U.S. Extended Continental Shelf Project

NSF

Deposition and Evolution of the Baranof Fan, Gulf of Alaska: Constraints from MGL1109

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JACKSON SCHOOL OF GEOSCIENCES

USGS science for a changing world

MGL1109
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Kodiak, AK

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Geophysicist


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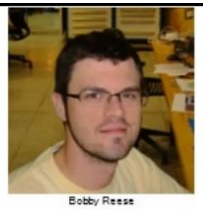
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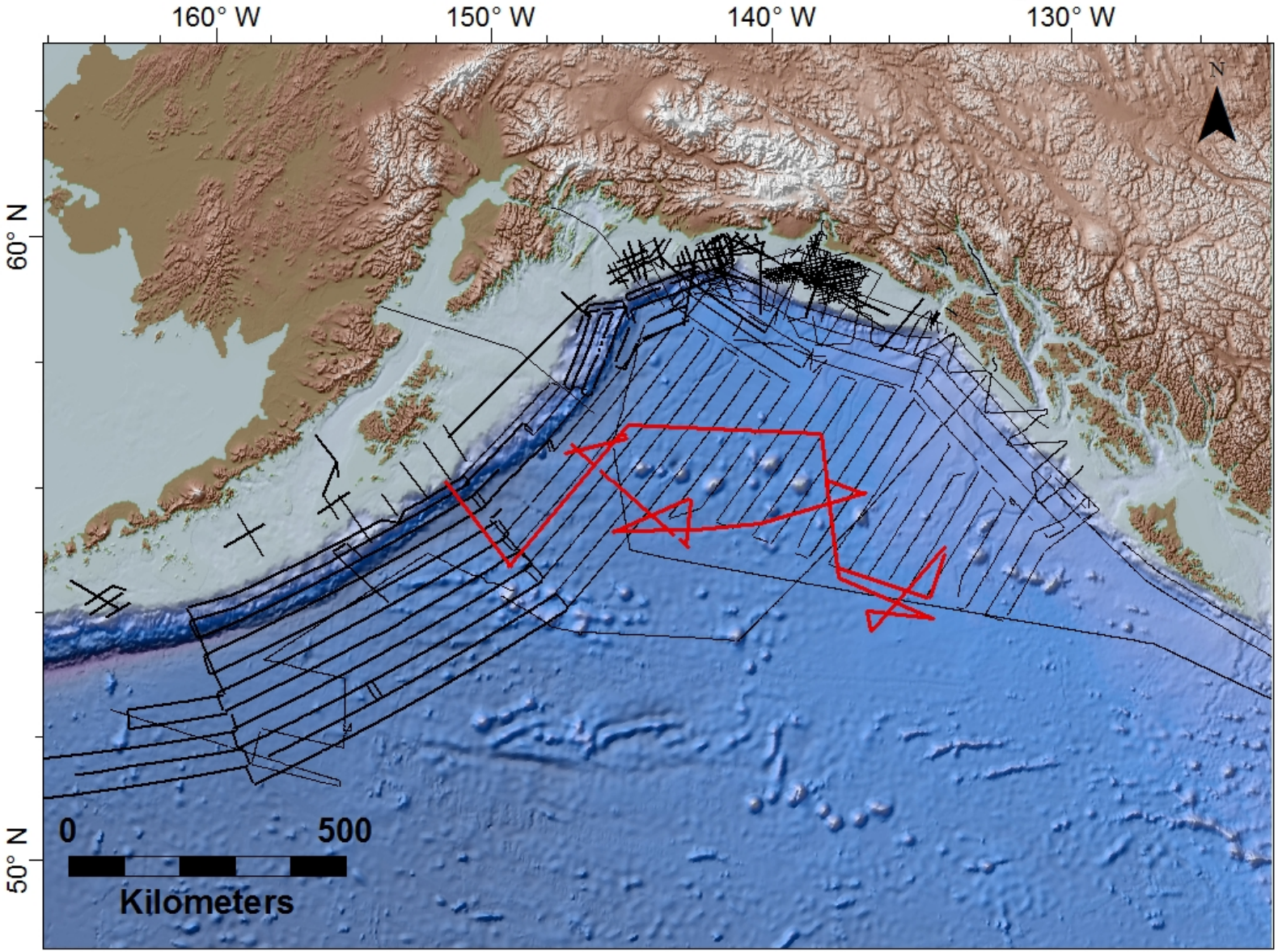
Cruise Objectives: US ECS Project

