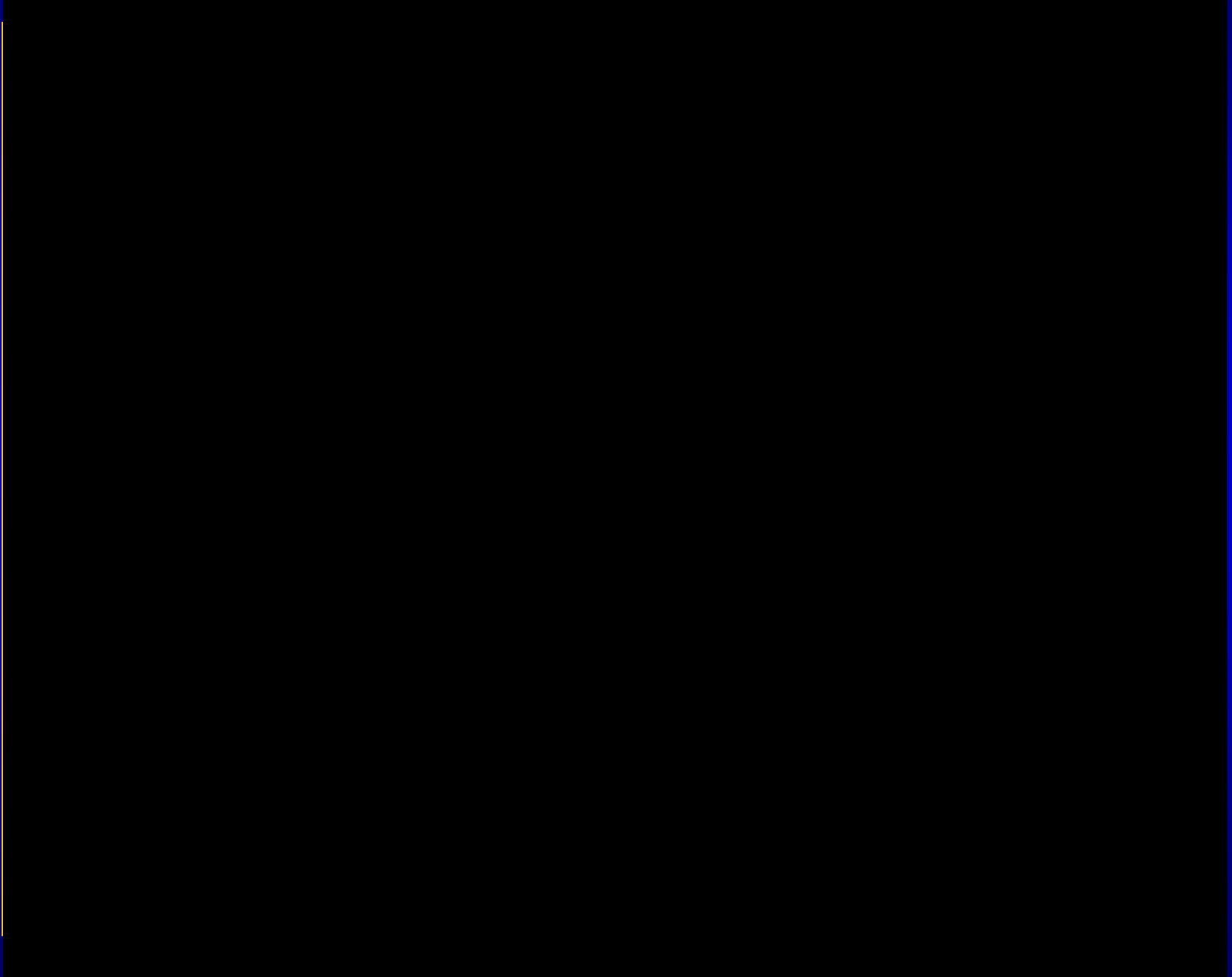
# Submarine lava flows, massive sulphides with bacterial mats indicative of defuse flow



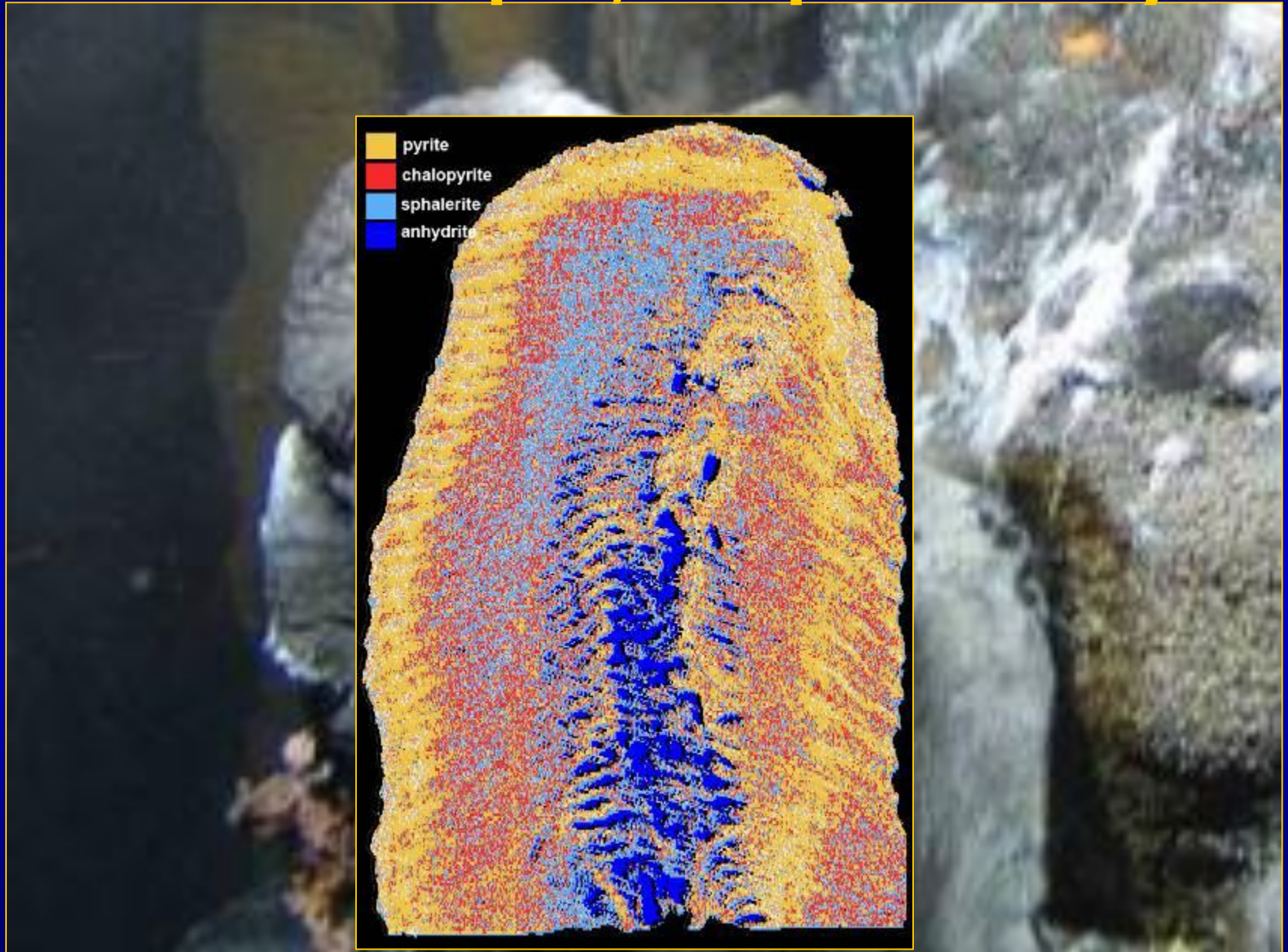
# Dian Cecht – a squat, complex vent system



