

# Offshore Wind Farm Activity and Submarine Slope Failure on Australian continental margins

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# Declared Areas

- Areas available for feasibility licence applications
- Gippsland area licence applications closed in April 2023
- Hunter area licence applications close in November 2023





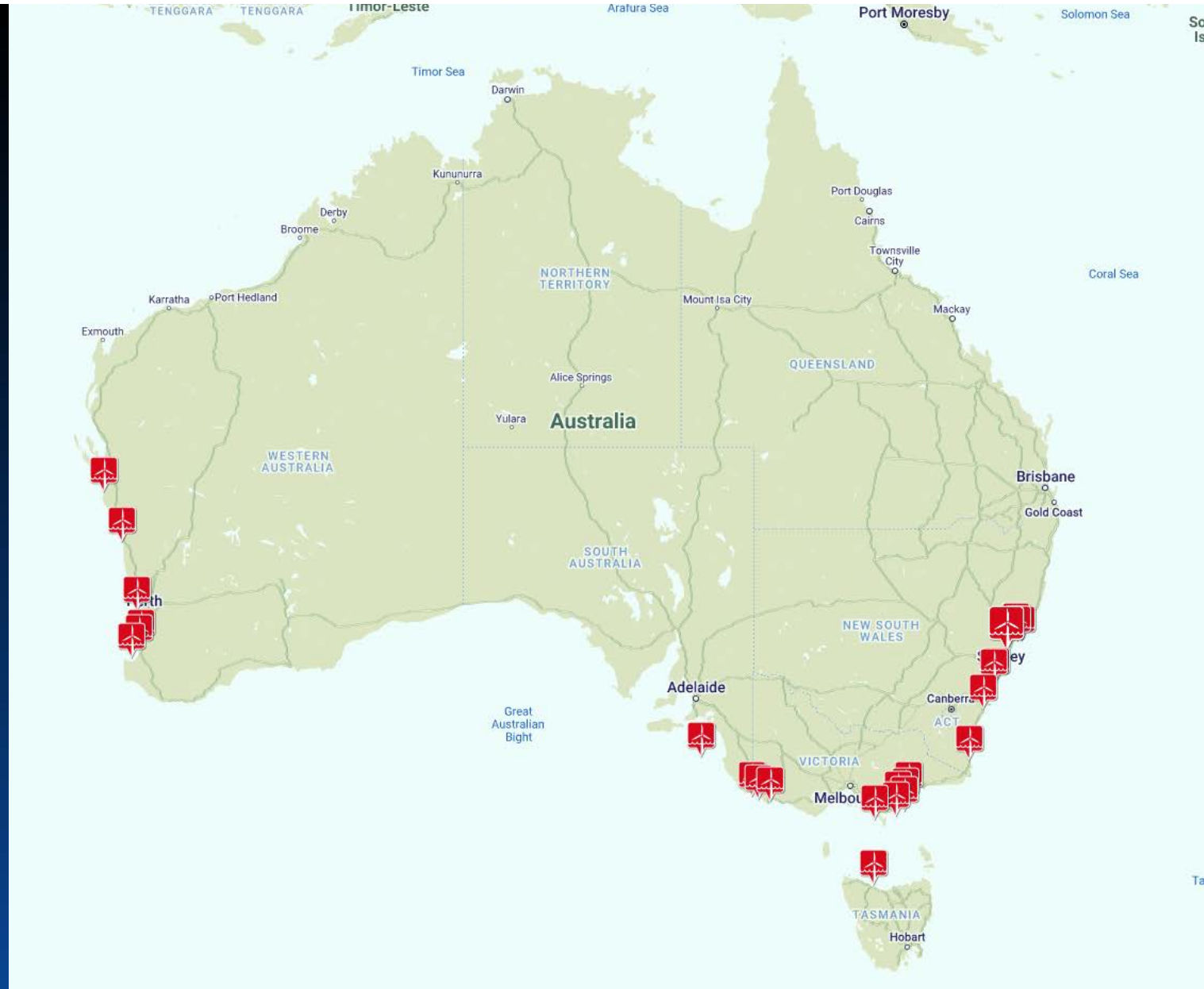
# Proposed Areas

- Southern Ocean - consultation closed 31 August 2023
- Illawarra - consultation closes 16 October 2023
- Additional “priority areas” offshore northern Tasmania and offshore Western Australia



# Potential projects

- Potential to replace all existing coal fired electricity generation
- No regulation prior to 2022

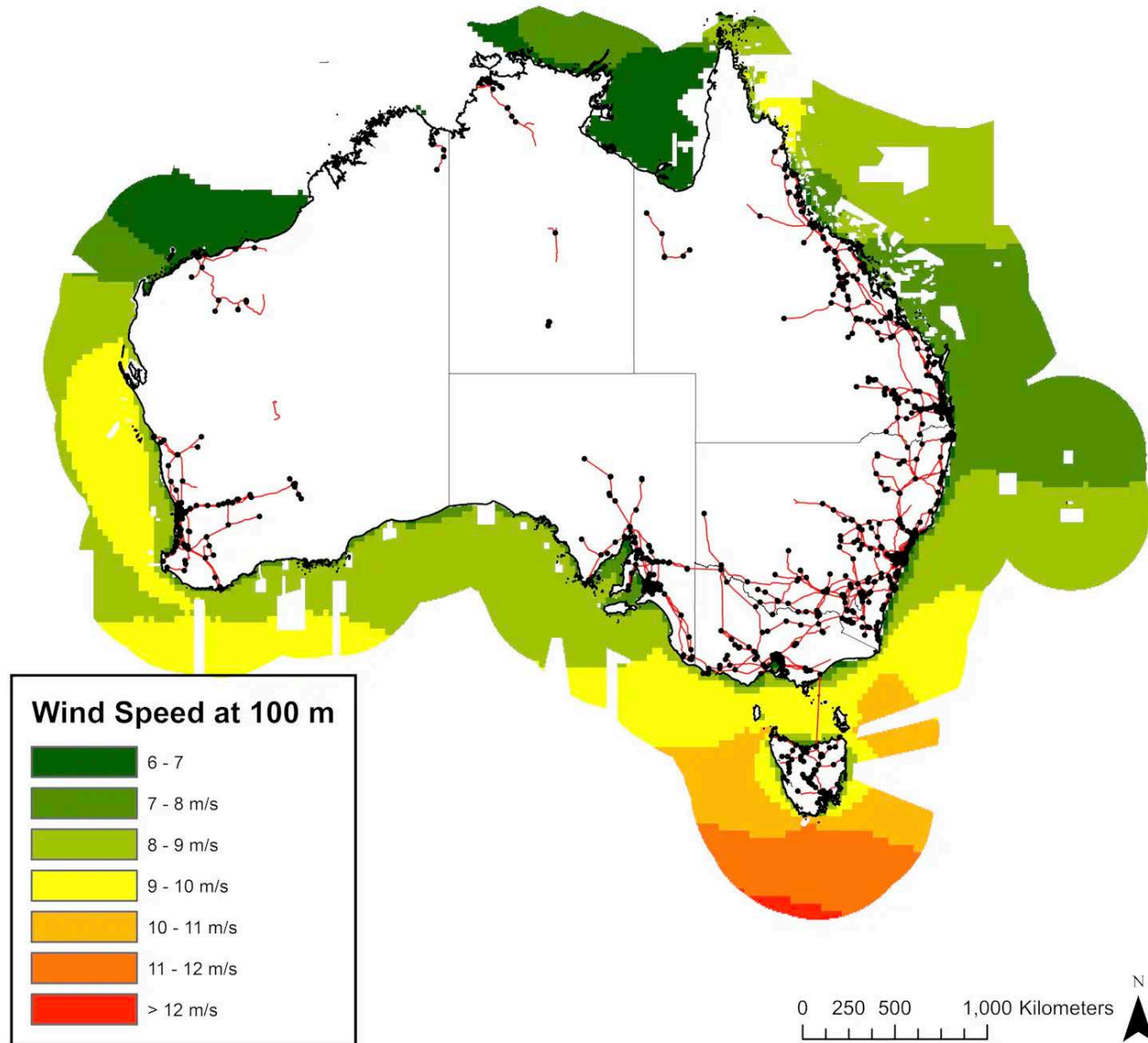


From [reneweconomy.com.au](http://reneweconomy.com.au)

# Potential projects

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- No regulation prior to 2022
- Favourable wind speeds

*From Teske et al. (2021) - The Conversation*





# Potential projects

- Potential to replace all existing coal fired electricity generation
- No regulation prior to 2022
- Favourable wind speeds
- Relatively narrow shallow shelves

*From earthquakes.ga.gov.au*

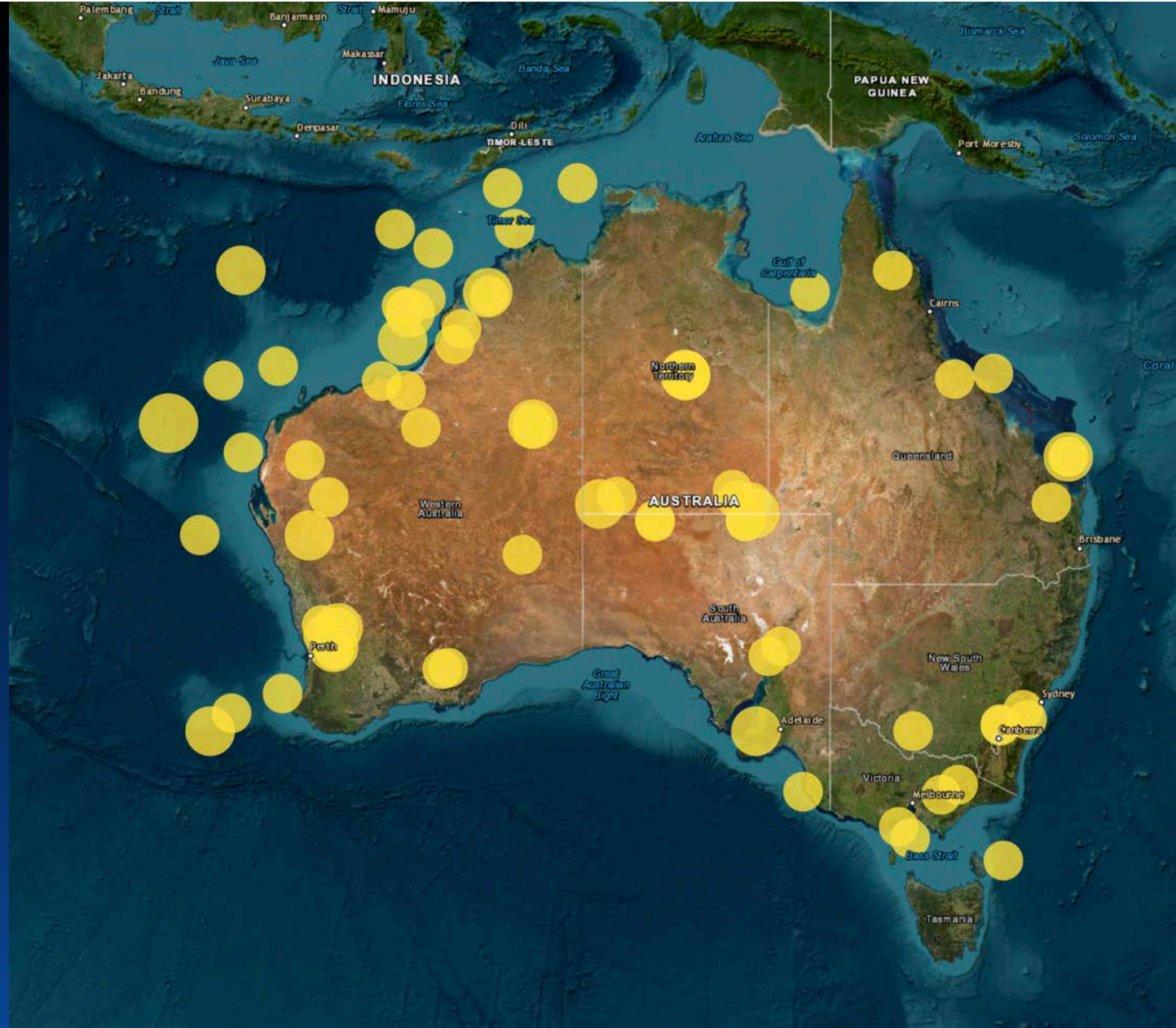




# Potential projects

- Potential to replace all existing coal fired electricity generation
- No regulation prior to 2022
- Favourable wind speeds
- Relatively narrow shallow shelves
- Earthquake prone, widespread submarine instability