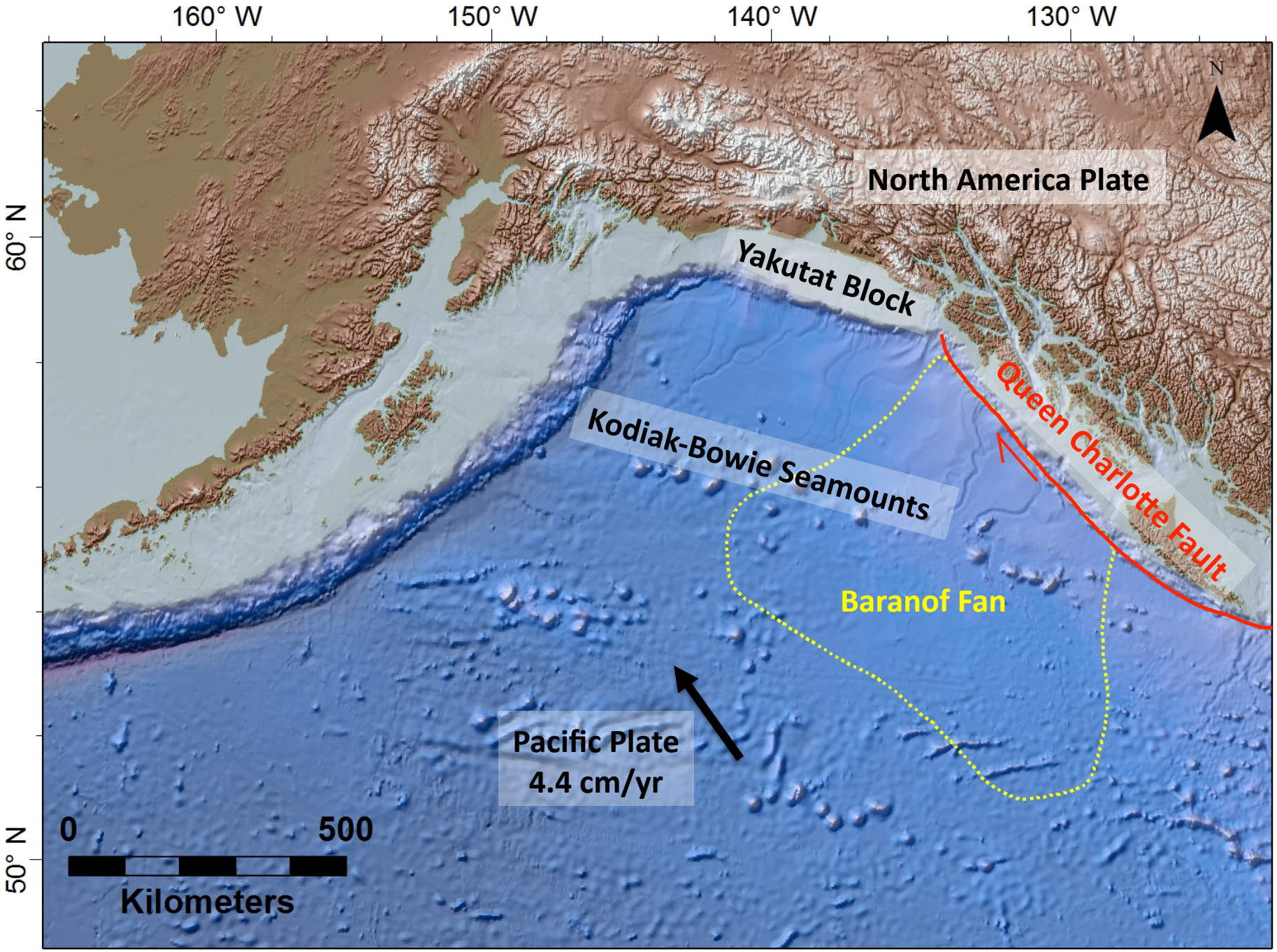
- U.S. Extended Continental Shelf Project - nation may extend seabed rights
- Sediment thickness proximal to foot of slope must be significant
- Requires and understanding of basement topography and sediment routing
- Must have seismic reflection data and good velocity control for thickness estimates