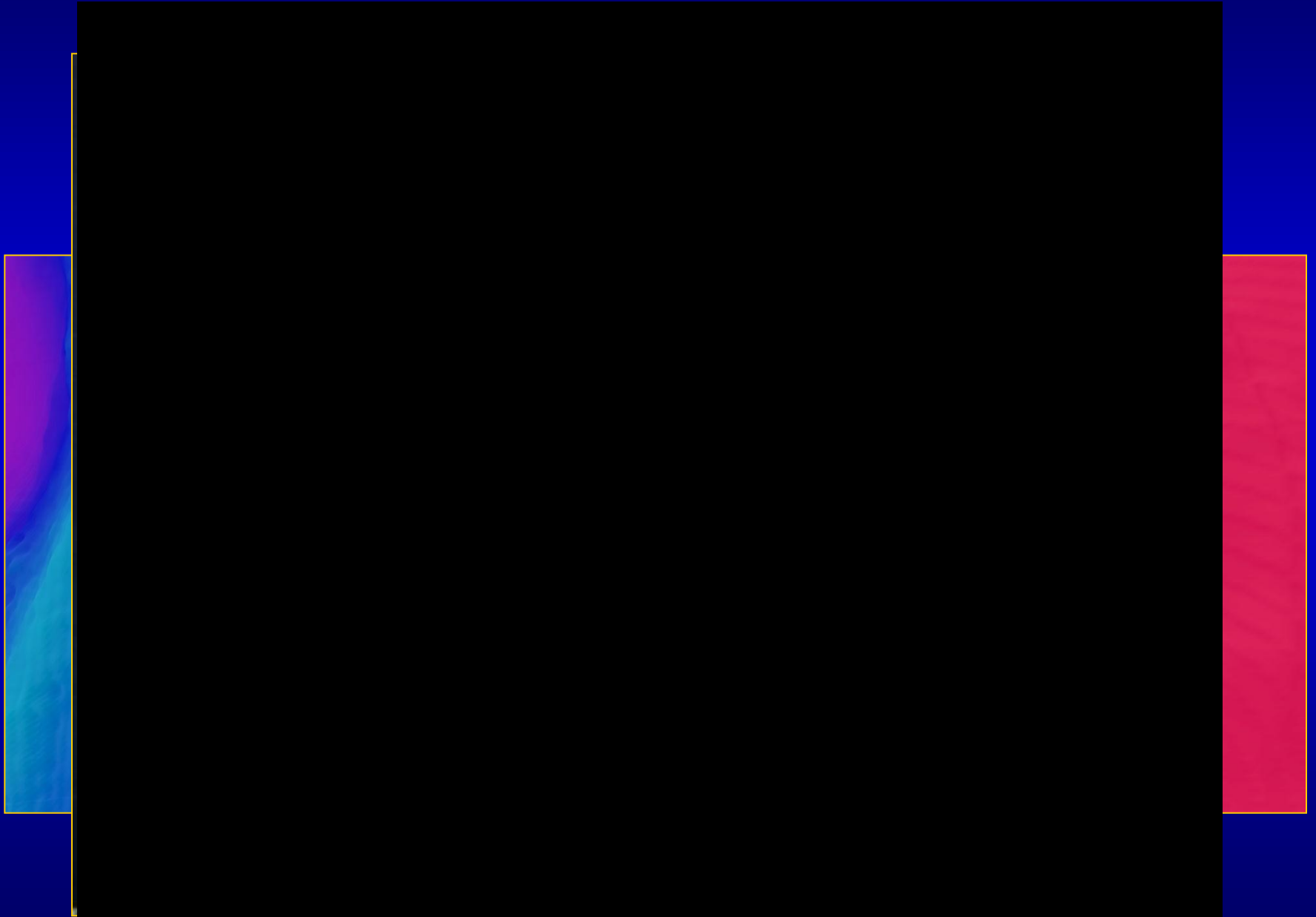
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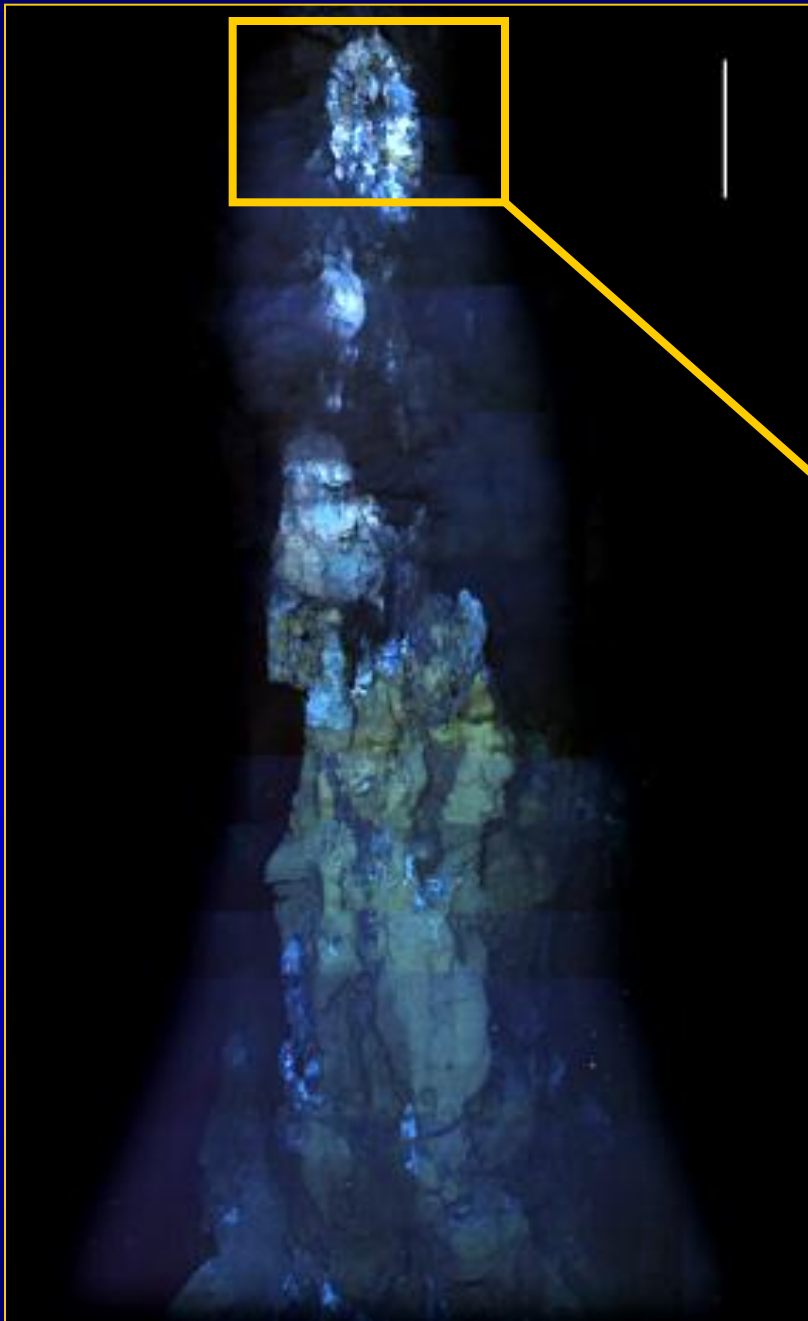
# Dian Cecht – a squat, complex vent system



