

MGL2514

Oceanic Crust Hydrothermal Circulation Offshore Guerrero

June 1, 2026



Oceanic Crust Hydrothermal circulation Offshore Guerrero - (OCHO-G)

Objective

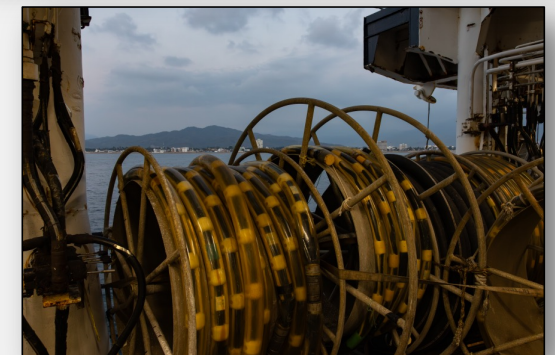
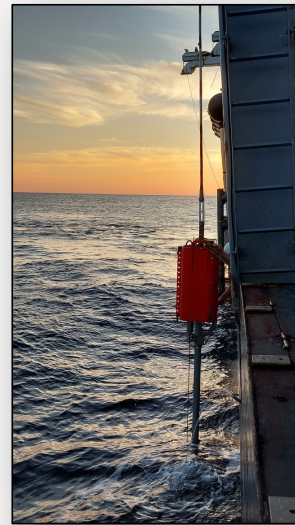
- Investigate tectonic structure and thermal properties of the incoming Cocos Plate as an input into the Middle America Trench near the Guerrero seismic gap to better understand unique slow-slip behavior in the region

Methods

- High-resolution 2-D MCS data
- Heat flow measurements

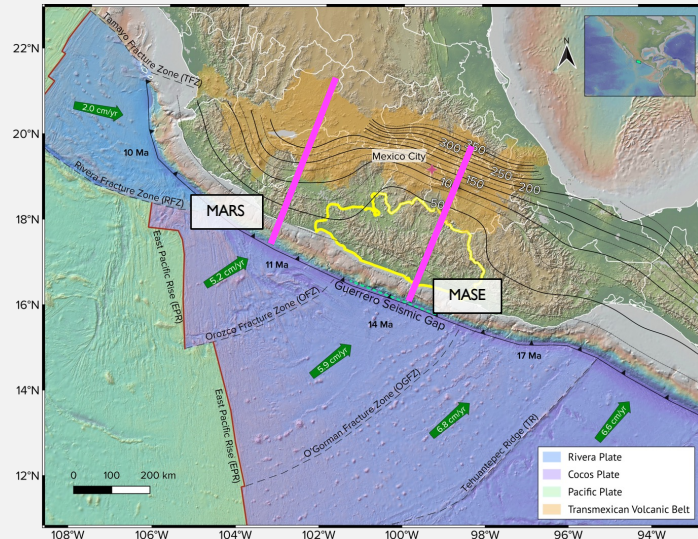
Data Integration

- Seismic data guided heat flow penetration placement
- Seismic data provides geologic context for heat flow observations and tectonic framework

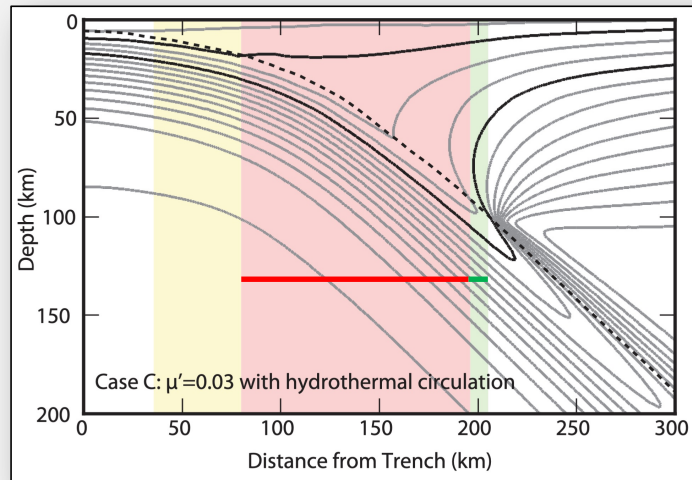


Flat Slab Subduction

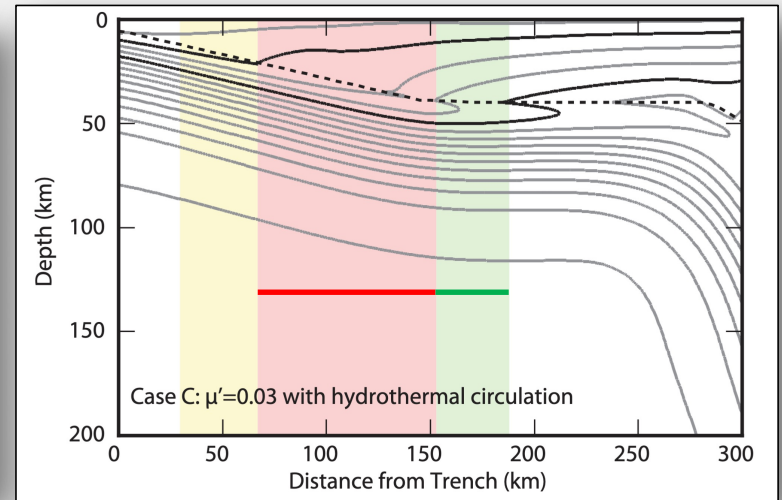
- Flat slab widens slow-slip region by altering thermal structure & dehydration depth
- Hydrated crust may carry water deeper into the subduction zone
- Current thermal models rely on sparse heat flow data
- Plate hydration and hydrothermal circulation important for understanding downdip slow-slip region (green)