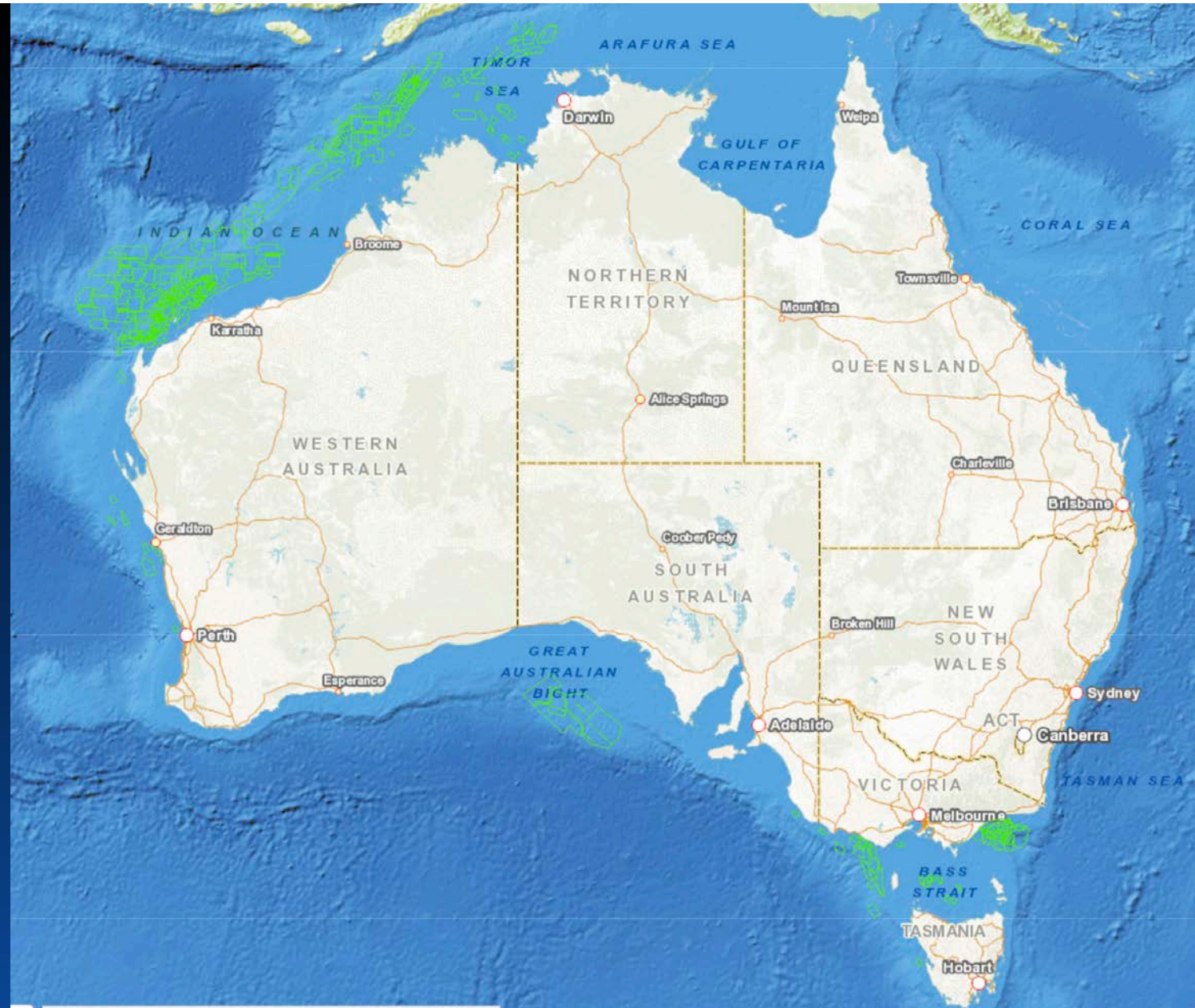
*From earthquakes.ga.gov.au*





# Potential projects

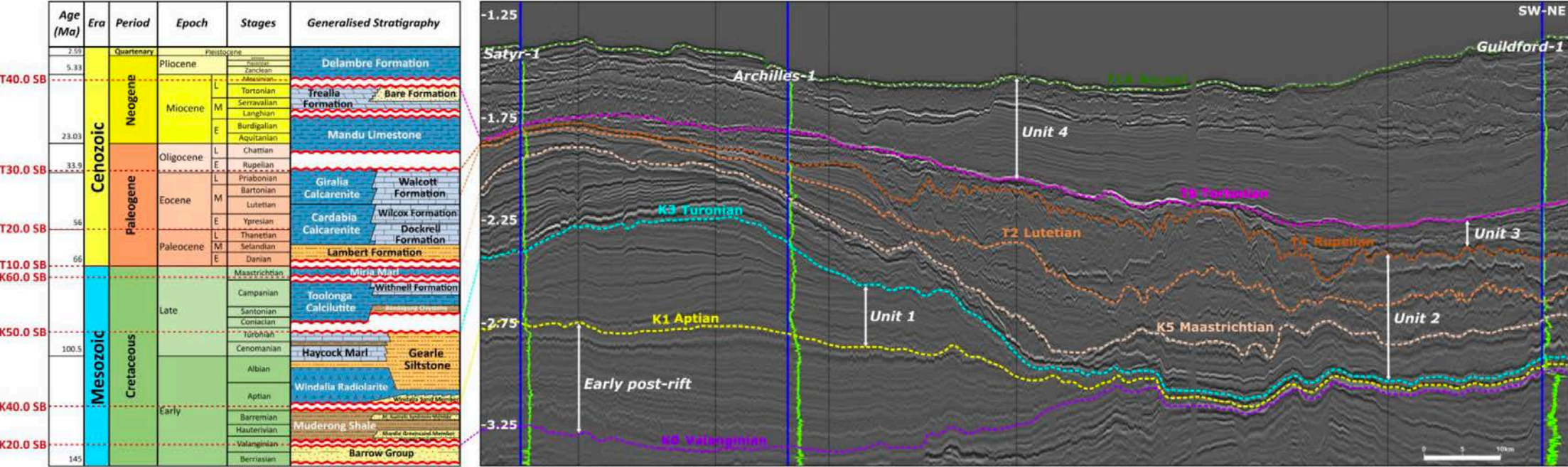
- Widespread, publicly available, easily accessible data



From [ga.gov.au/nopims](http://ga.gov.au/nopims)

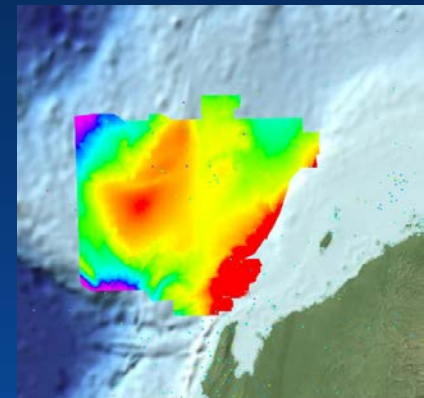
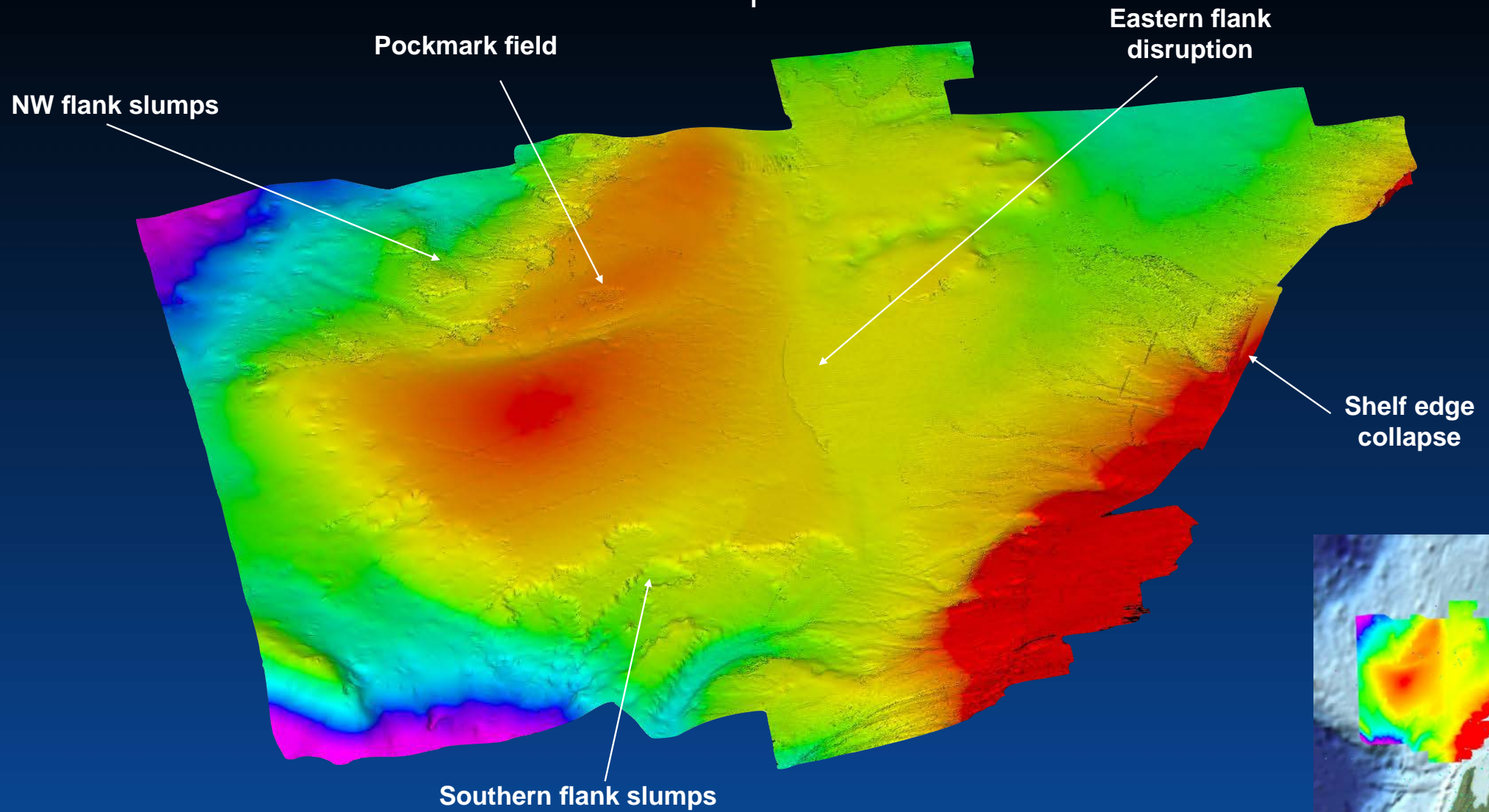


# Northwest Shelf post-rift evolution



Winata et al (2023)