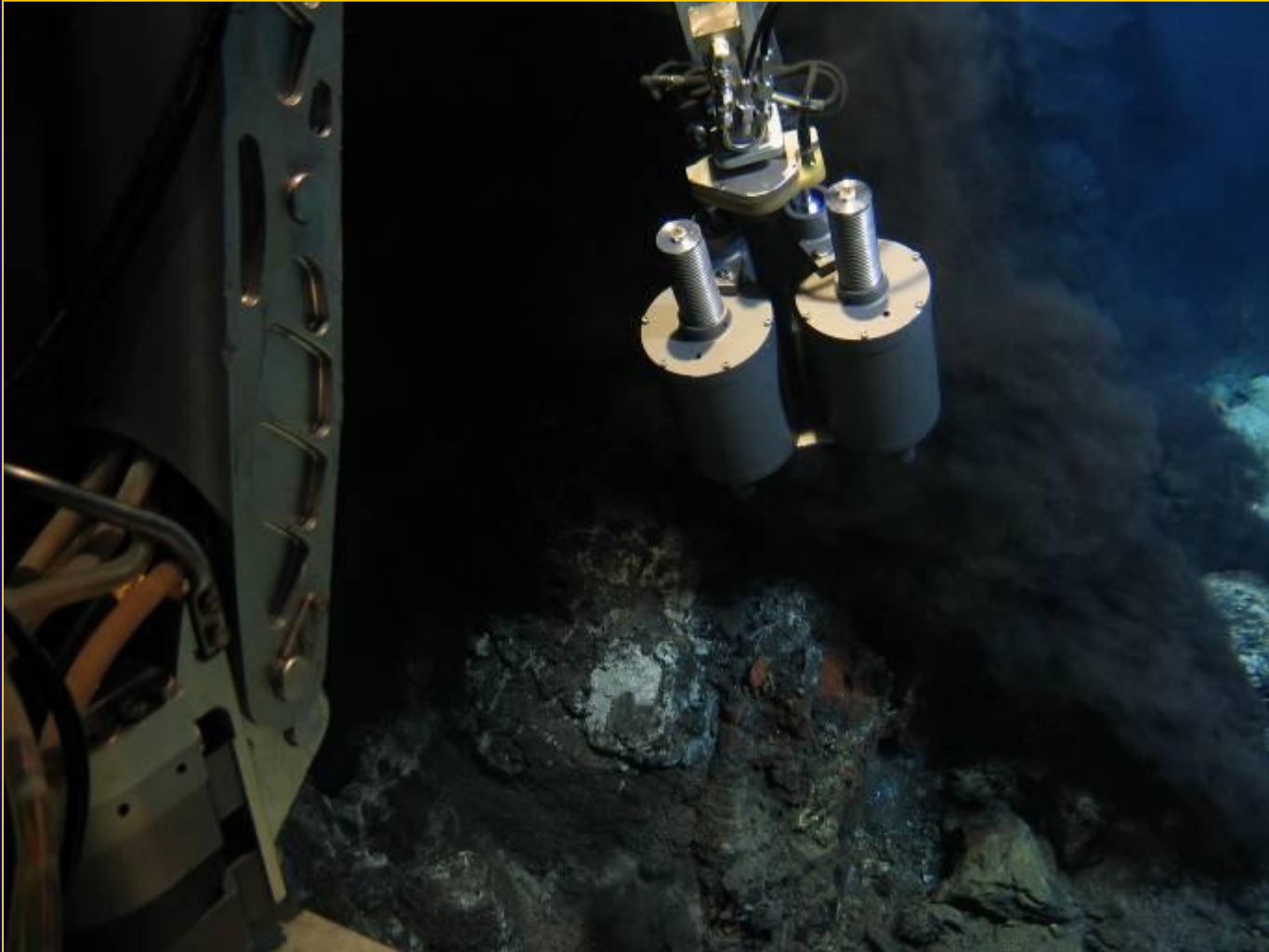
# The Fomorians – slender towers



# 15m high Balor chimney

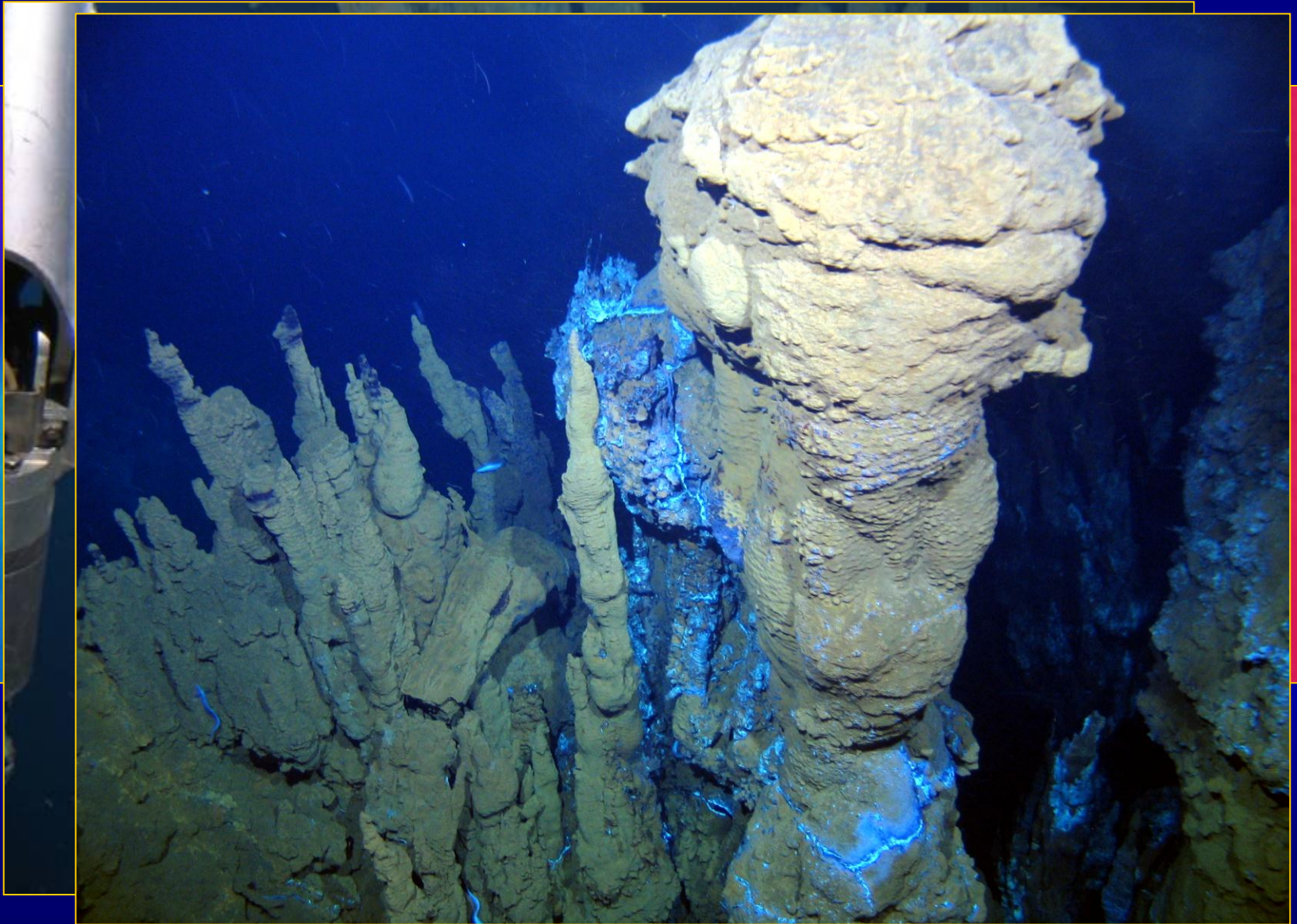


# Vent fluid sampling