Northern MAT (MARS transect)

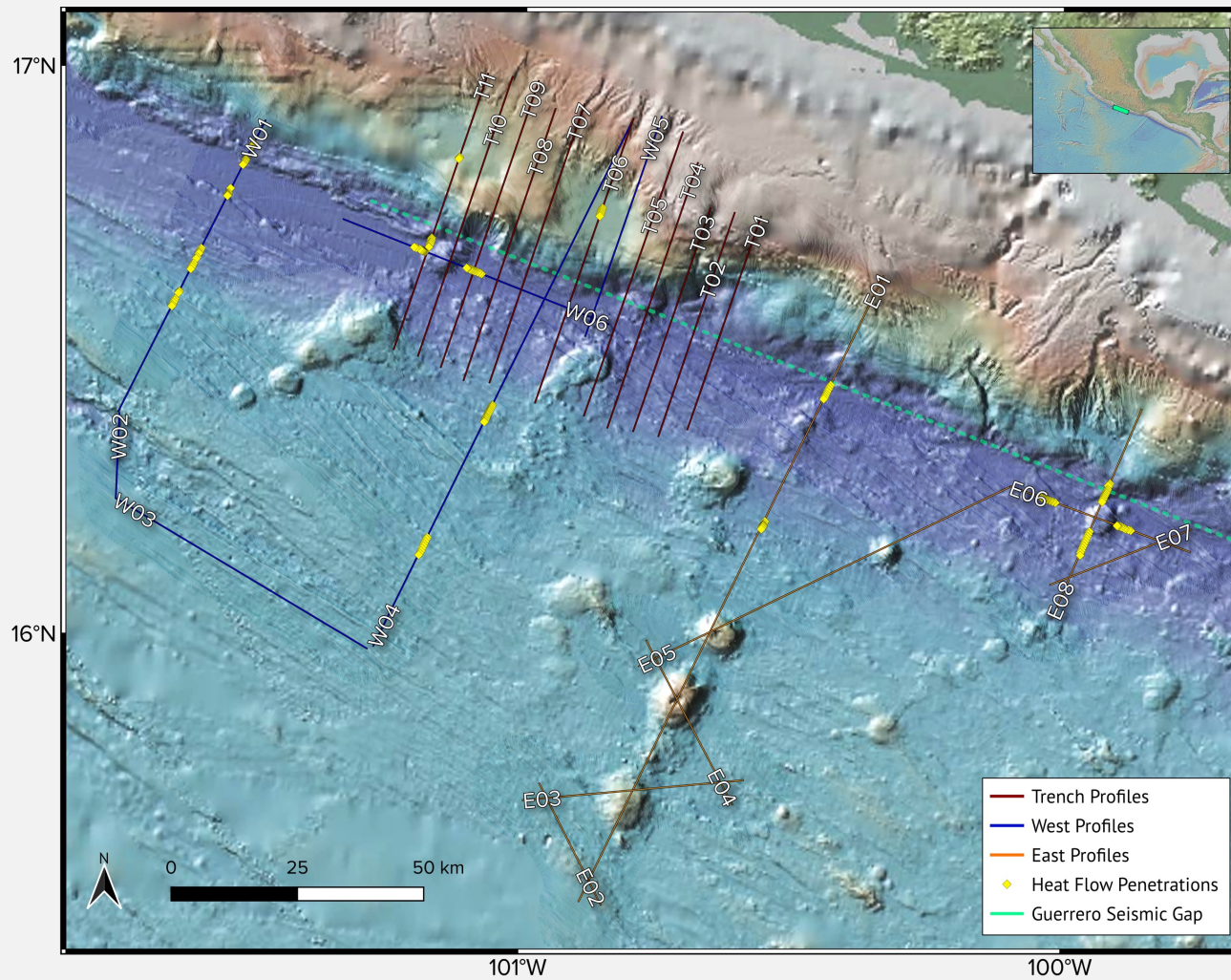


Central MAT (MASE Transect)