Acquisition Parameters

- 8 km streamer, 636 channels spaced at 12.5 m
- 6600 in^3 36-airgun array; shot spacing 50 m
- Processed to post-stack migration, CDP spacing at 6.25 m and max fold of ~80 – depth migrations planned
- Seismic refraction, sonobuoy, and multibeam data also collected

Seismic Data Coverage

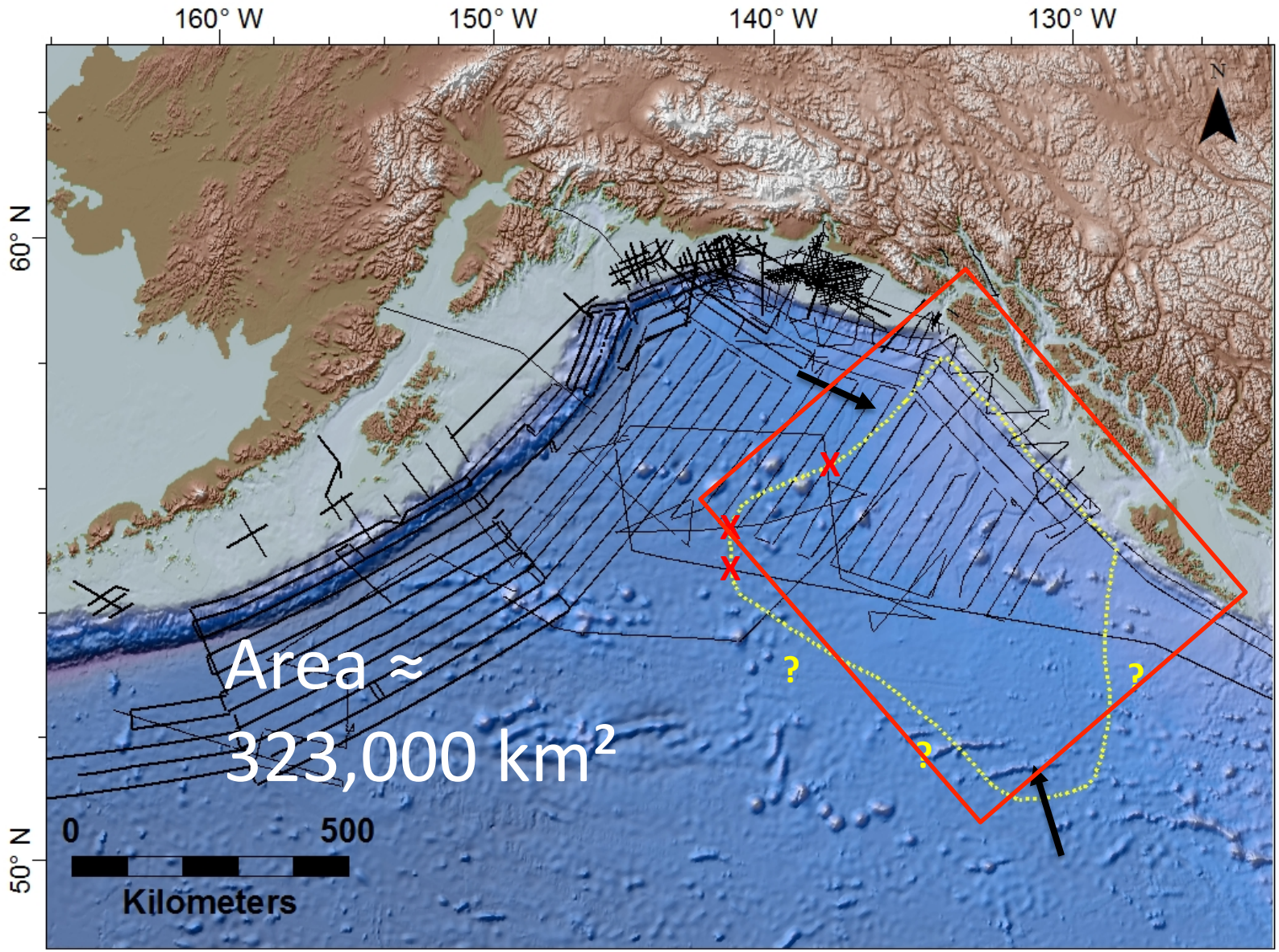


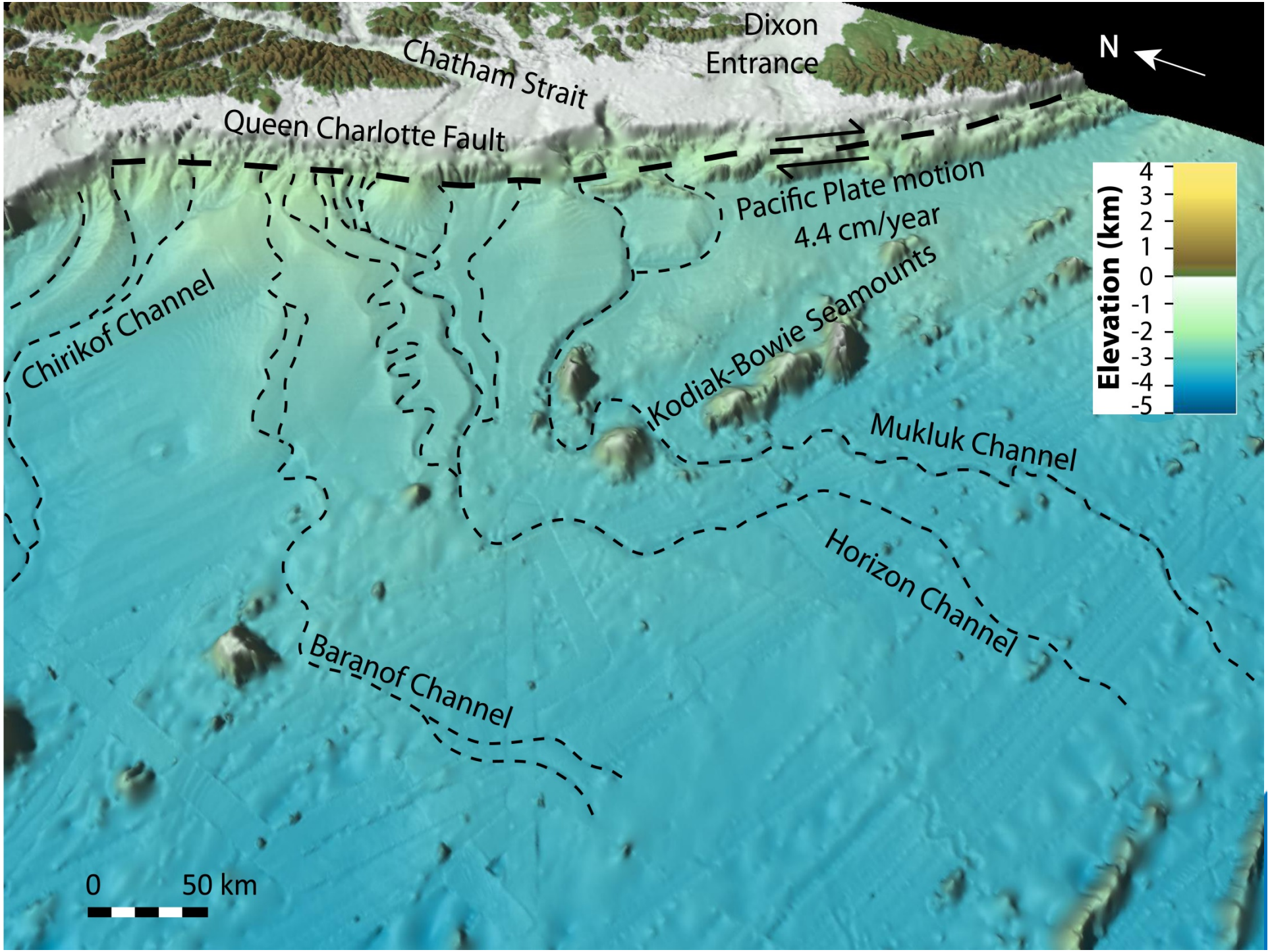

160° W
150° W
140° W
130° W
60° N
50° N
N
North America Plate
Yakutat Block
Queen Charlotte Fault
Kodiak-Bowie Seamounts
Baranof Fan
Pacific Plate
4.4 cm/yr
0
500
Kilometers