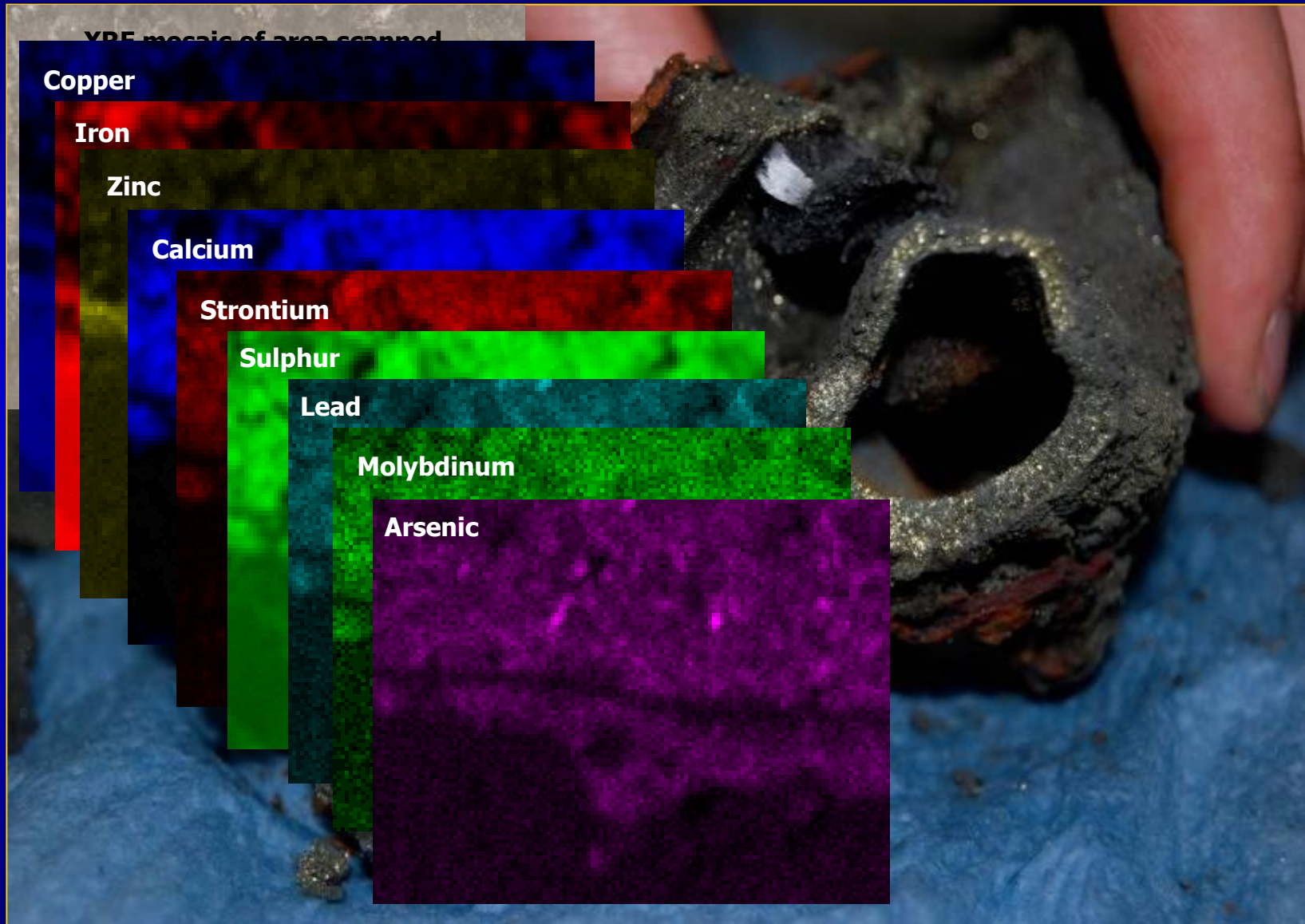




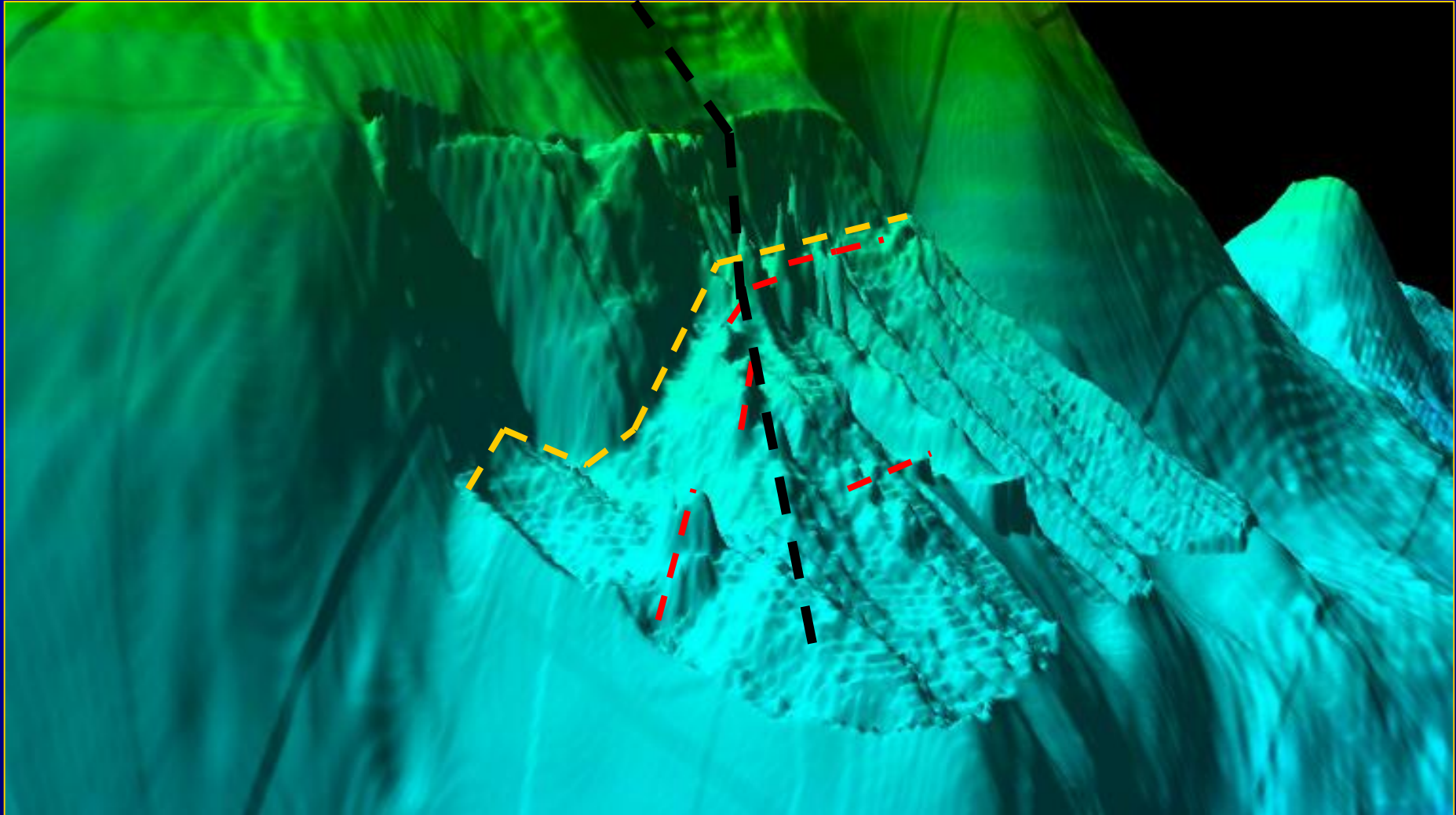
# Mag Mell – old, organ pipe forest



# Chimney composition

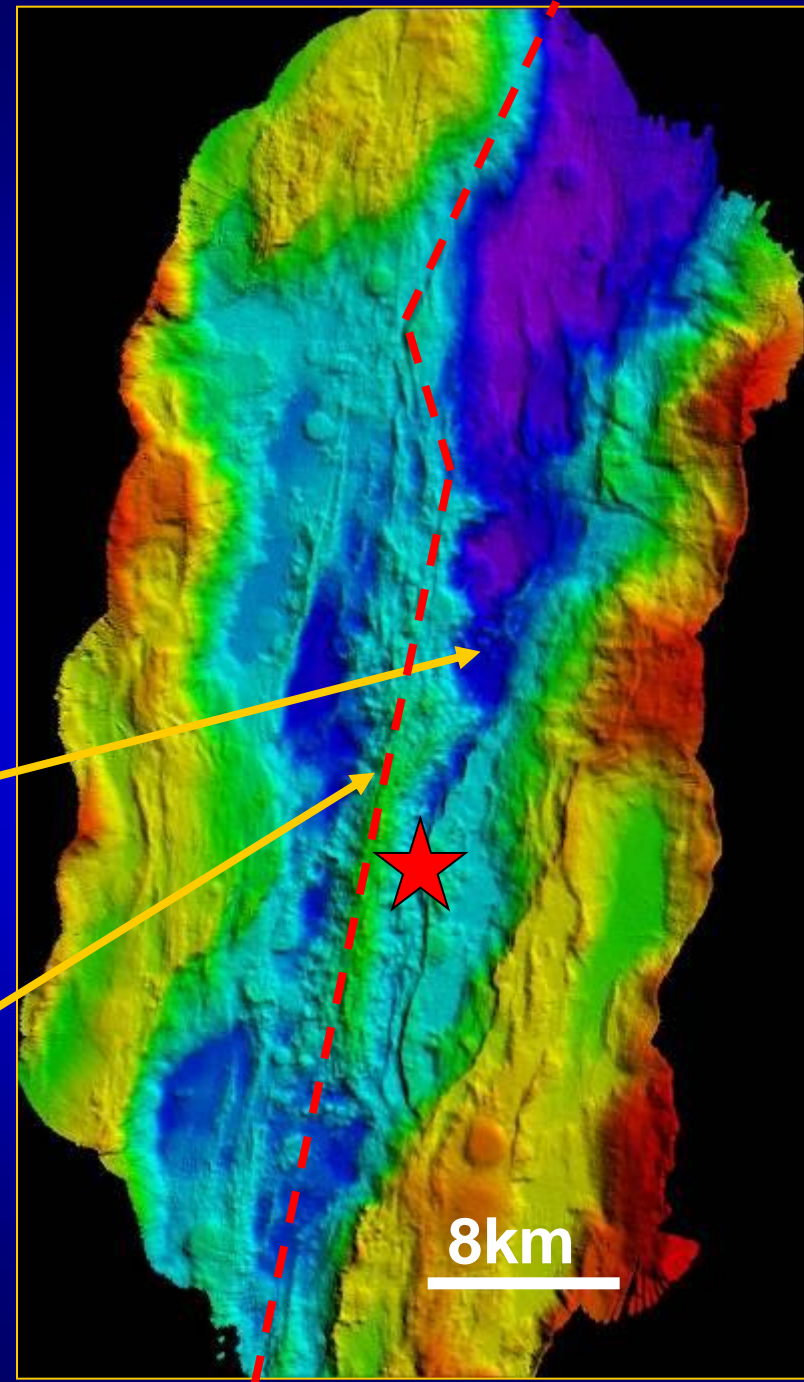