Perry et al. 2016 - Thermal models of regions of MAT

Study Area

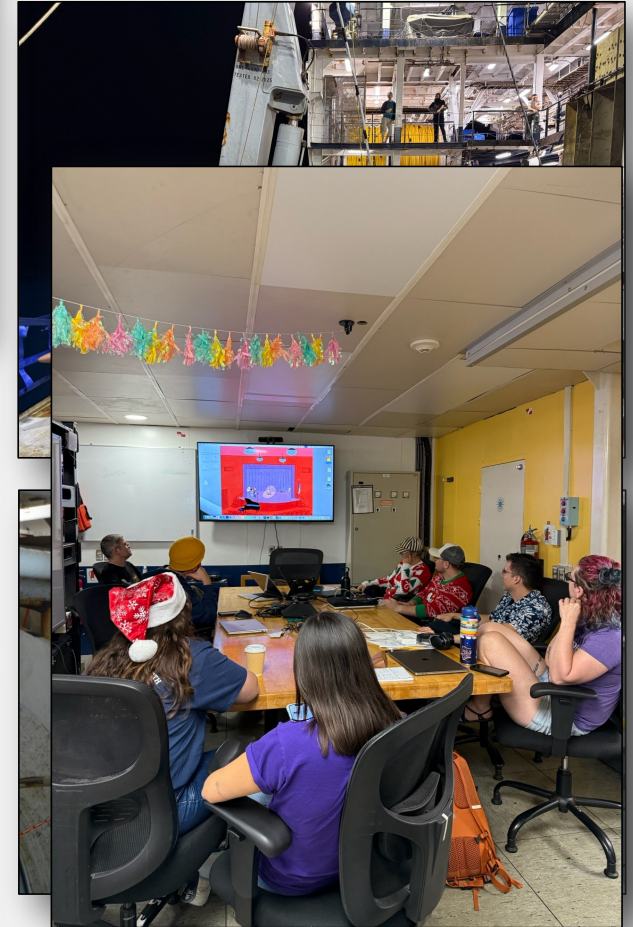


Overview of Activity

Most of December 2025

Collected:

- Over 140 successful heat flow penetrations
- Over 1300 km of high-resolution seismic
- ~ 24 days
- ~ 4.5 da
- ~ 9.5 da
- ~ 9.5 da measure
- ~ 0.5 da troubles



Seismic Report

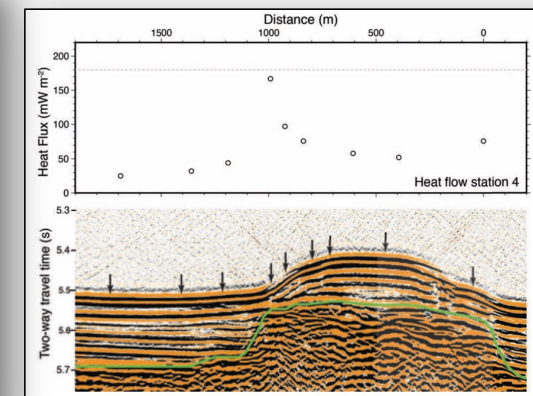
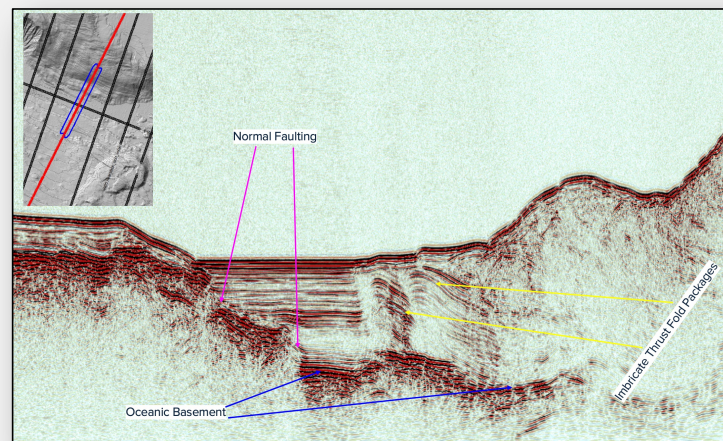
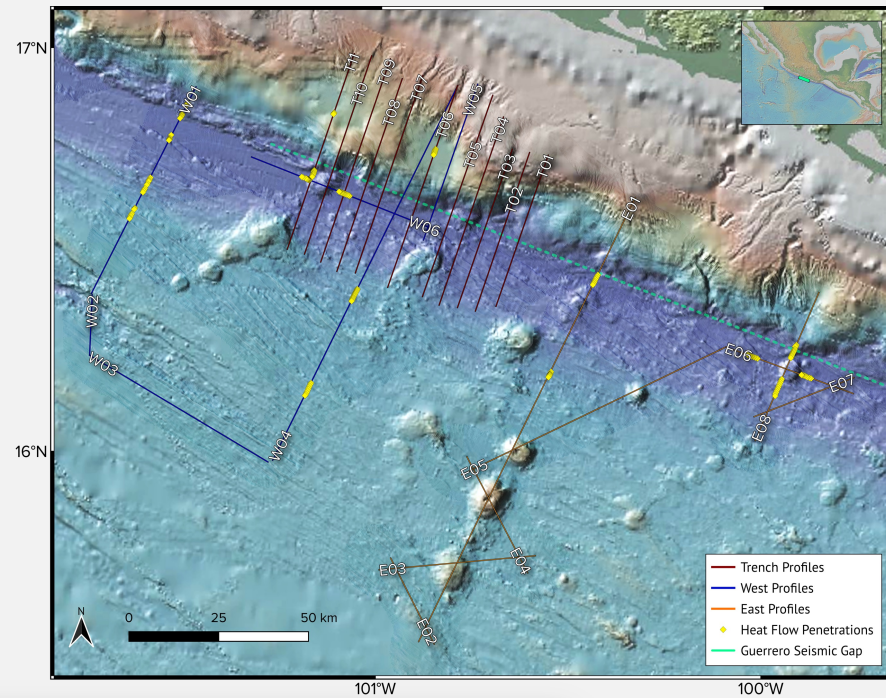
Goals:

- Collect seismic reflection profiles across the Guerrero seismic gap for tectonic interpretation
- Give structural context to heat flow data and inform heat flow penetration placement

Outcome: Collection and preliminary processing of 25 seismic reflection profiles

Preliminary imaging shows:

- Abundant normal faulting
- Thin sediment cover
- Significant variation in sediment thickness
- Rough seafloor topography
- Along-strike variation in wedge morphology
- Possible inherited spreading fabric