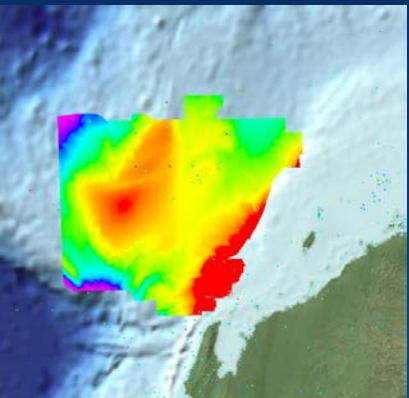
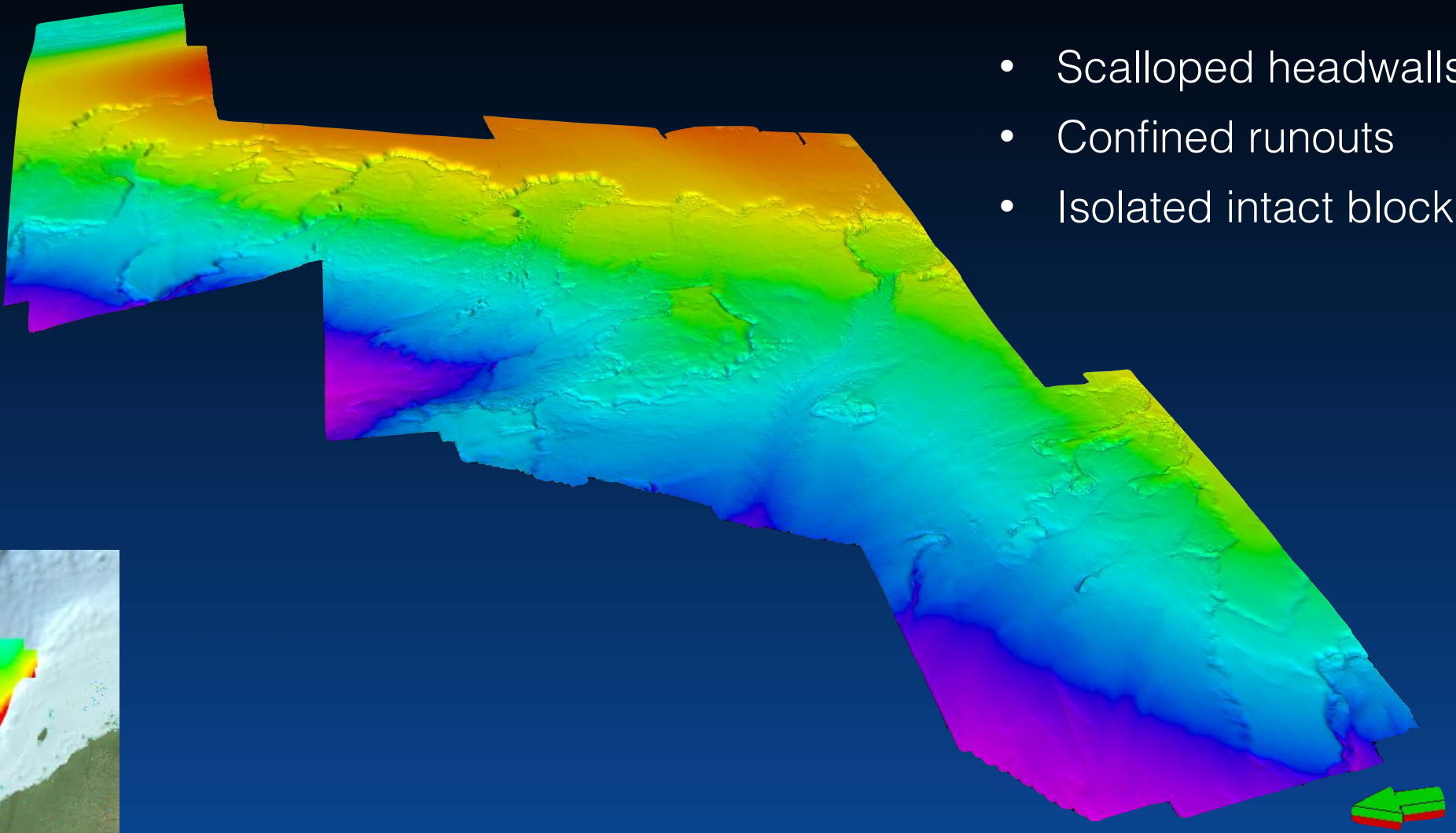
# Northern Carnarvon Basin slope failures