# Why off Axis? Is it the plumbing?

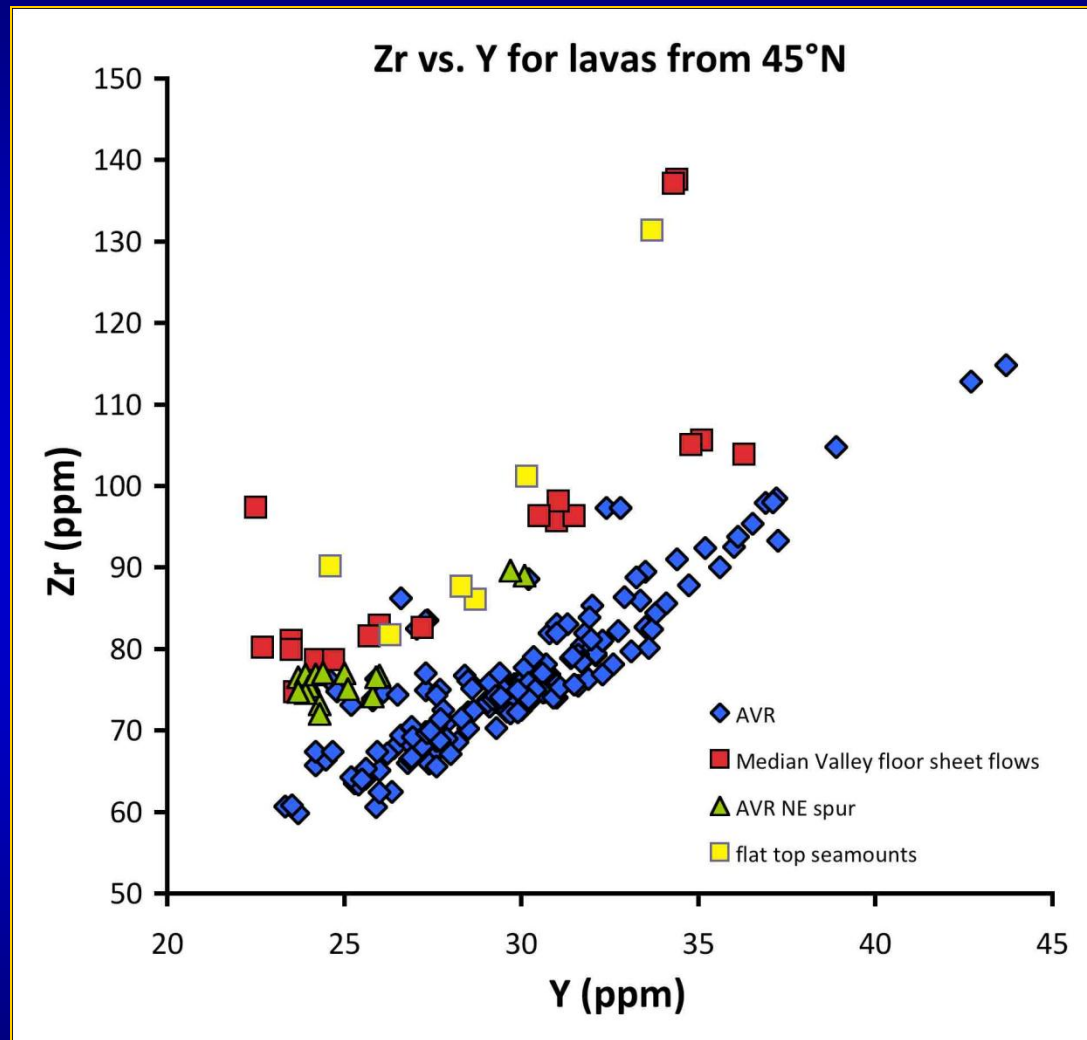


# Why off-axis?

Why is the heat source and venting off-axis and not on the axial volcanic ridge?