Heat Flow Report

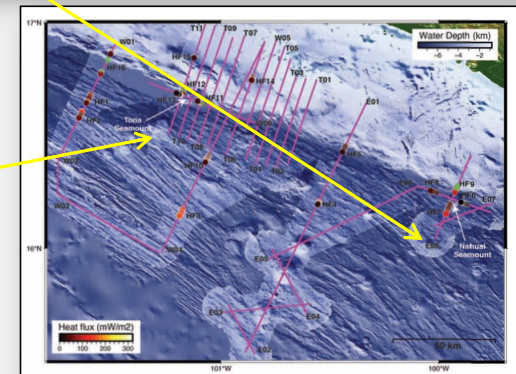
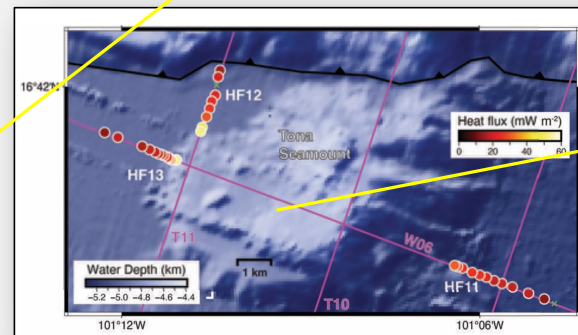
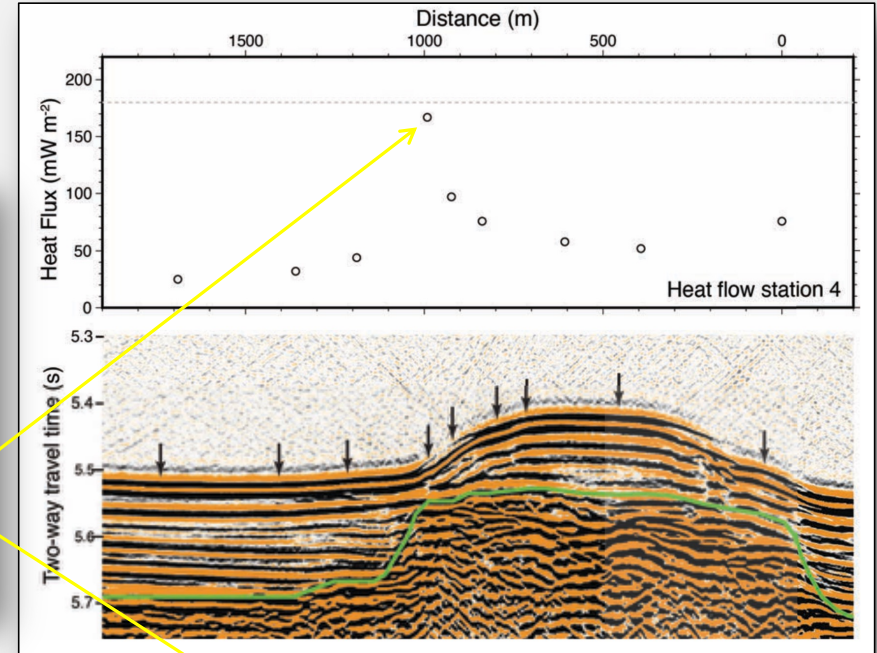
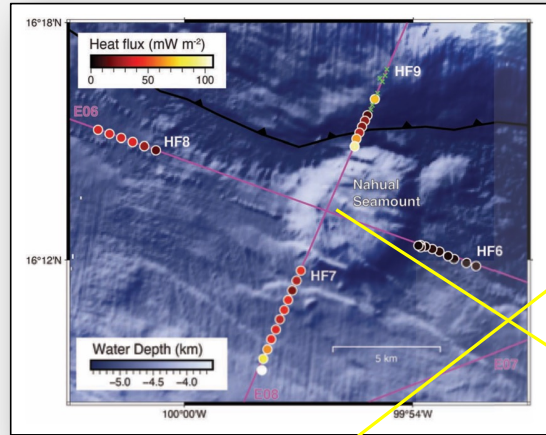
Goal: Investigate hydrothermal circulation within the incoming Cocos Plate to determine how it influences thermal state

Outcome: Collection of over 140 successful heat flow penetrations

- Plate bending normal faults
- Seamount flanks
- Basins of margin wedge

Preliminary data shows:

- Heat flux is substantially lower than expected for conductive cooling alone
- Seamounts may act as recharge and discharge pathways
- High heat flux near normal faults may indicate discharge of heated water



Preliminary Results



W01

T09

T01

W06

W04

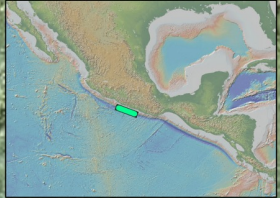
E08

- West Profiles
- Trench Profiles
- East Profiles
- Heat Flow Penetrations
- Guerrero Seismic Gap