Baranof Fan: Research Objectives

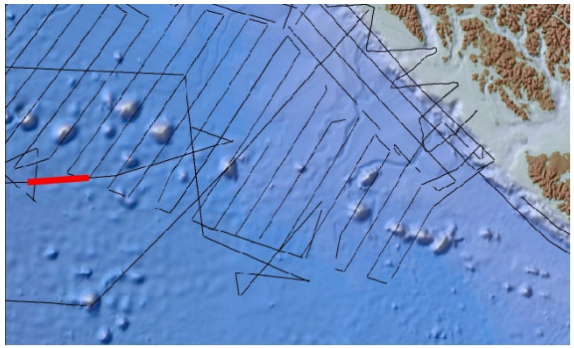
- Gain insight into depositional processes and channel system development
- Determine channel avulsion history and influence of tectonics
- Provide new constraints on Fan size and age

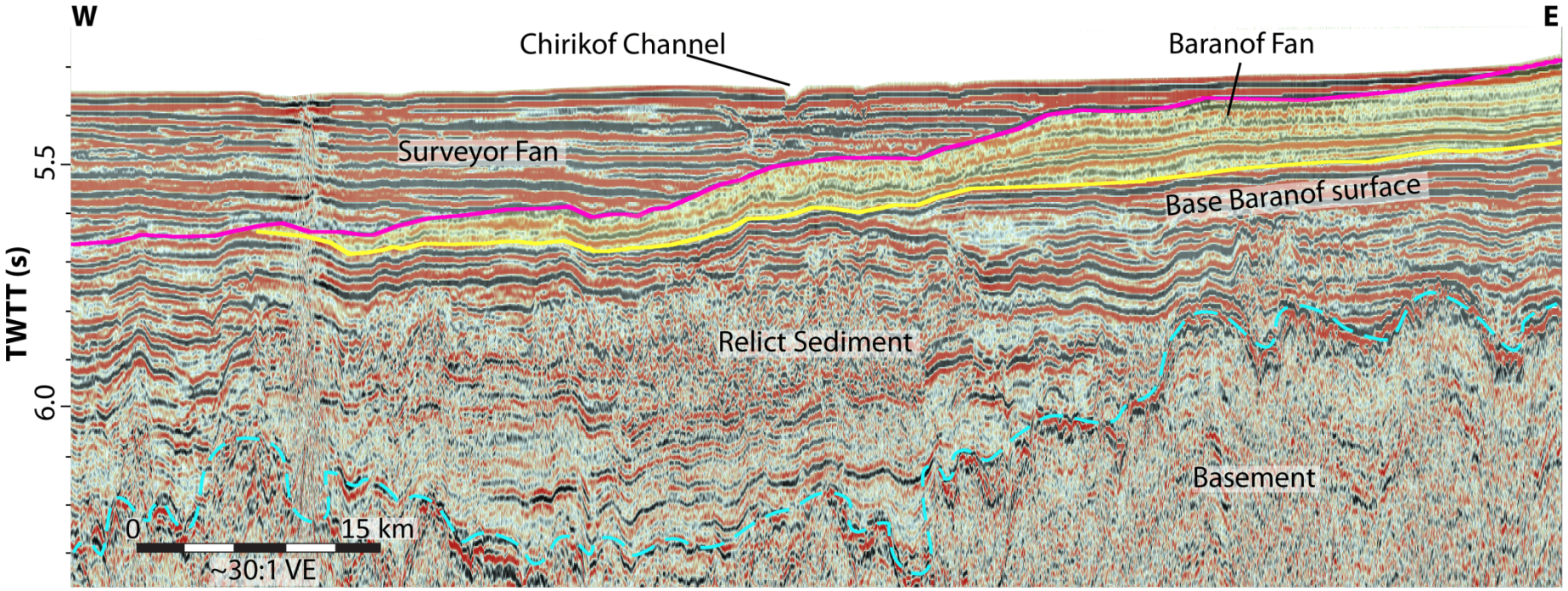
Fan Area


160° W
150° W