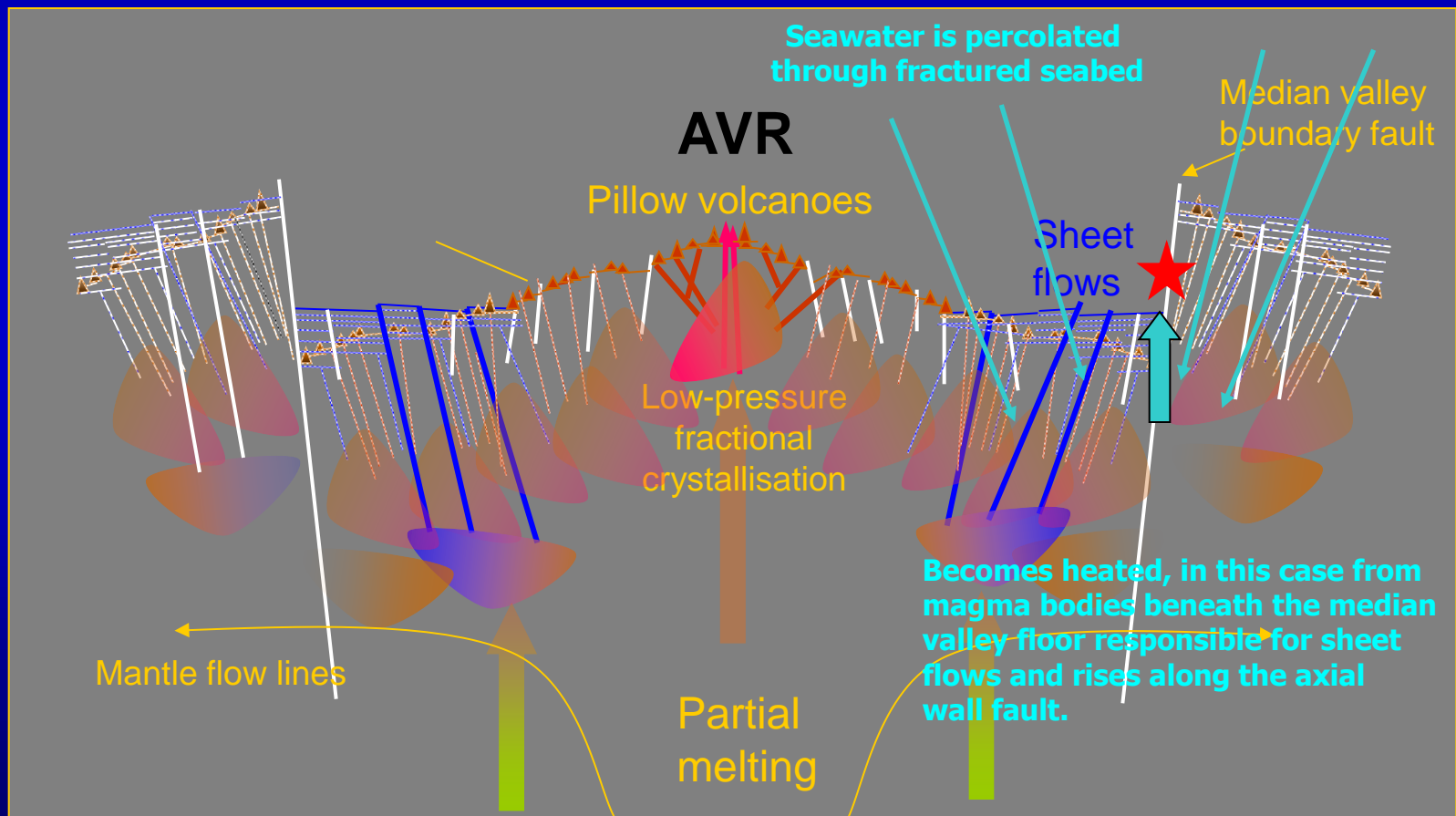


# Why off-axis?

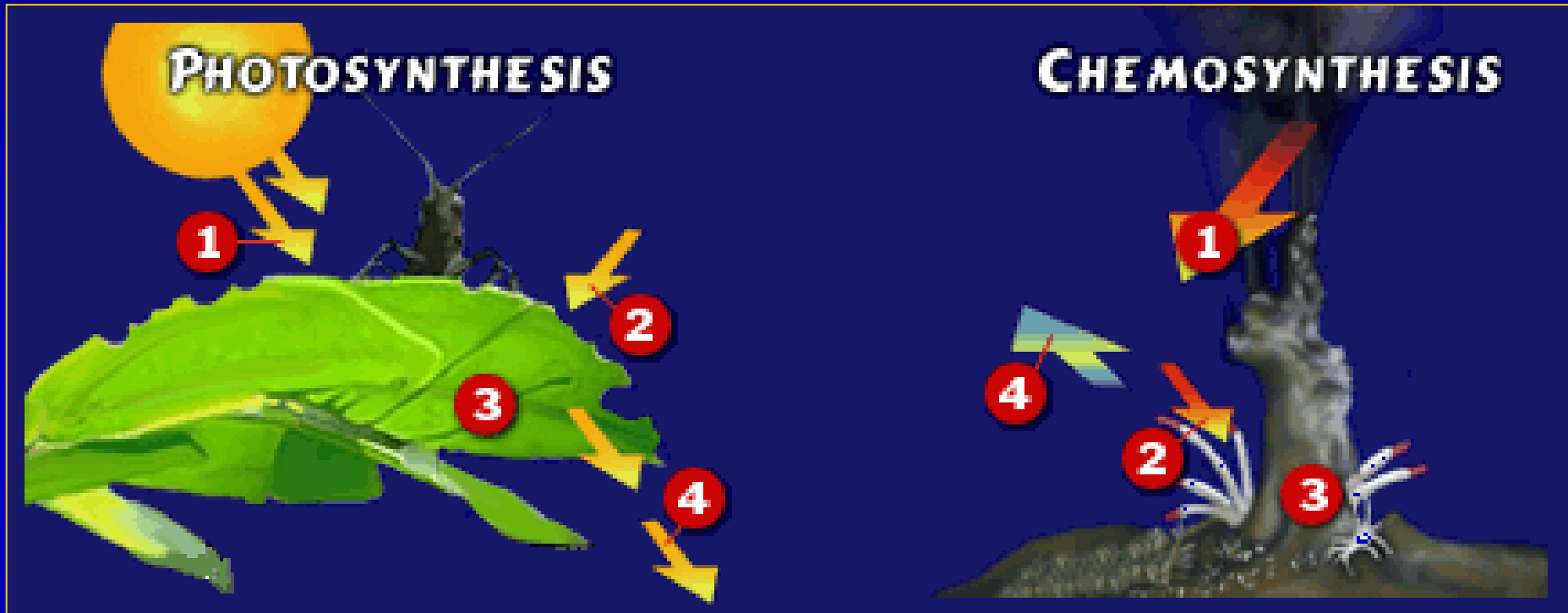


# Why off-axis?

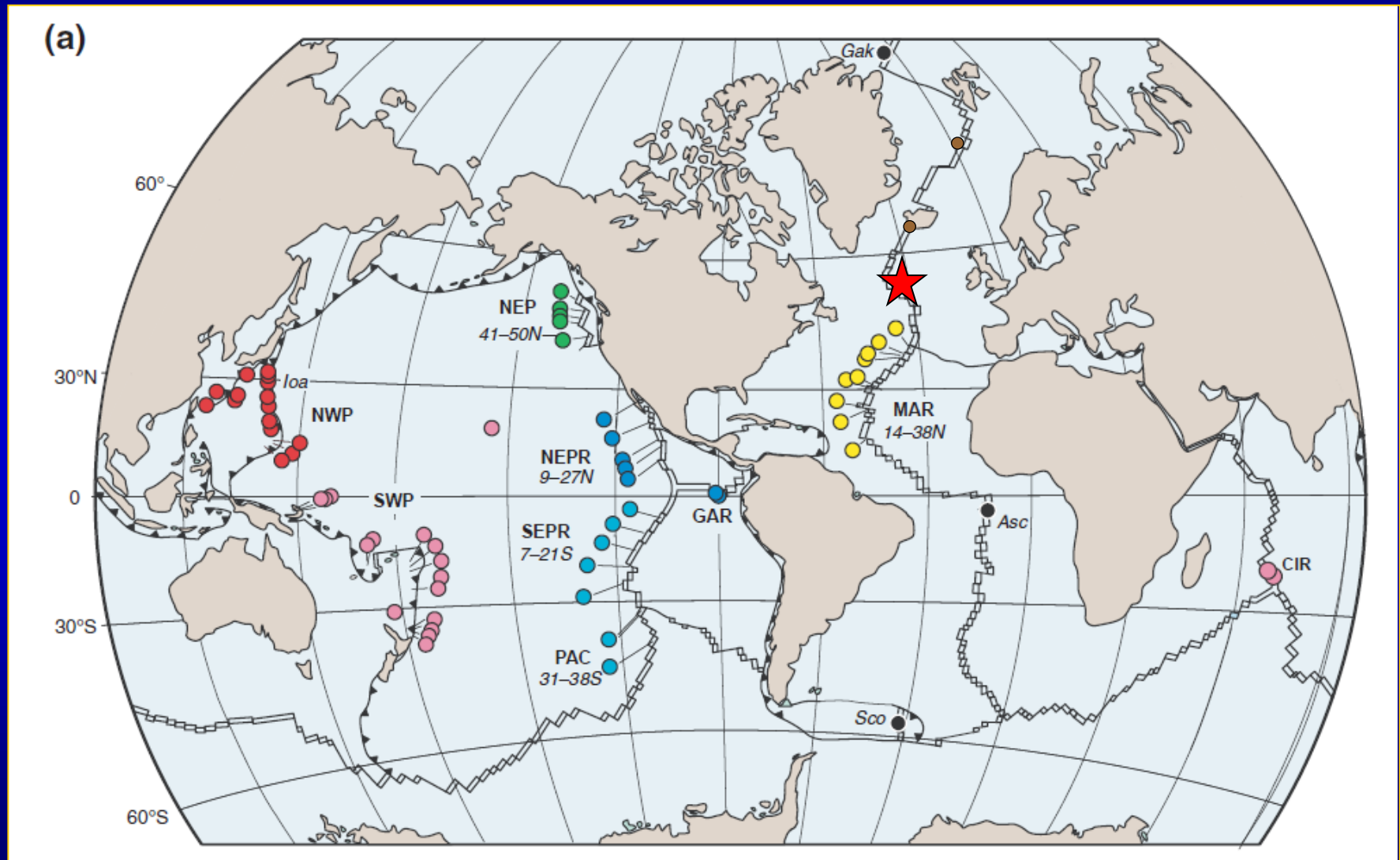
Moytirra model for hydrothermal circulation driven by ridge margin faulting and off-axis magma chambers