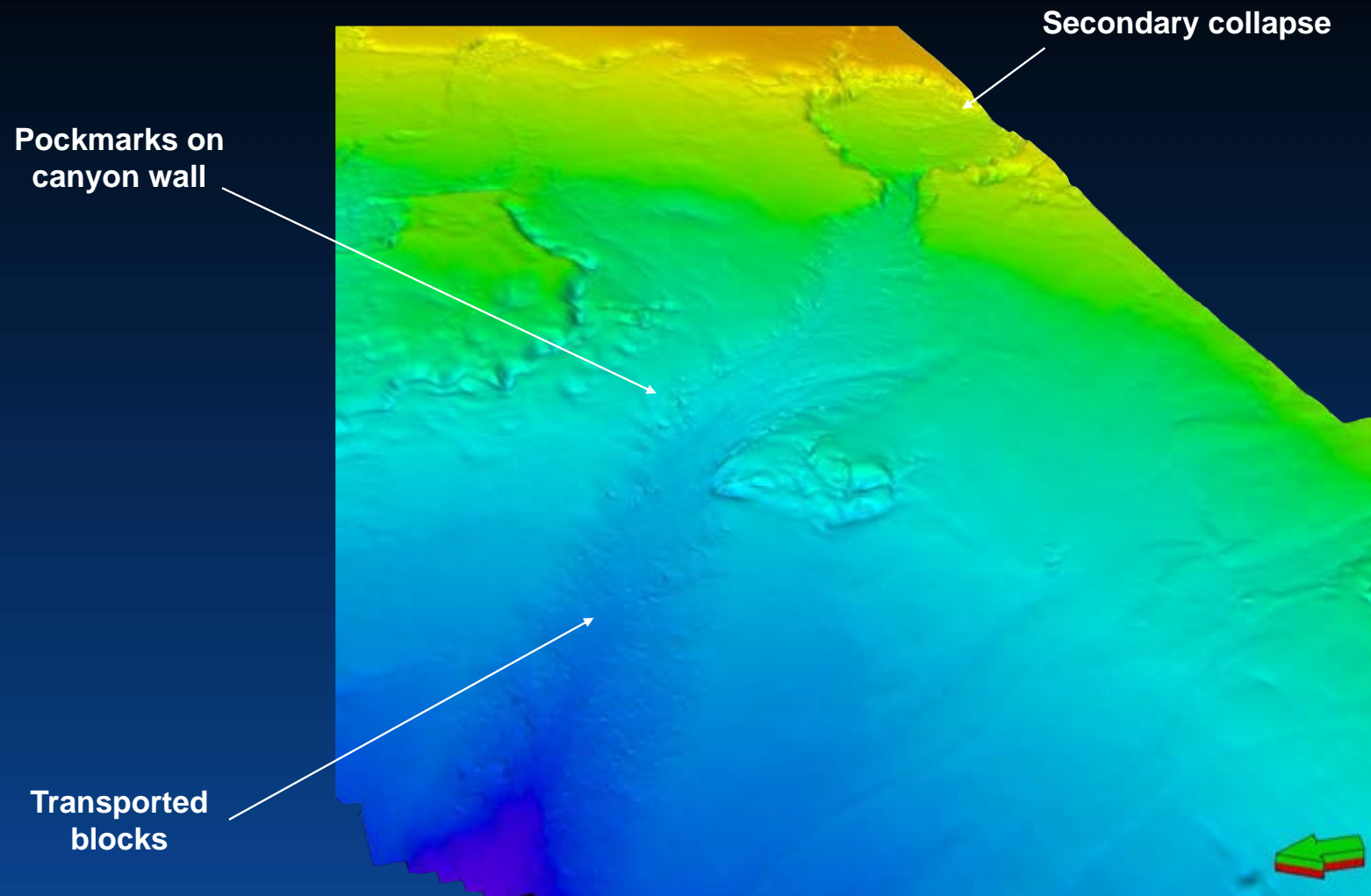


# Exmouth Arch NW flank slumps

- Scalloped headwalls
- Confined runouts
- Isolated intact blocks

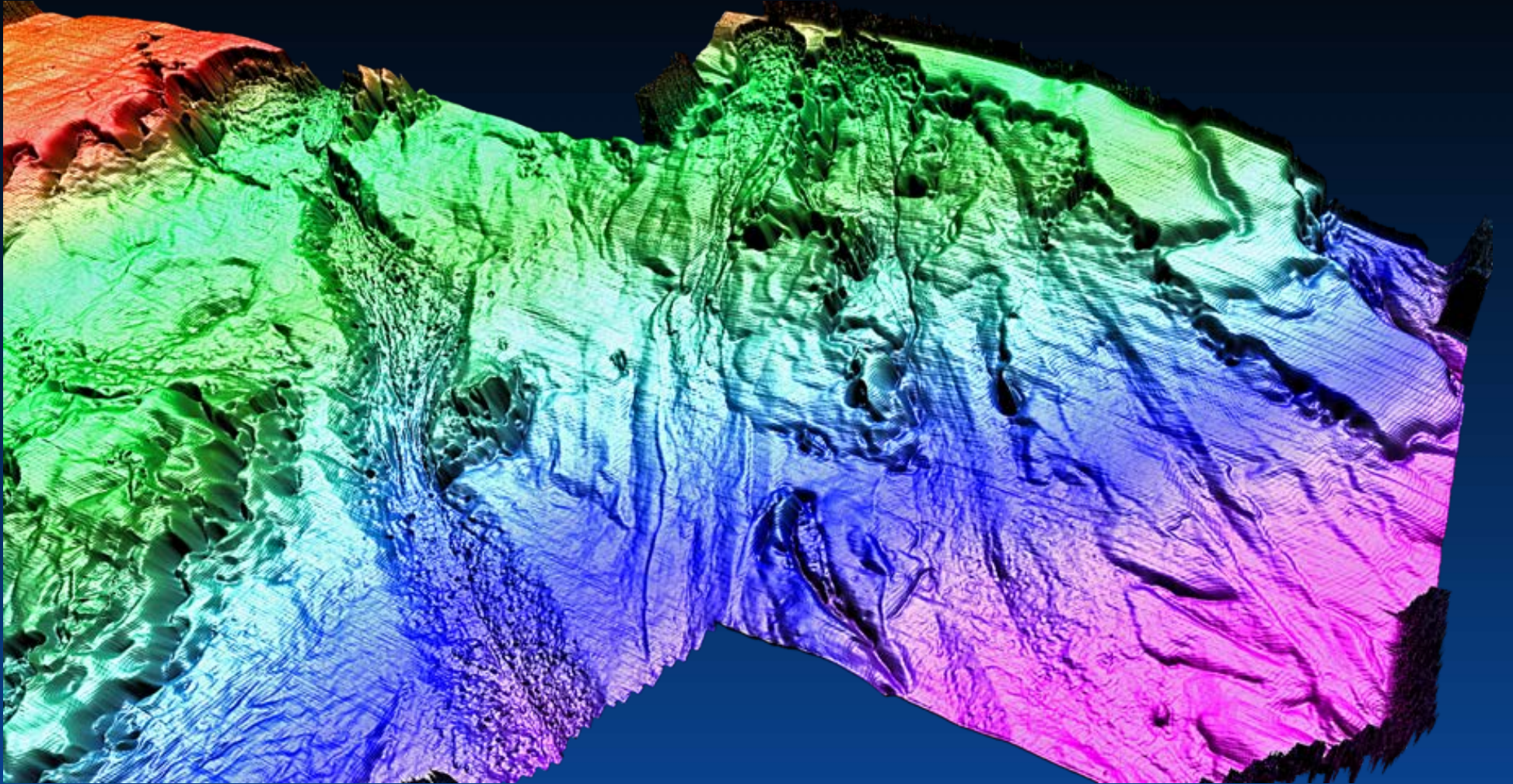


# Exmouth Arch NW flank slumps



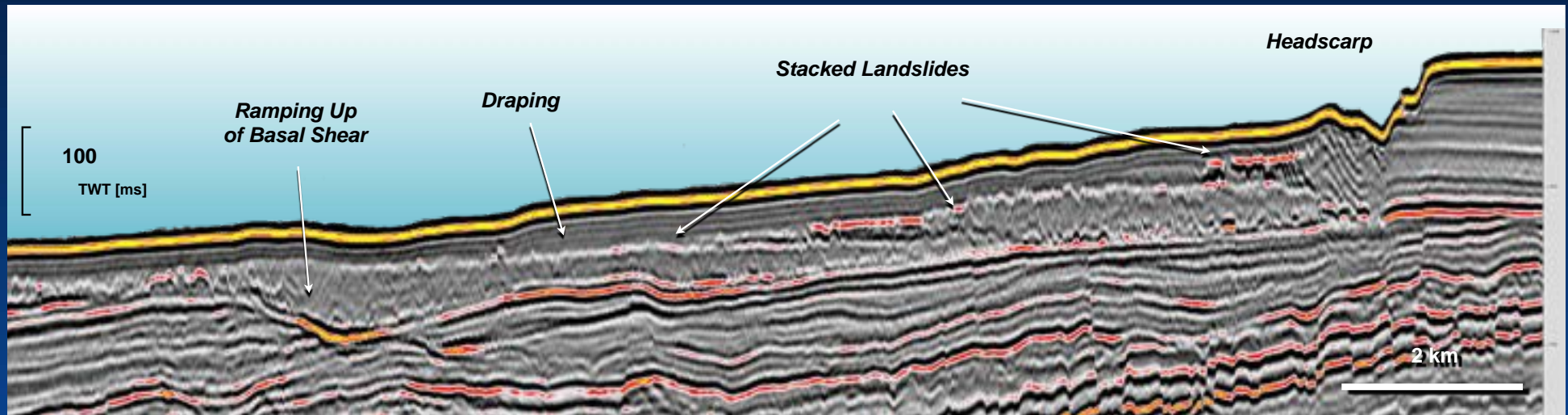
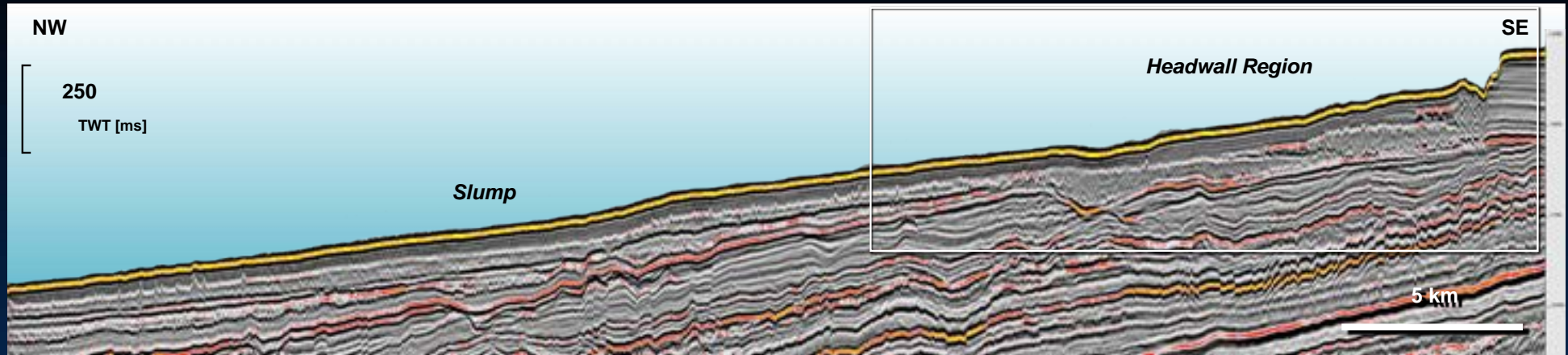