140° W
130° W
60° N
50° N
N
Area ≈
323,000 km²
0
500
Kilometers

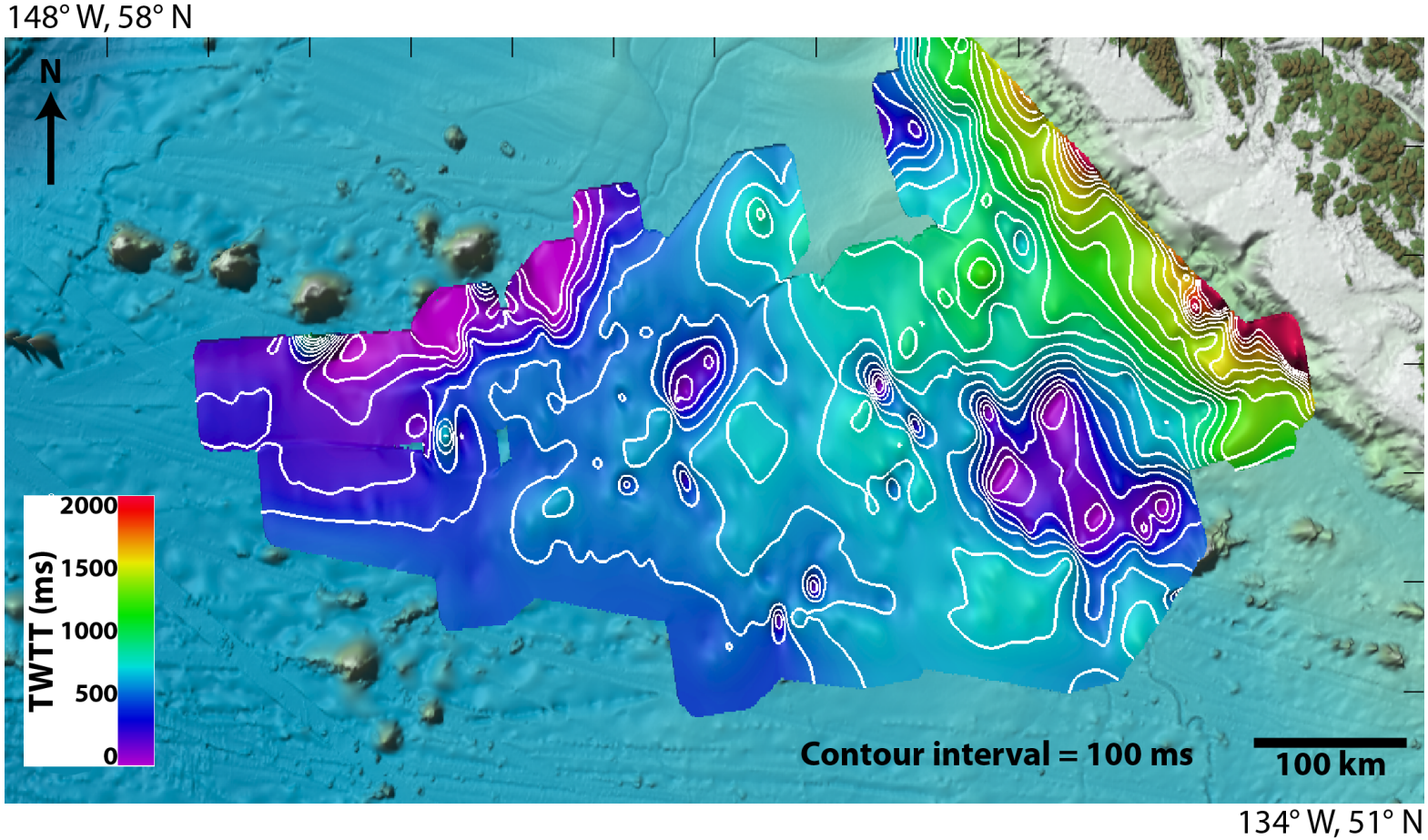

Chatham Strait
Dixon
Entrance
N
Queen Charlotte Fault
Pacific Plate motion
4.4 cm/year
Chirikof Channel
Kodiak-Bowie Seamounts
Mukluk Channel
Horizon Channel
Baranof Channel
Elevation (km)
4
3
2
1
0
-1
-2
-3
-4
-5
0
50 km