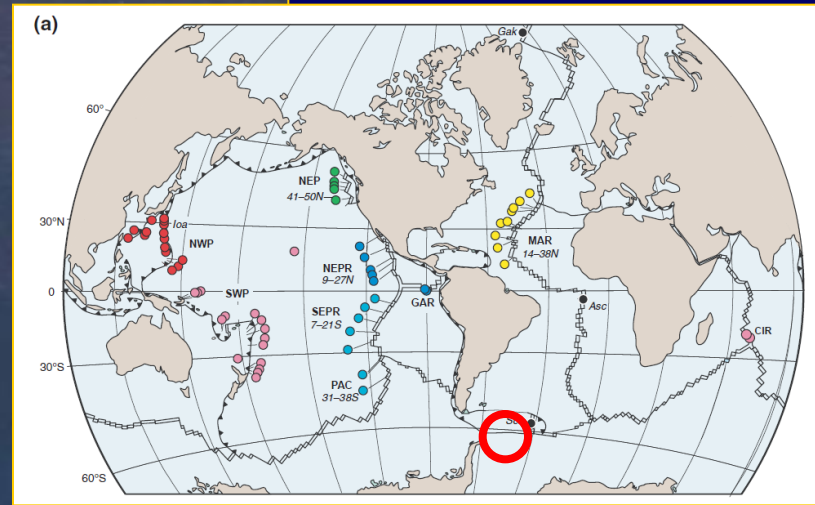
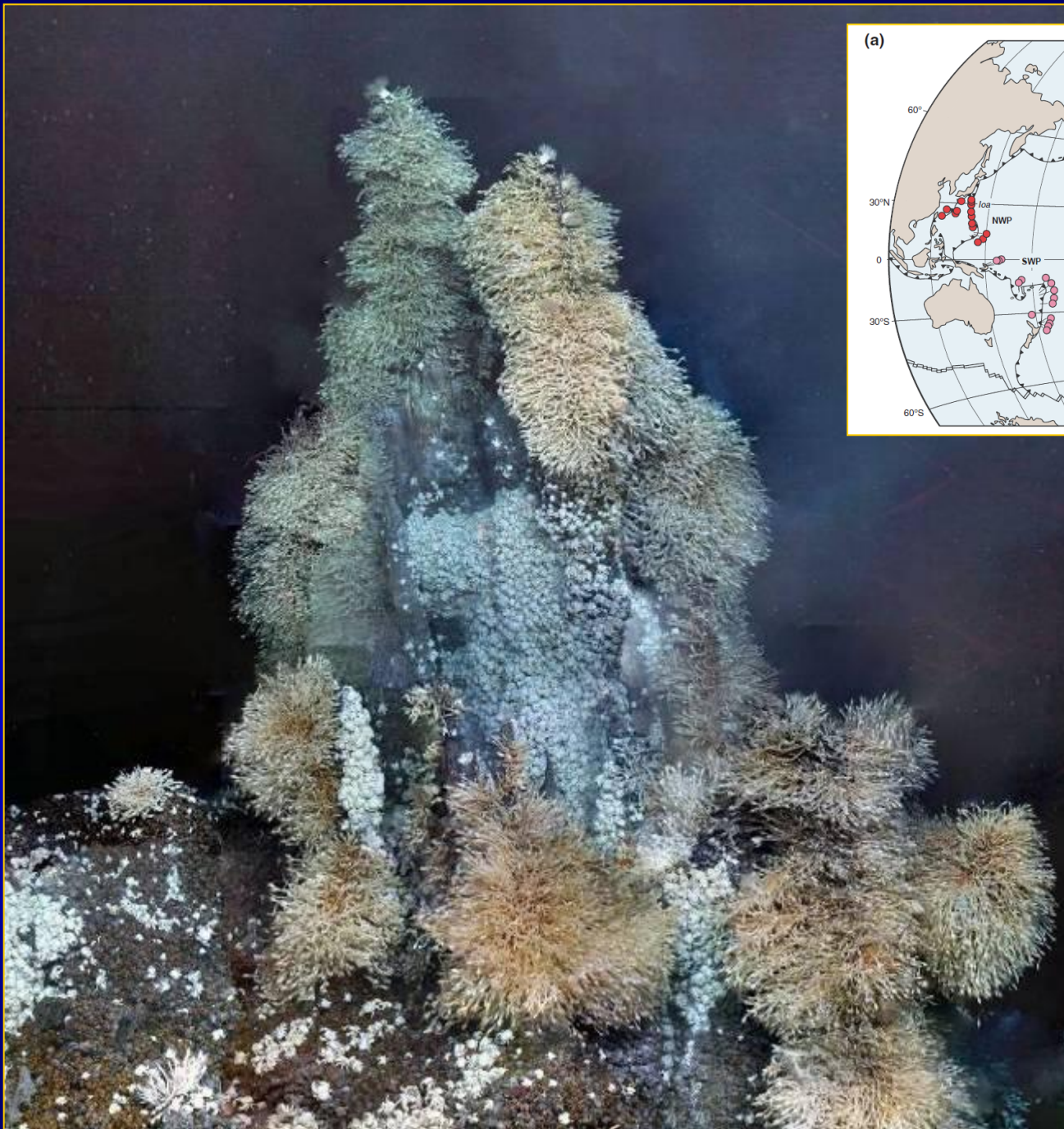
# Another life