# Exmouth Arch NW flank slumps



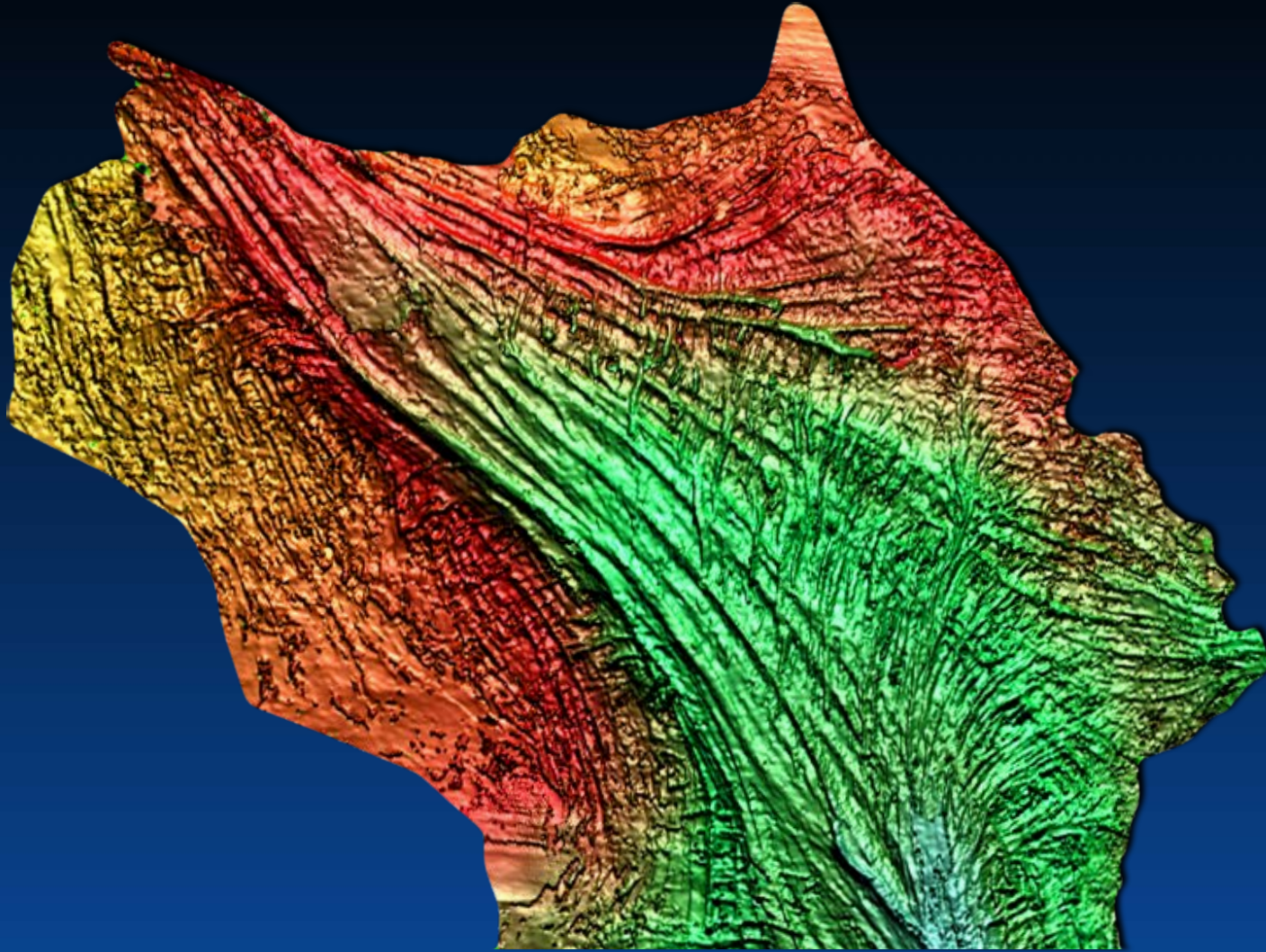


# Exmouth Arch NW flank slumps

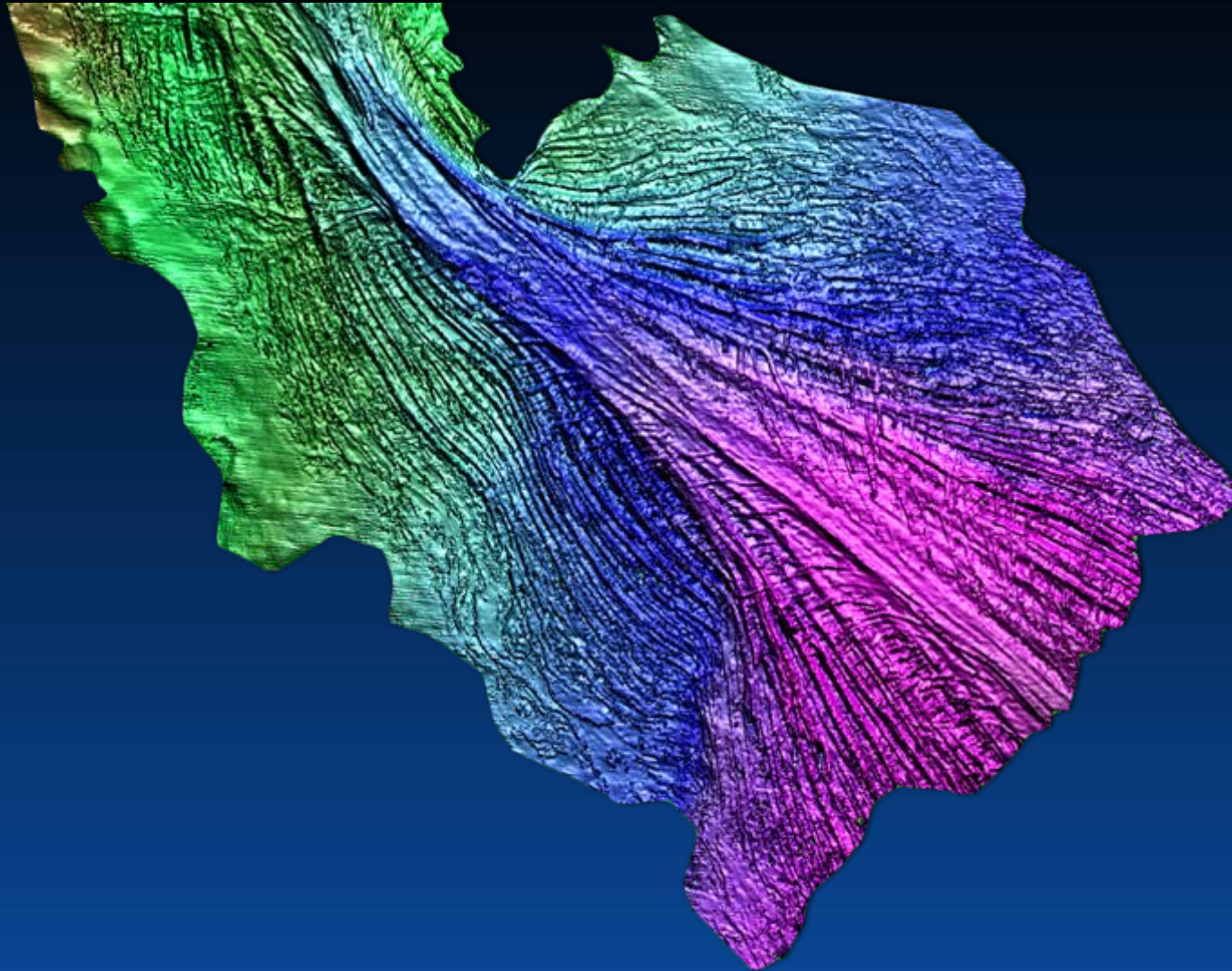




# Exmouth Arch NW flank slumps - basal shear surface

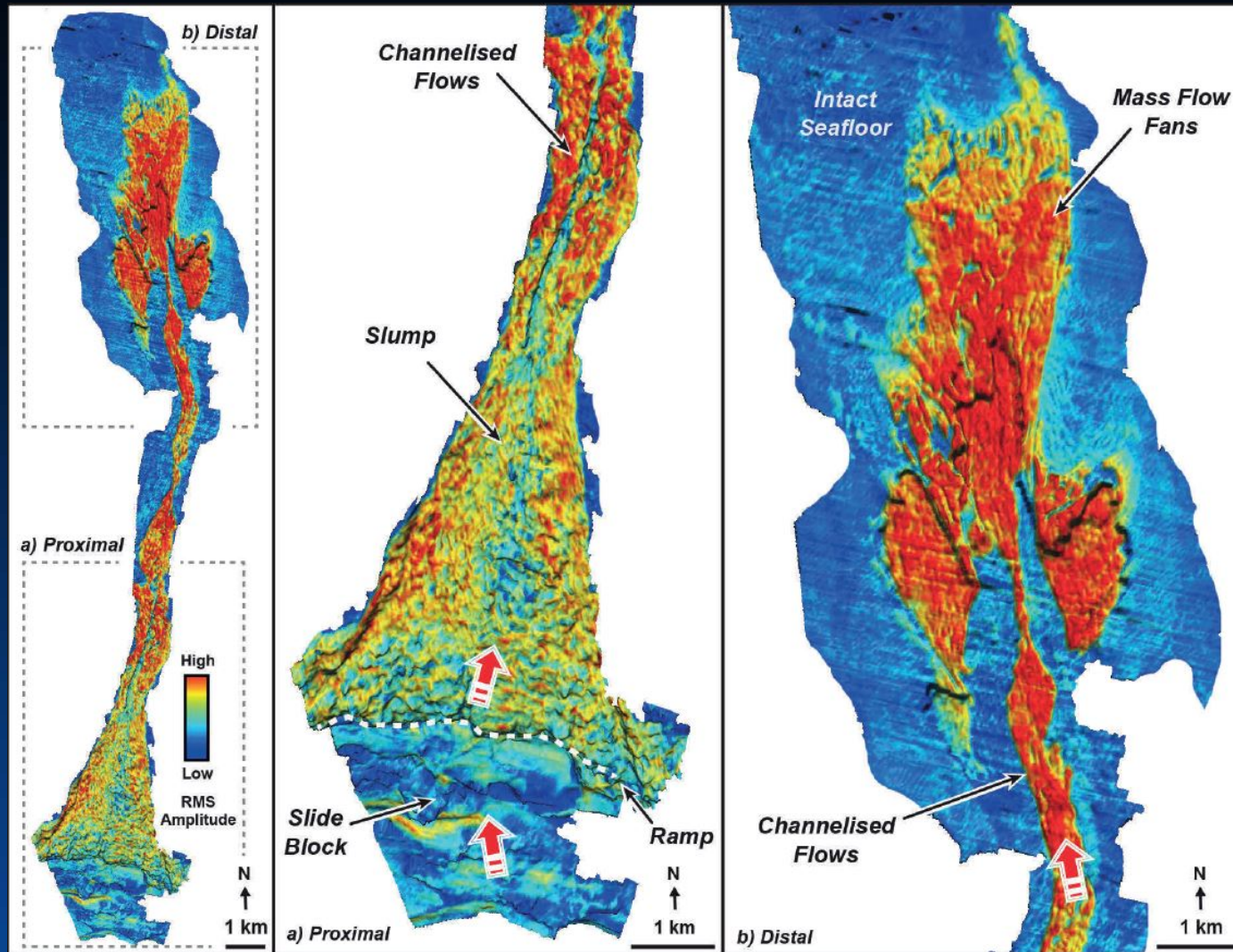


# Exmouth Arch NW flank slumps - basal shear surface

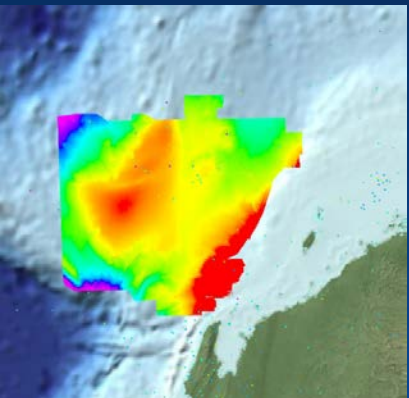
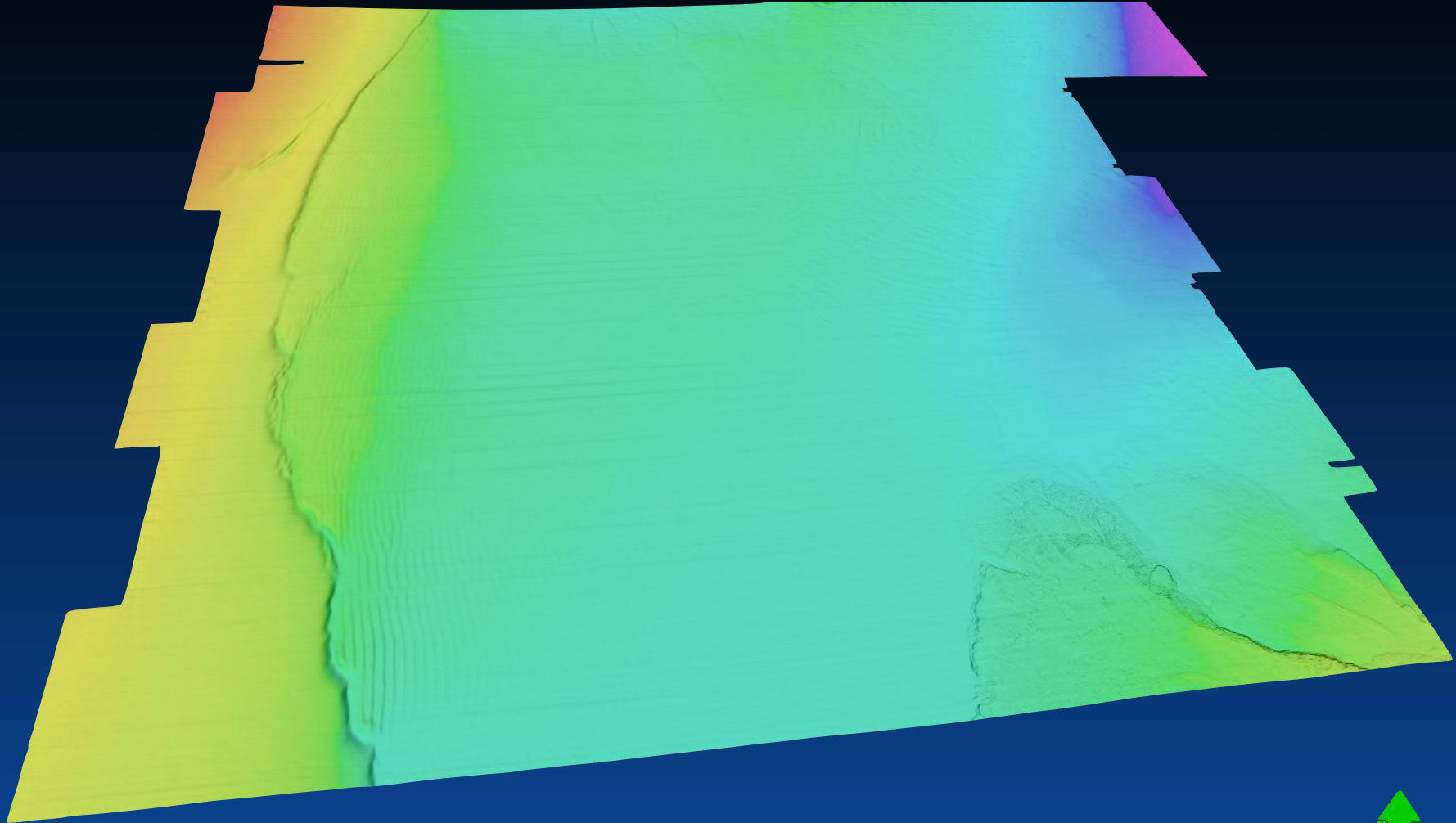