Surveyor/Baranof Intersection





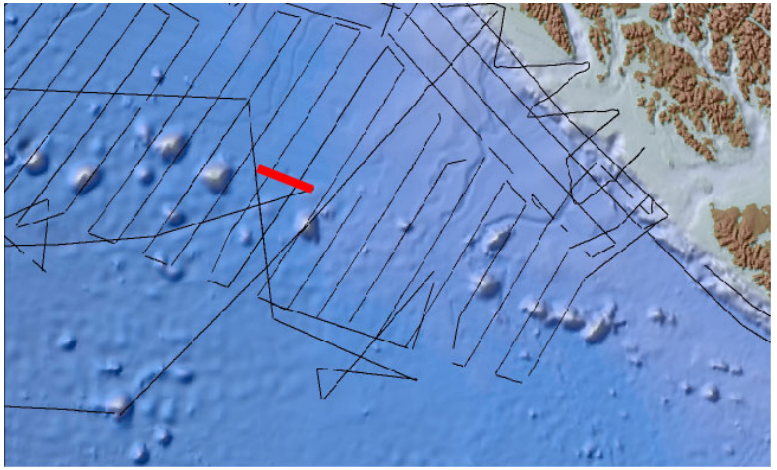
Seafloor-Base Baranof Isopach

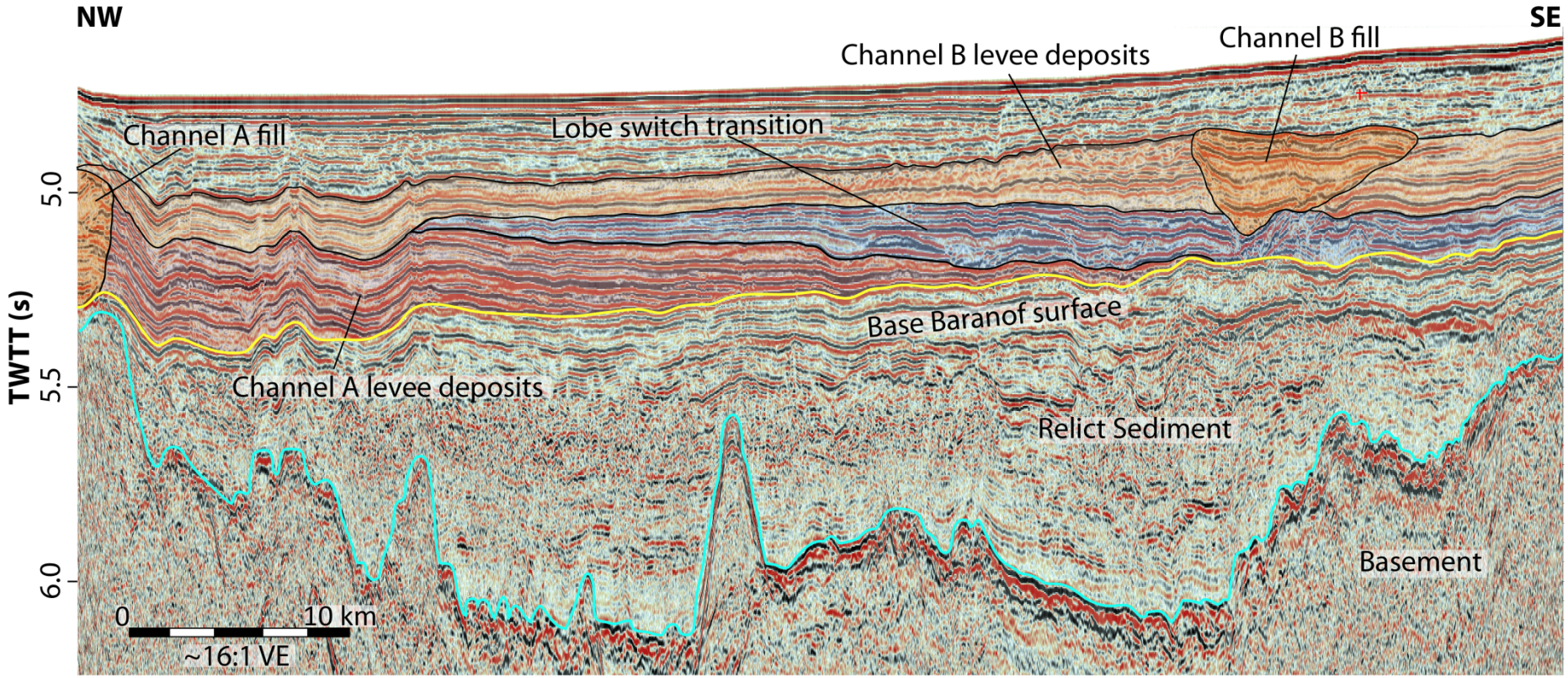