# Previously unknown hydrothermal vent between Iceland and the Azores

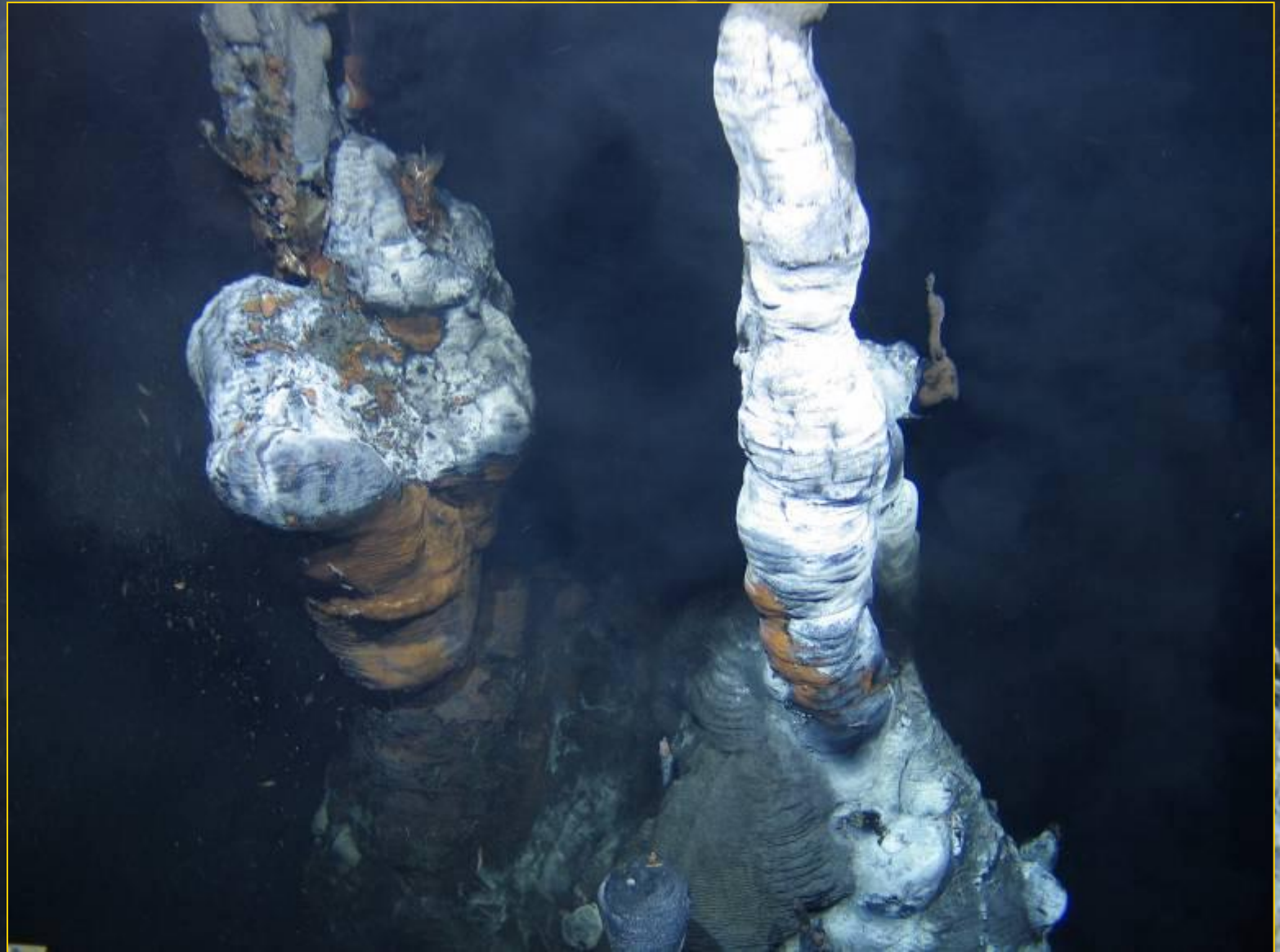






## Southern Ocean

Courtesy Jon Copley,  
Uni. Southampton



# Moytirra fauna – Bacterial slime and worms



# Moytirra fauna – vent limpets (Peltospirid gastropods)



# Moytirra fauna – Whelks & Snails



# Moytirra fauna – fish (Zoarcid or eelpout)



# Moytirra fauna – crabs (brachyuran)

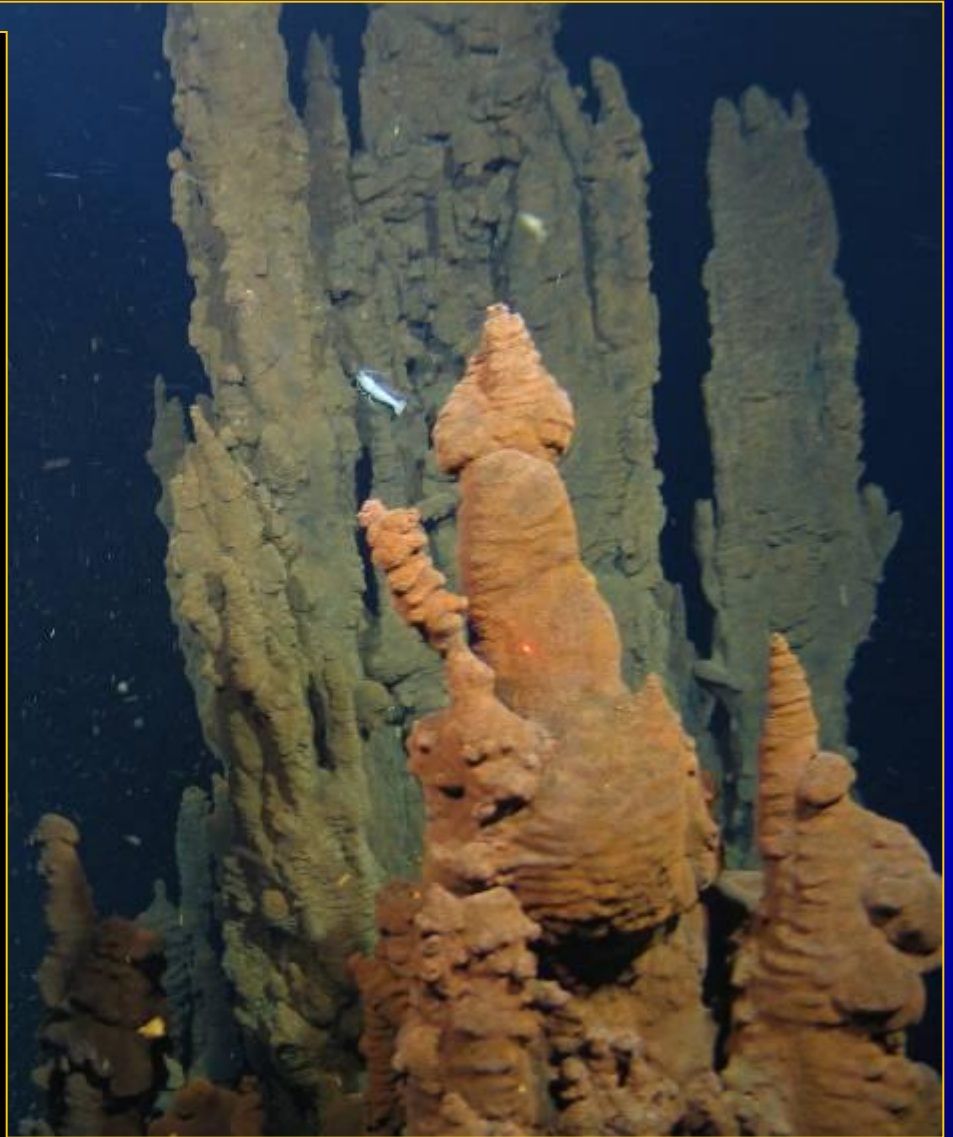


# Moytirra fauna – the worms





# Moytirra fauna – shrimp (Alvinocaridid)

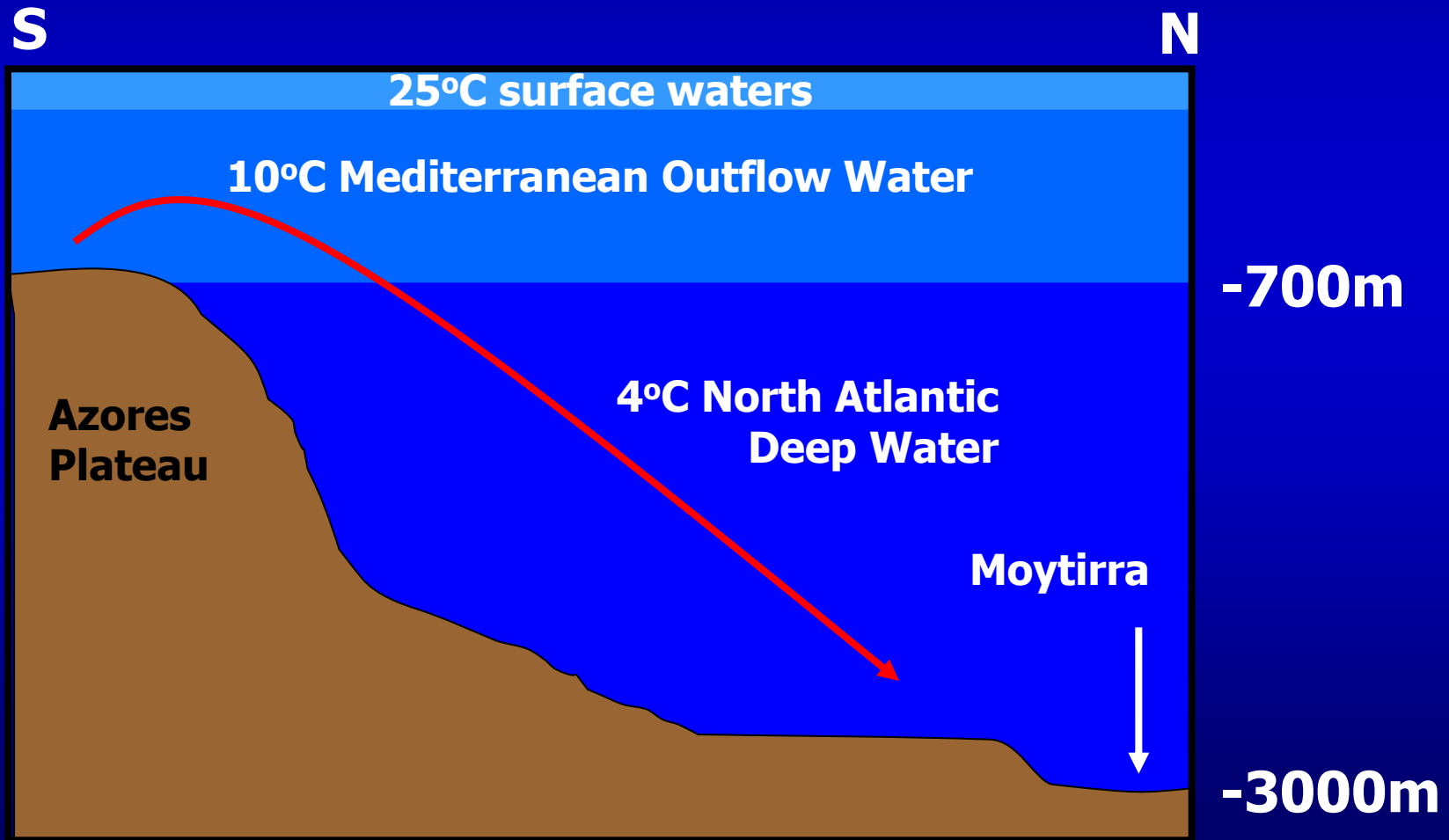


# Moytirra fauna – shrimp (Rimicaris sp.)



# Biogeographical affinities

## Azorian or Icelandic



**Thank-you for listening.....**