# Exmouth Arch NW flank slumps - mass flow fans



# Eastern flank slope failure

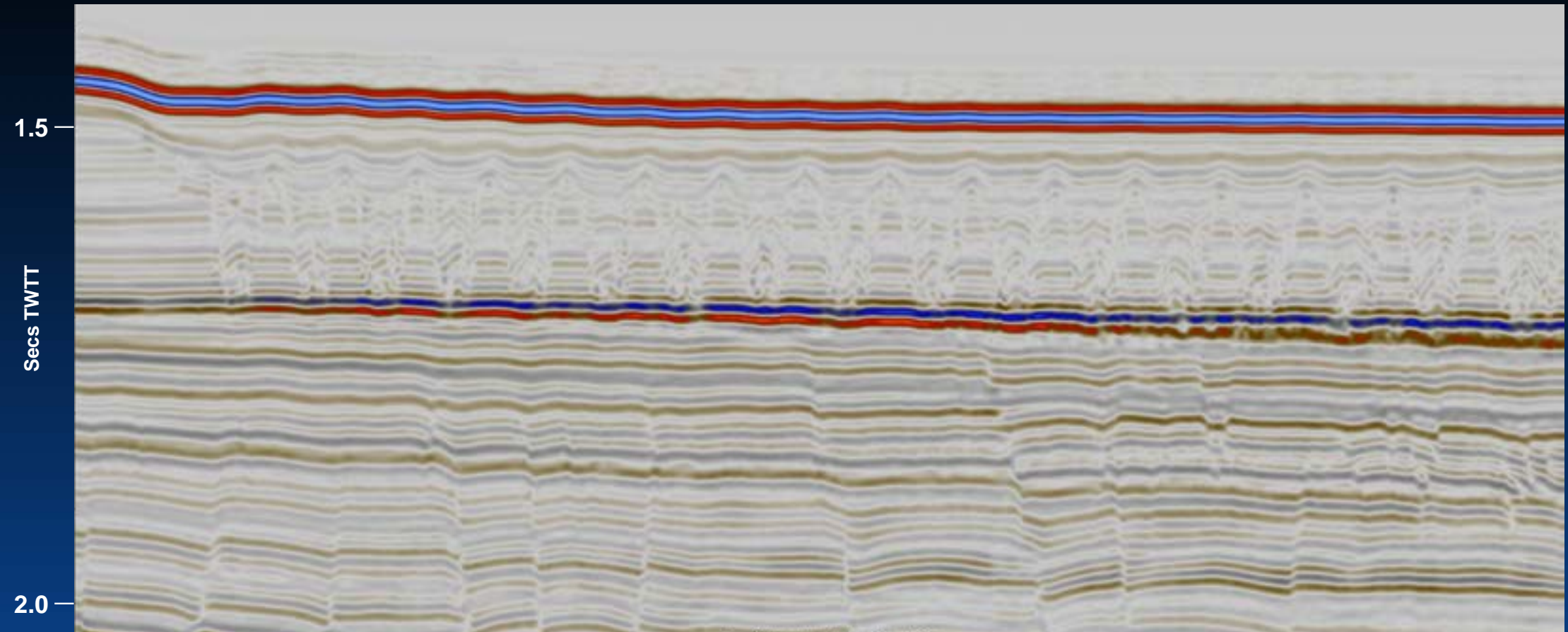




# Eastern flank slope failure

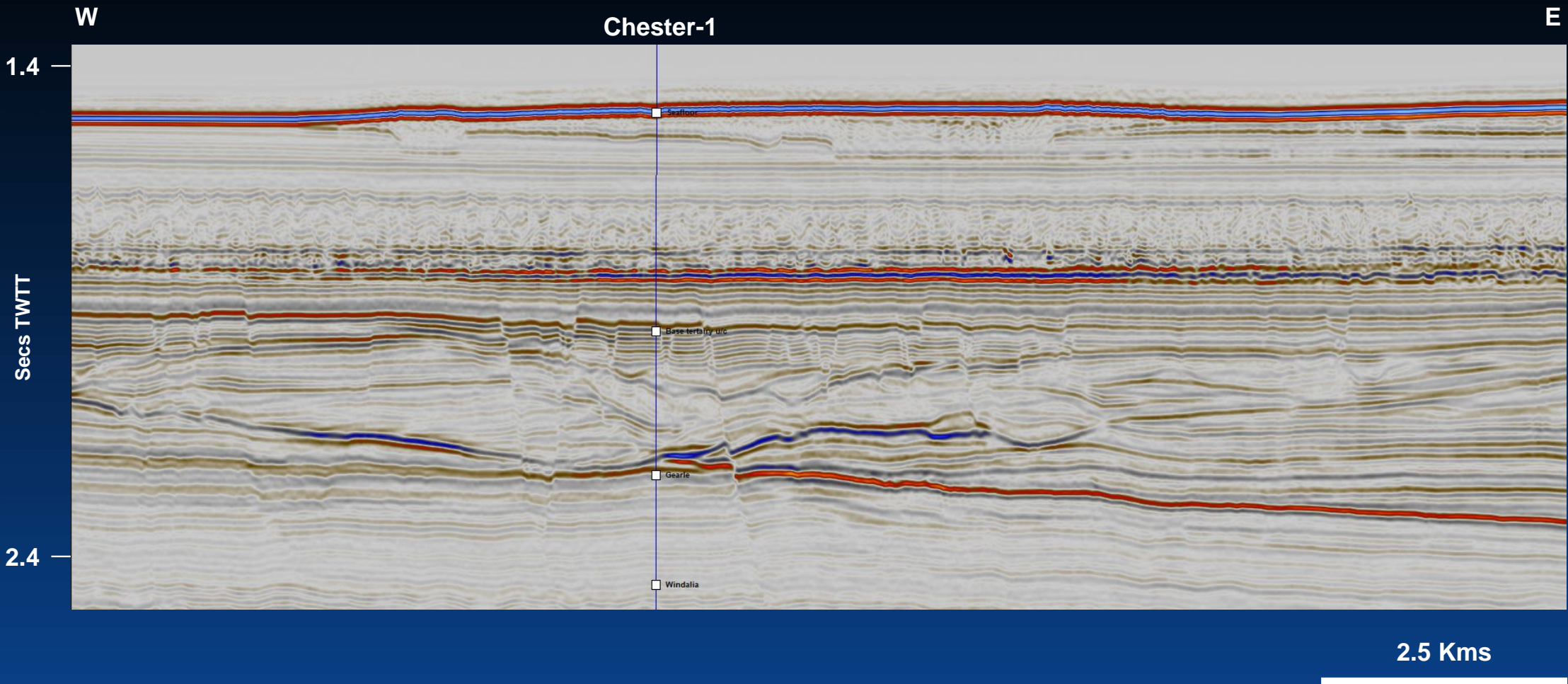
W

E



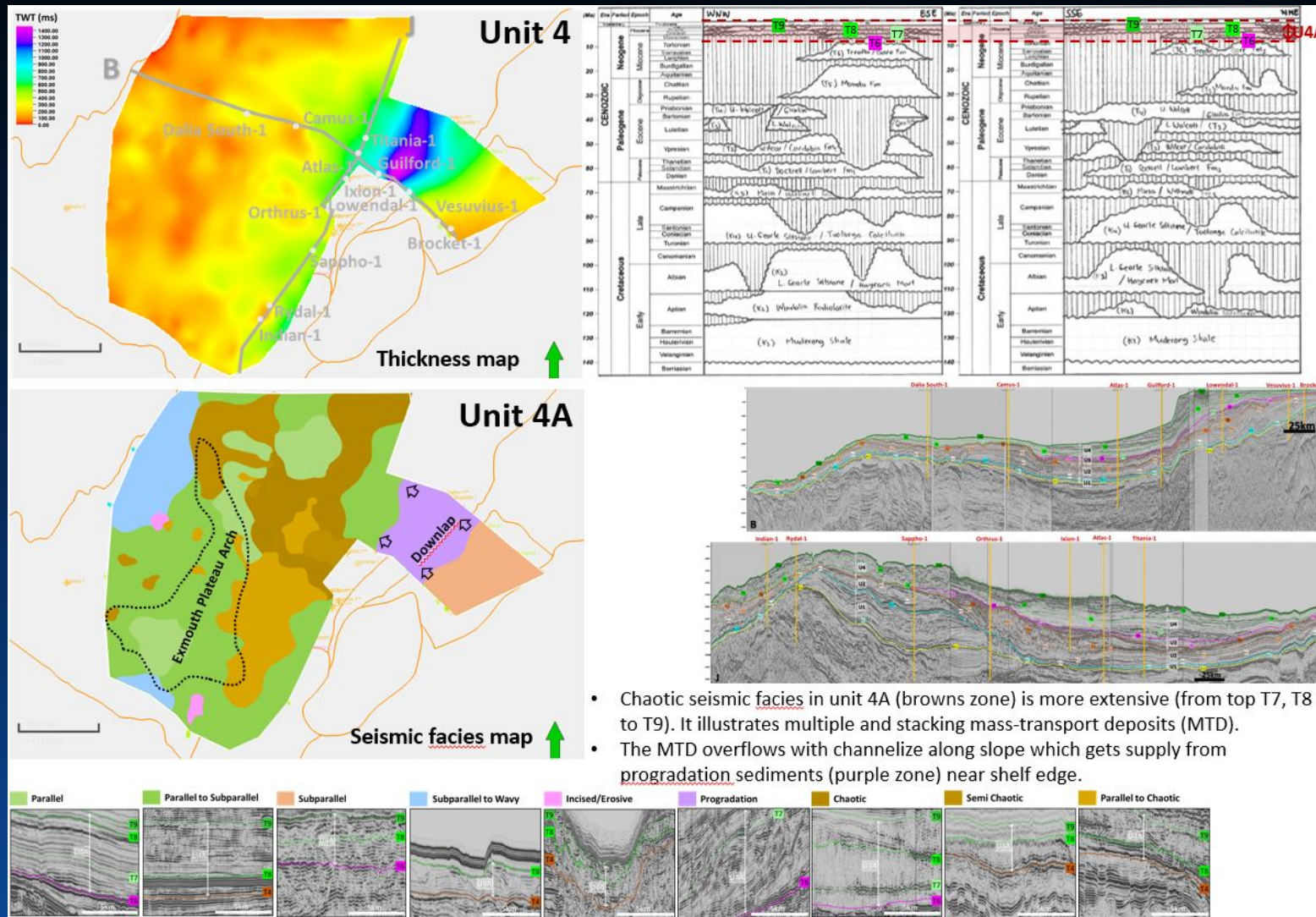
1 Km

# Eastern flank slope failure



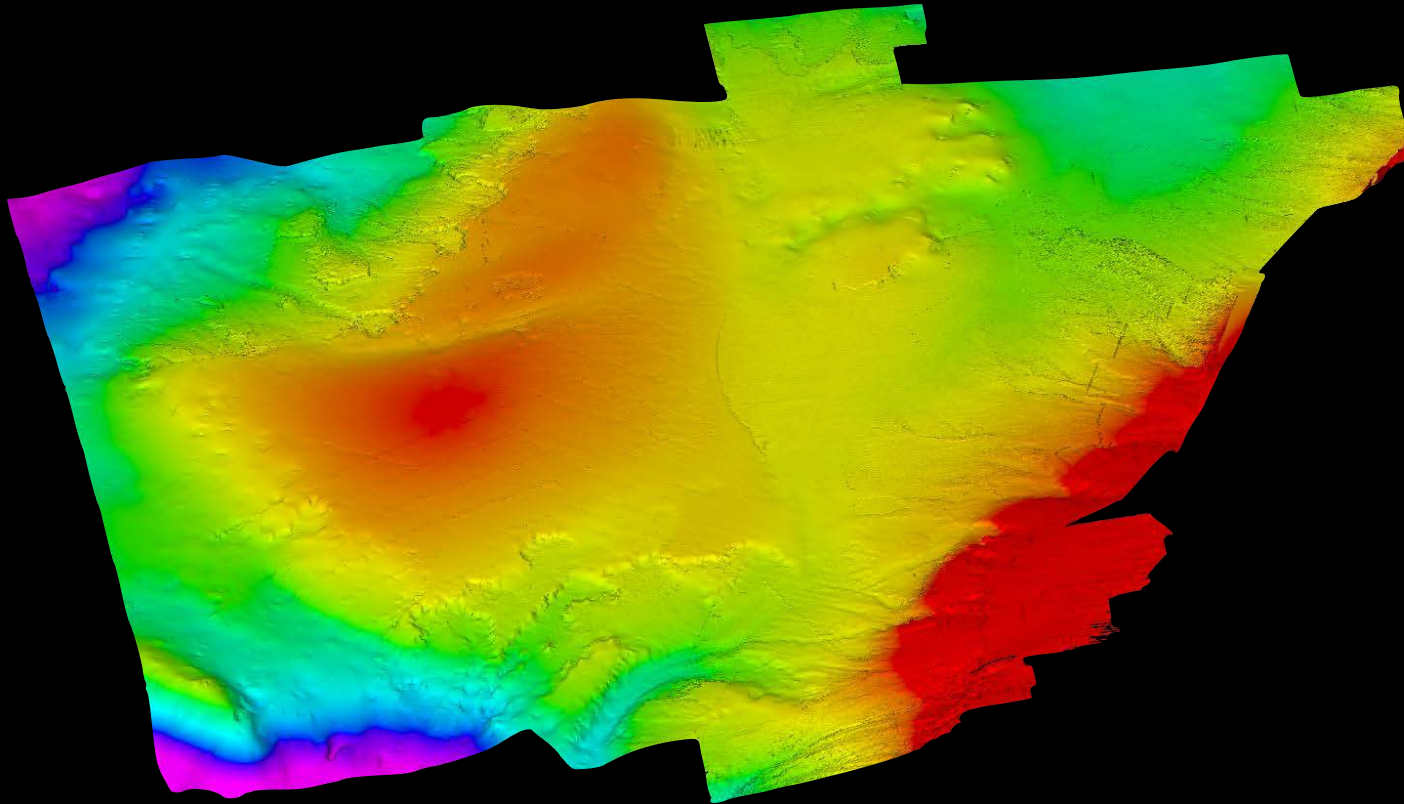


# Slope failure extent



- Chaotic seismic facies in unit 4A (browns zone) is more extensive (from top T7, T8 to T9). It illustrates multiple and stacking mass-transport deposits (MTD).
- The MTD overflows with channelize along slope which gets supply from progradation sediments (purple zone) near shelf edge.