0 25 50 km



Preliminary Results



W01

T09

W06

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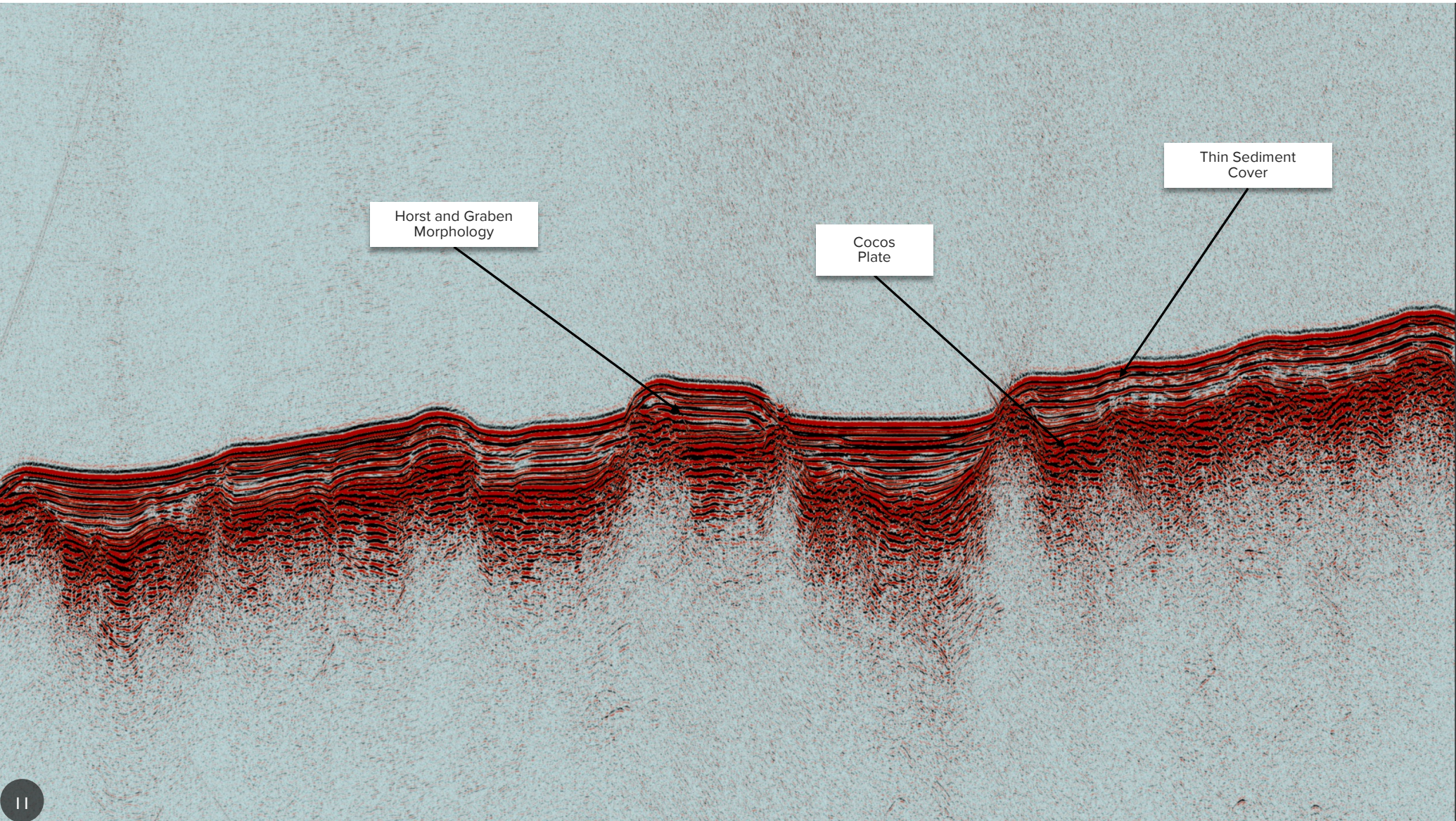
0 25 50 km



Horst and Graben
Morphology

Cocos
Plate

Thin Sediment
Cover



Preliminary Results



W01

T09

T01

W06

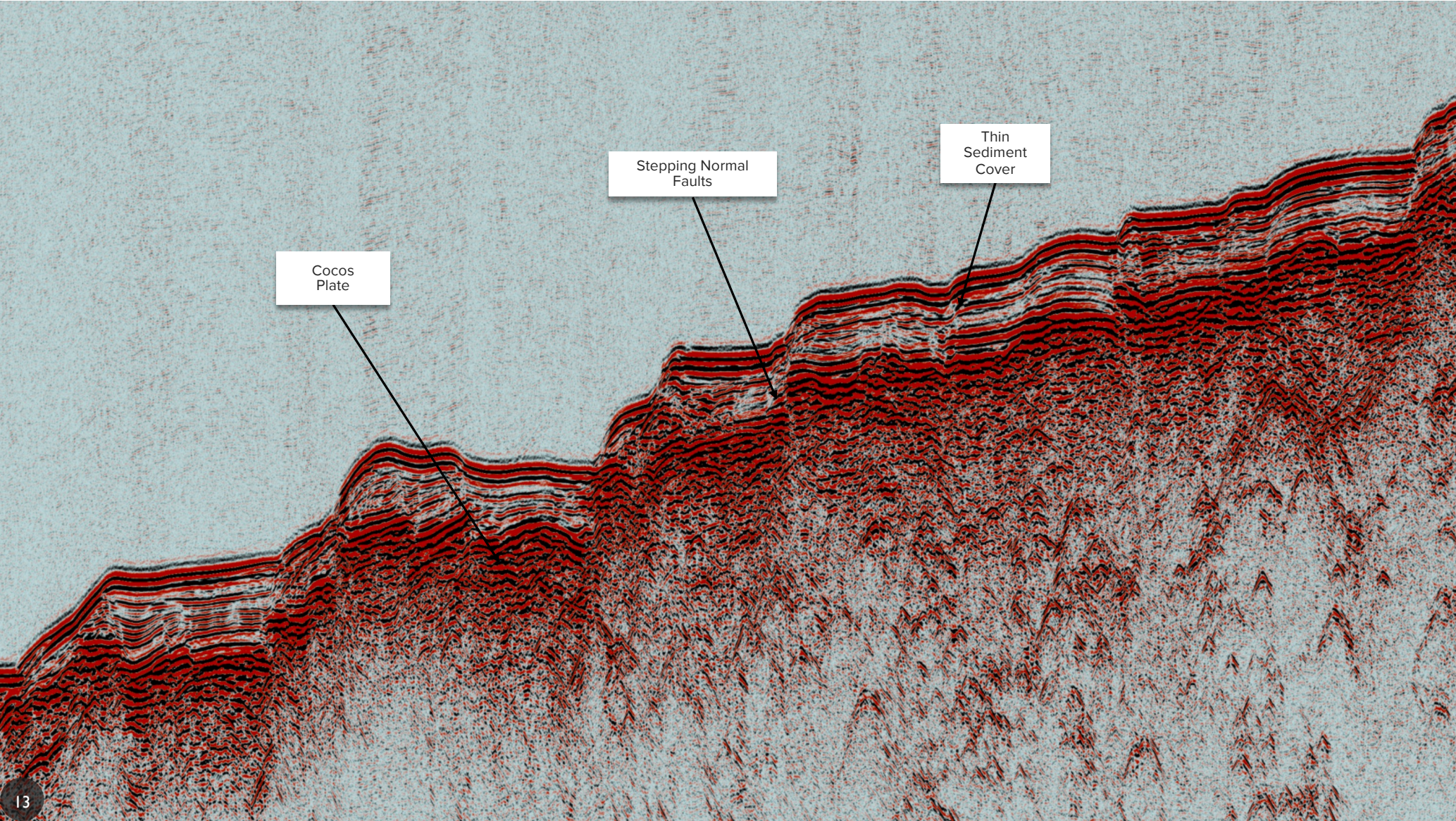
W04

E08

- West Profiles
- Trench Profiles
- East Profiles
- Heat Flow Penetrations
- Guerrero Seismic Gap