# Potential triggering mechanisms - slope steepening

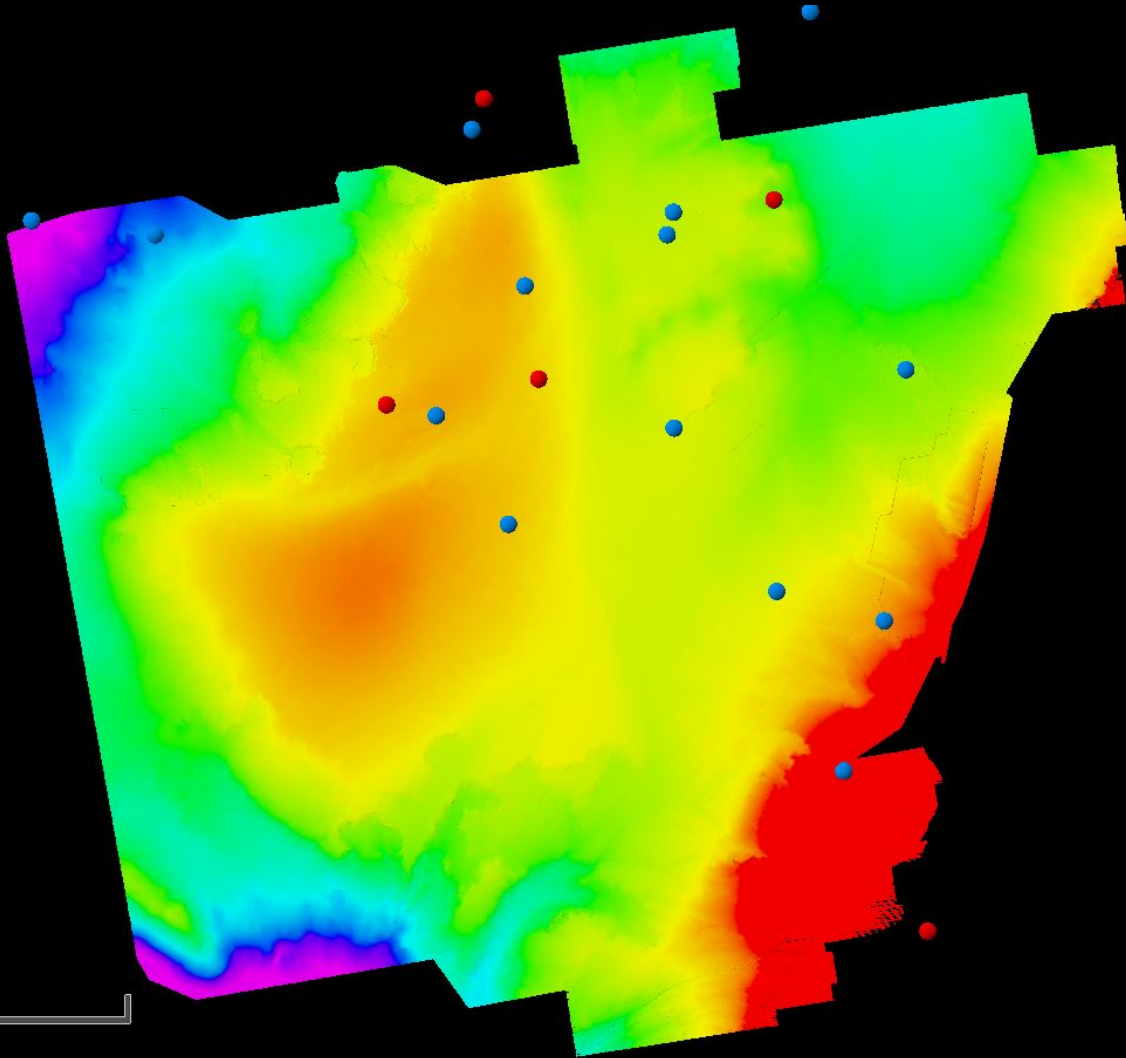


- Post Oligocene growth of Exmouth Arch
- Active, growing structure
- 0.7 degree slope of western flank, 0.2 degrees on eastern flank



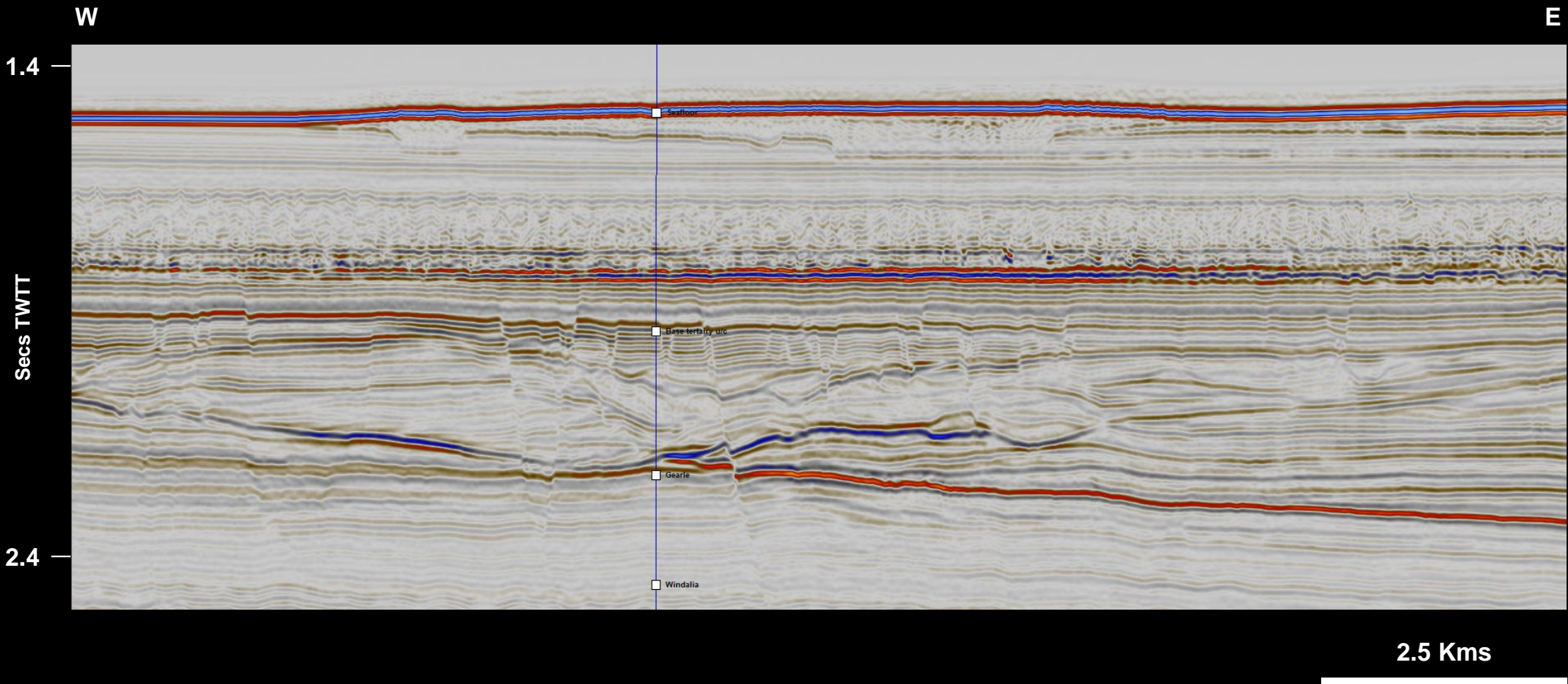


# Potential triggering mechanisms - seismic shaking



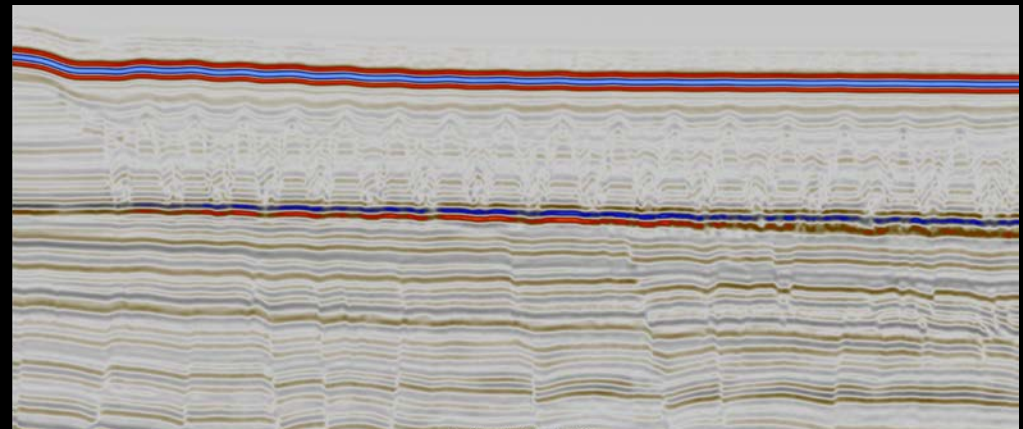
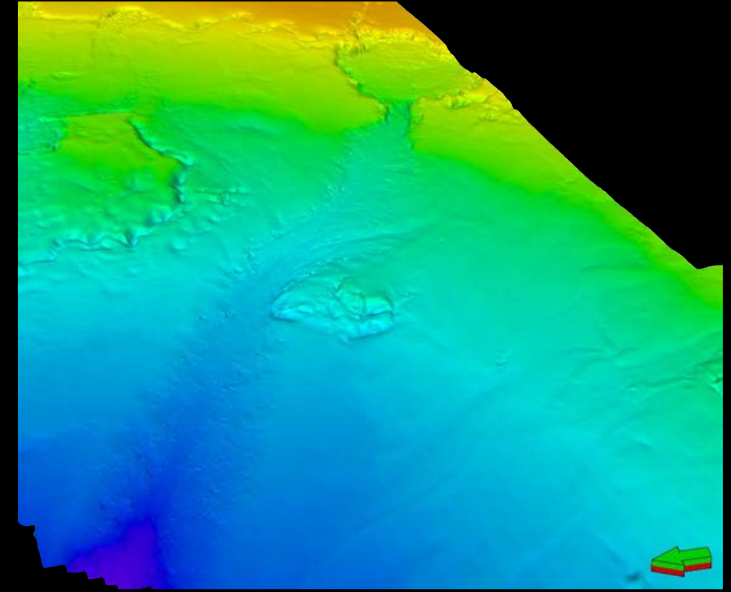
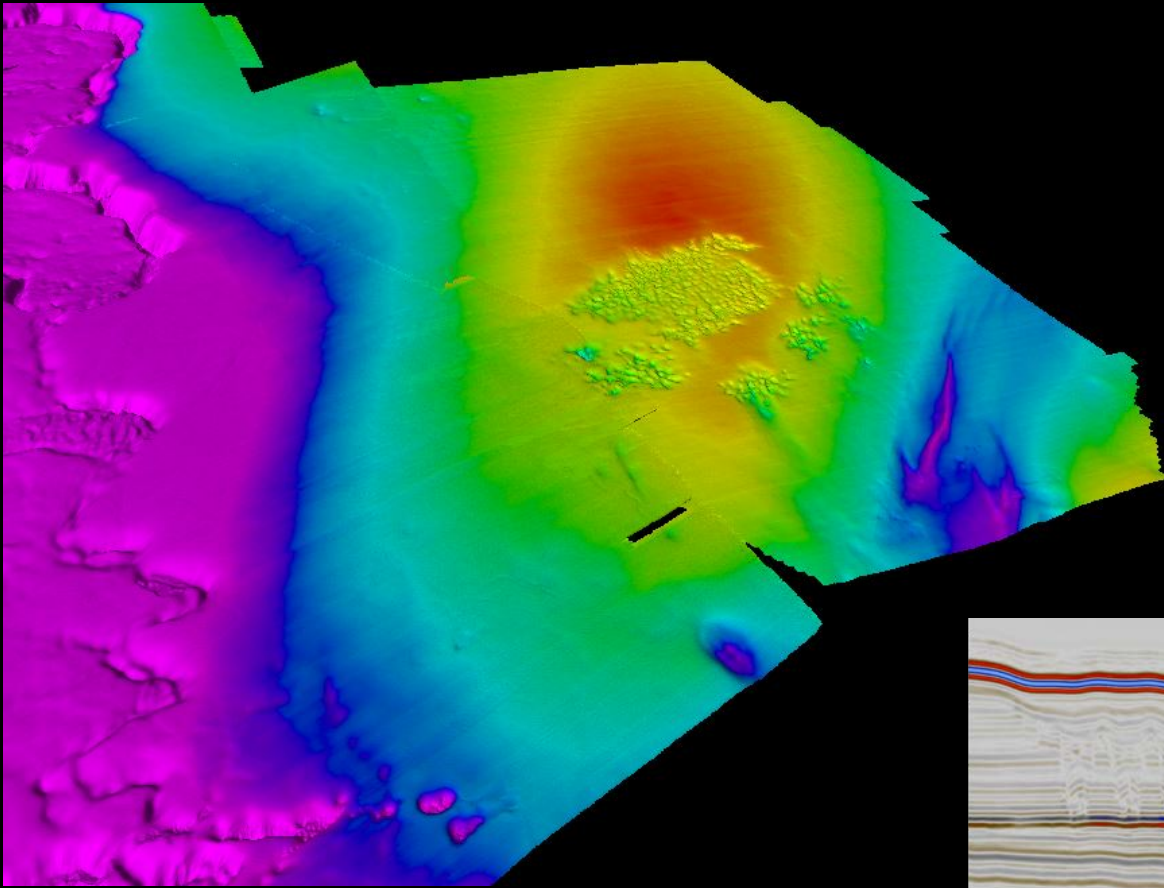
Historic earthquake record,  
magnitude 5 (red),  
magnitude 4 (blue)