0 25 50 km





Preliminary Results



W01

T09

T01

W06

W04

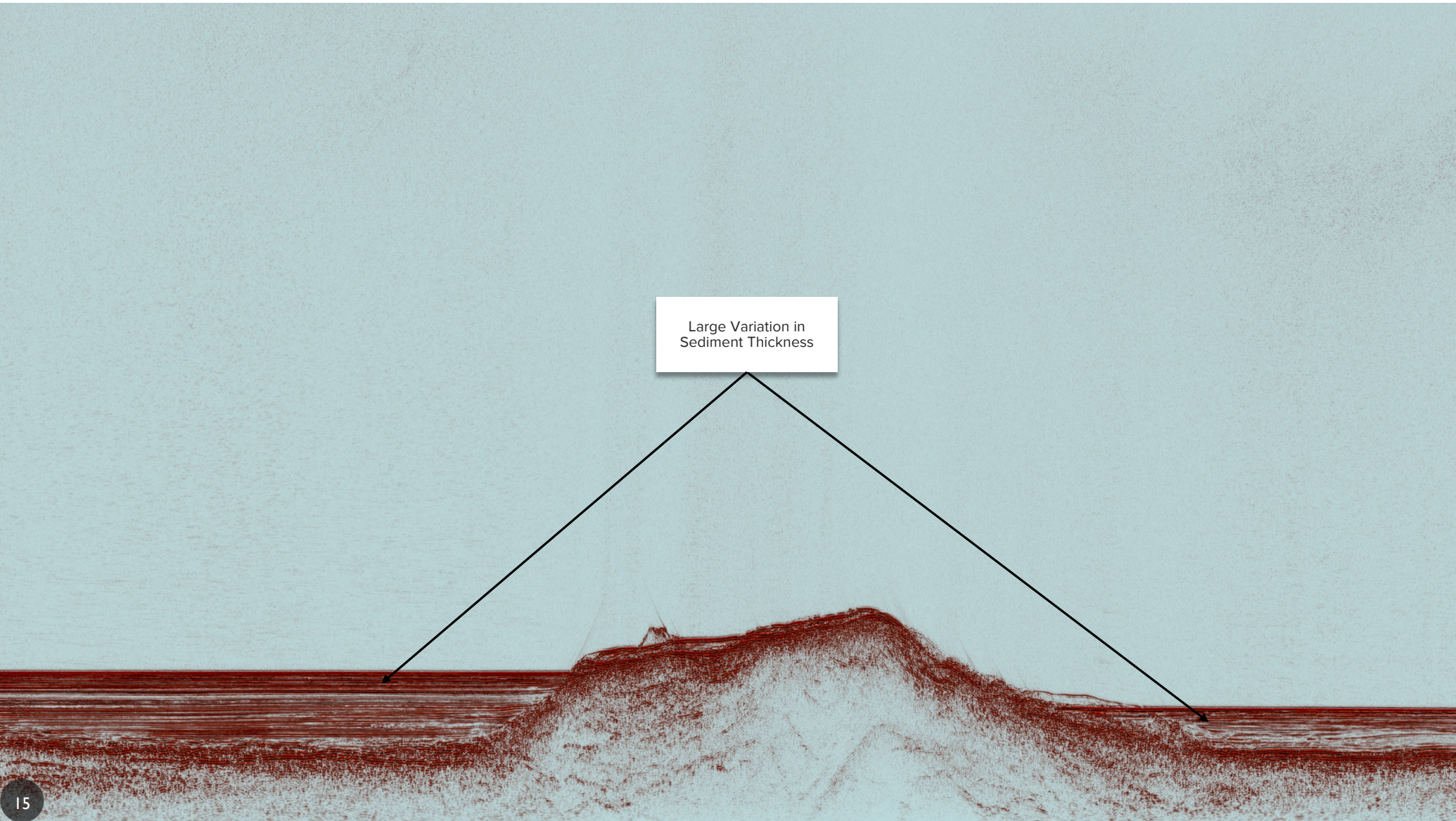
E08

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0 25 50 km



Large Variation in
Sediment Thickness



Preliminary Results



W01

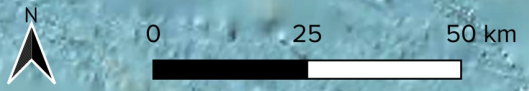
T09

W06

W04

E08

T01

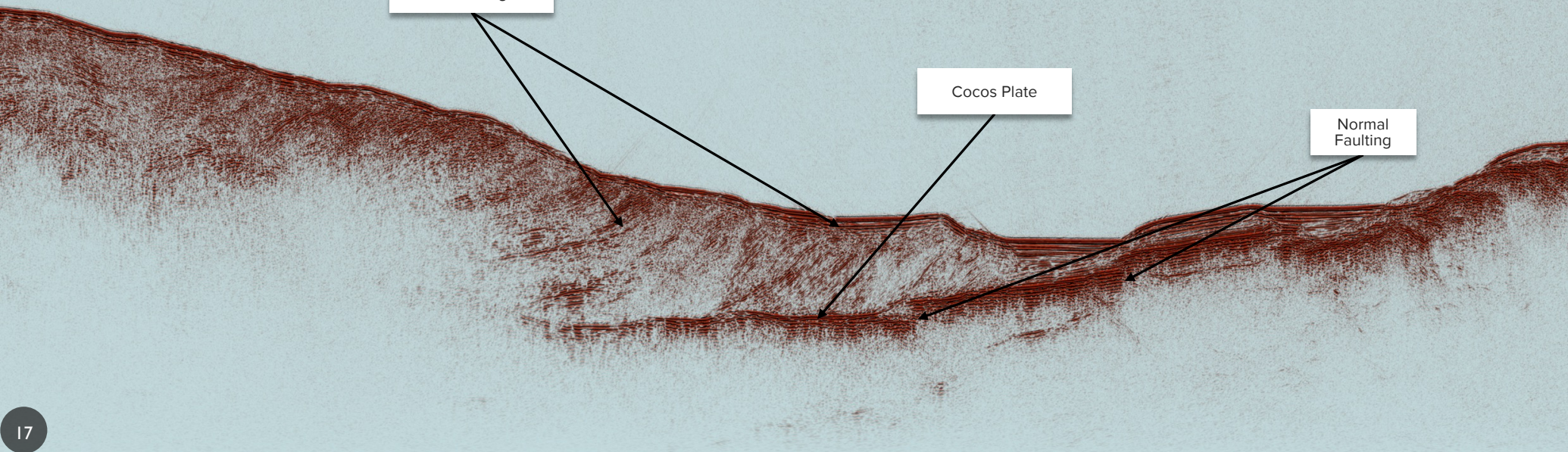


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- Trench Profiles
- East Profiles
- Heat Flow Penetrations
- Guerrero Seismic Gap