# Potential triggering mechanisms - weak basal detachment

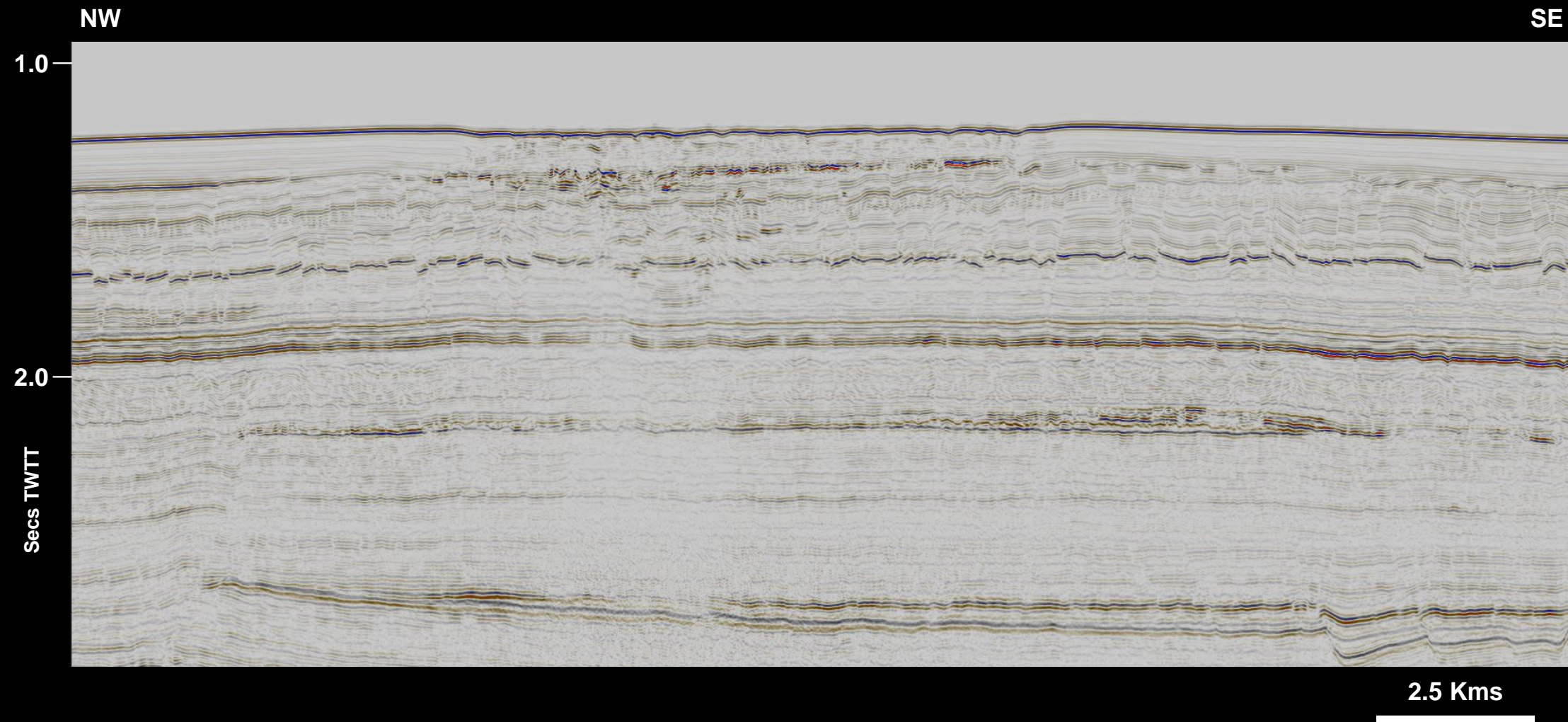




# Potential triggering mechanisms - elevated pore fluid pressure

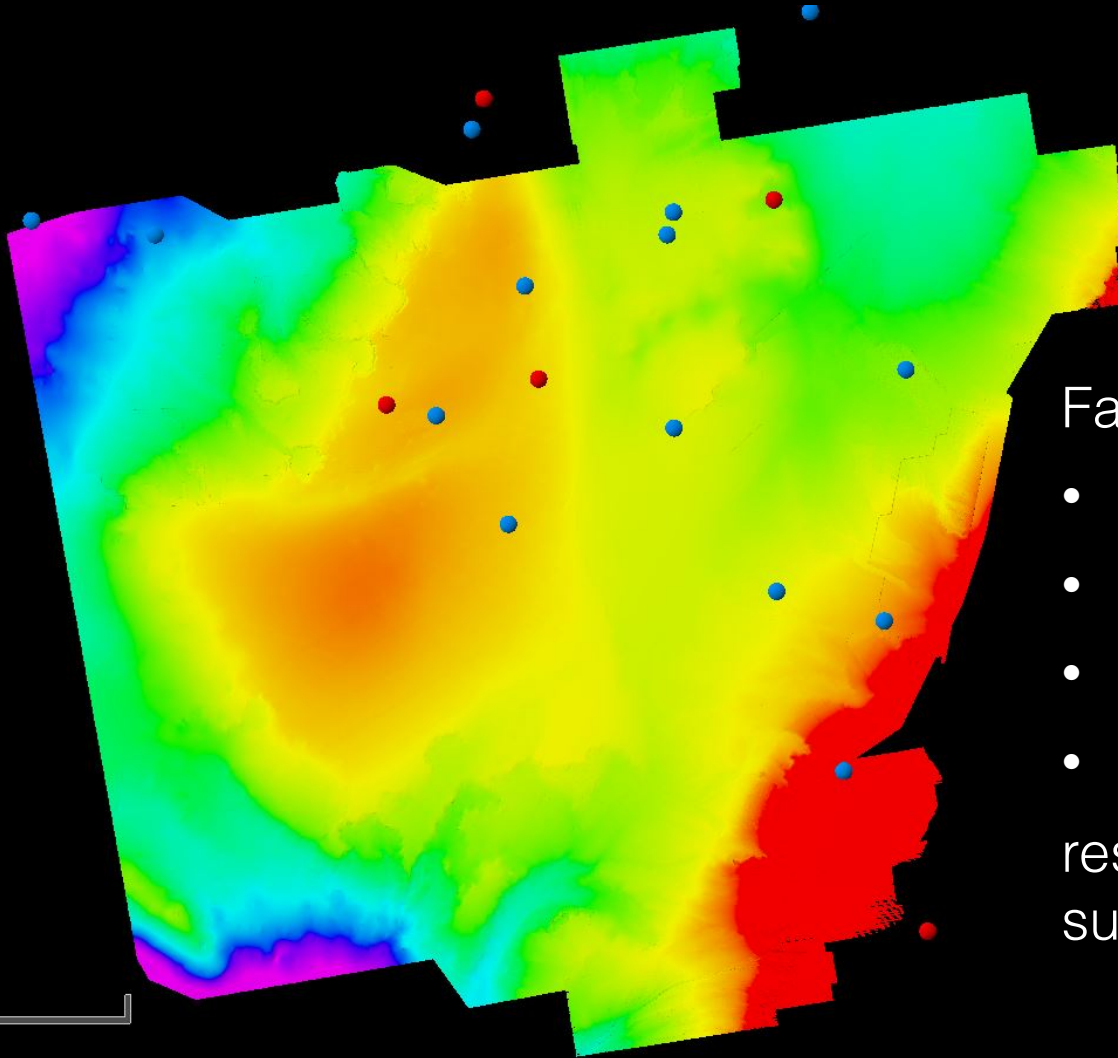


# Potential triggering mechanisms - elevated pore fluid pressure





# Potential triggering mechanisms - summary



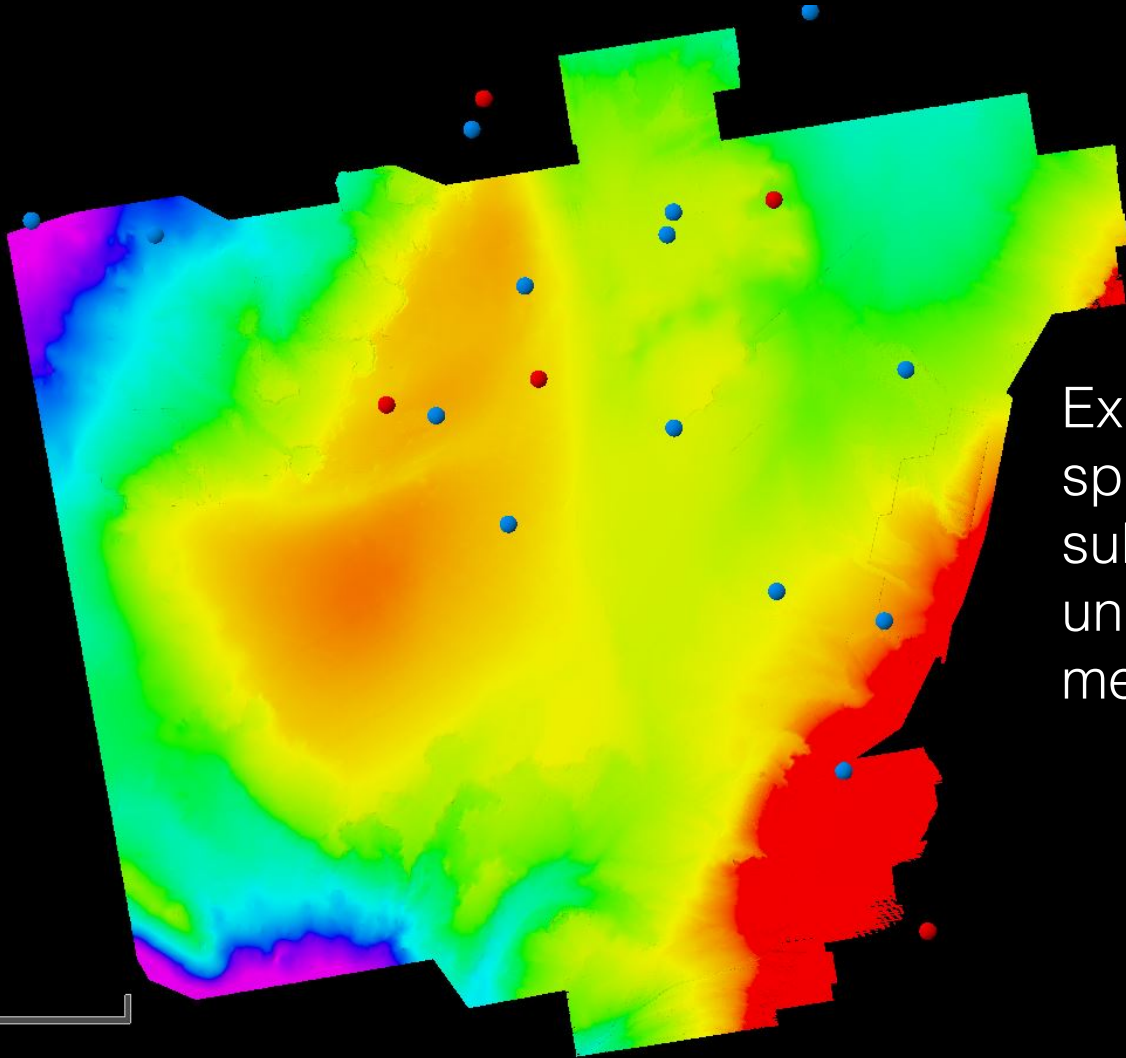
Favourable combination of triggers:

- Slope steepening
  - Seismic shaking
  - Weak basal detachment
  - Excess pore fluid pressures
- result in the common occurrence of submarine slope failures

100000m

1:1373509

# Potential future work



Excellent opportunity to map the spatial and temporal distribution of submarine failure to better understand frequency triggering mechanisms and risk

100000m

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