Imbricate Thrust
Fold Packages

Cocos Plate

Normal
Faulting



Preliminary Results



W01

T09

W06

W04

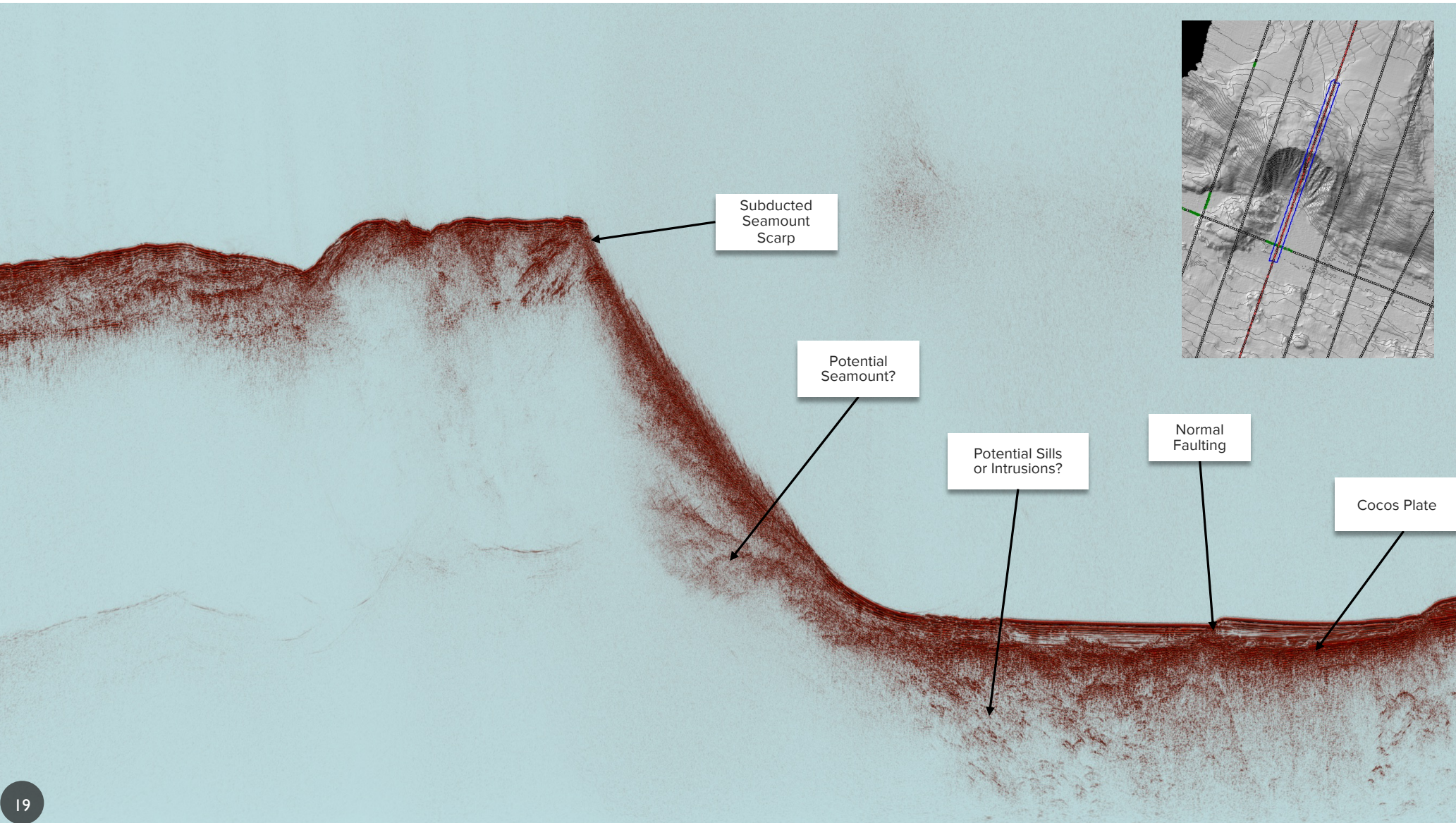
T01

E08

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0 25 50 km





Preliminary Results



W01

T09

W06

W04

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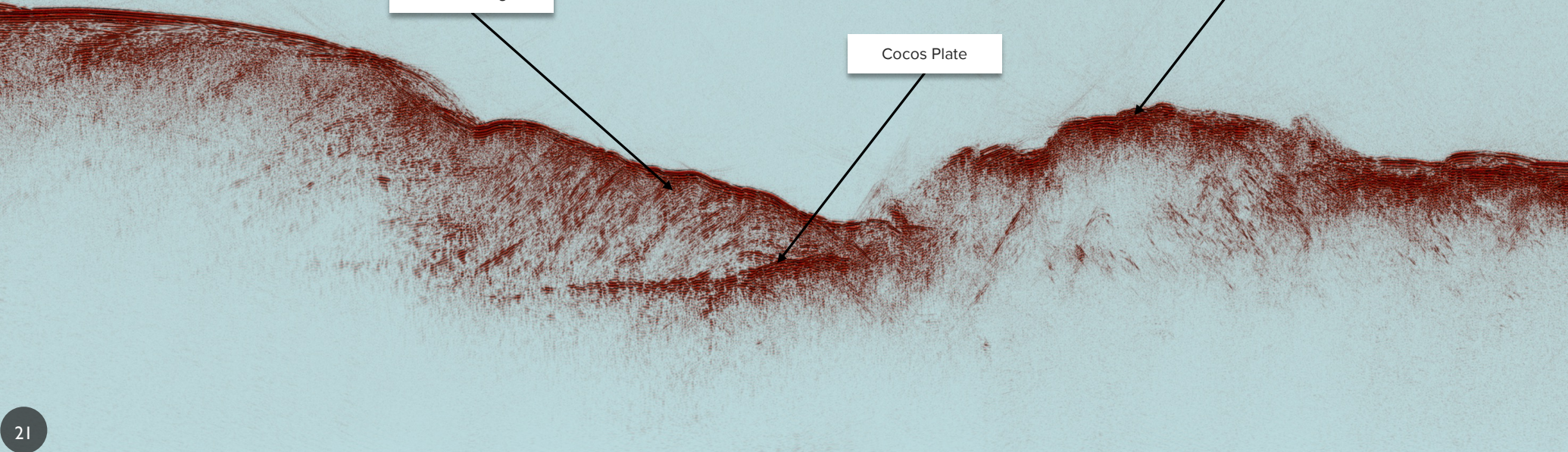
0 25 50 km



Imbricate Thrust
Fold Packages

Cocos Plate

Soon to be
Subducted
Topography



Key Takeaways

- Successful cruise: >1300 km MCS data and >140 heat flow measurements
- Incoming Cocos Plate shows abundant faulting, rough topography, and variable sediment cover
- Margin profiles show along-strike changes in wedge morphology
- Heat flow shows lower values than typical for only conductive cooling
- Heat flow variability seems to be linked to structural setting (e.g., seamount flank, along normal faults, etc.)
- This integrated dataset will help evaluate links between structure, heat flow, and slow-slip

Thank you!

Questions?