Seafloor-Base Baranof volume ≈ 209,000 km³

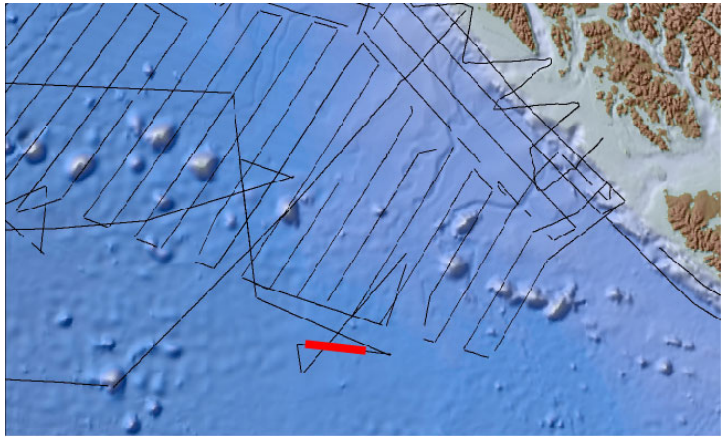
Seafloor-basement volume ≈ 301,000 km³

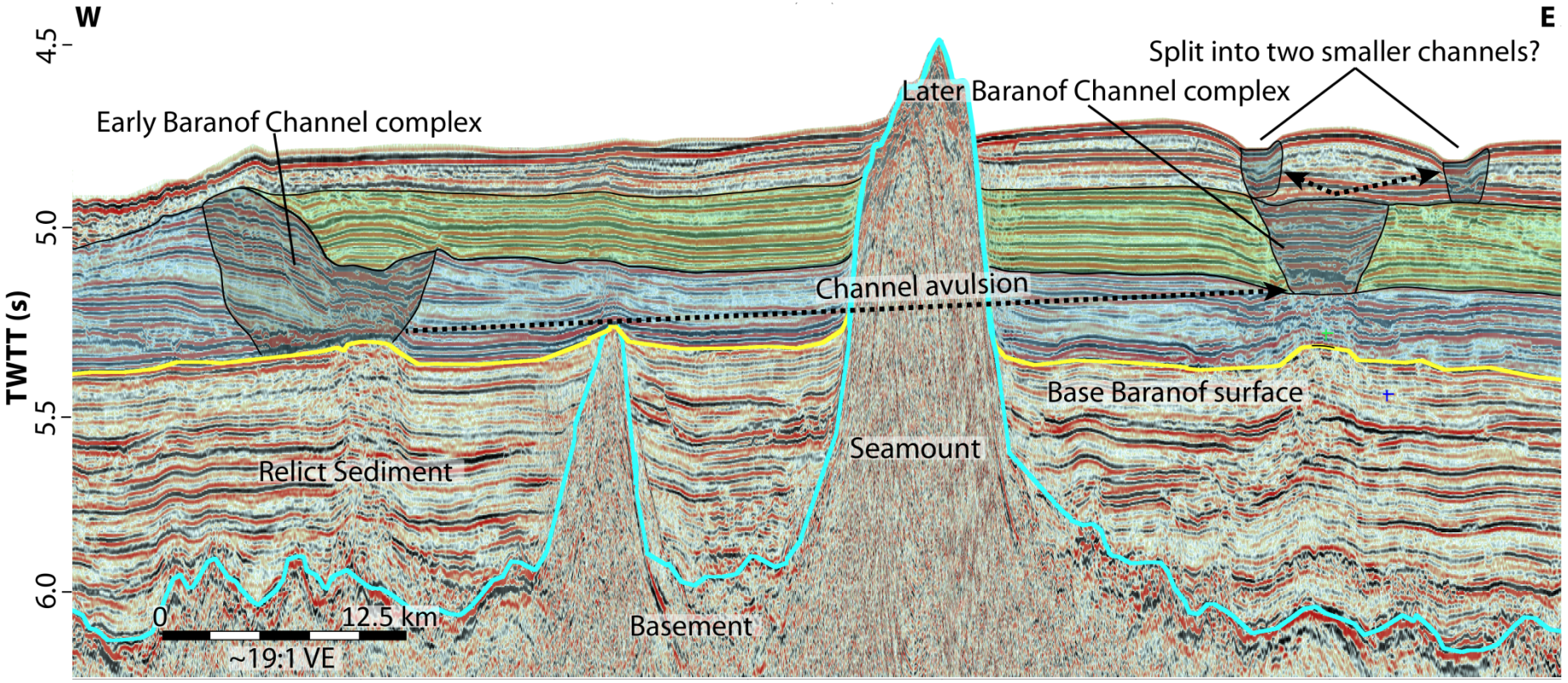
Oldest (Baranof?) Channel

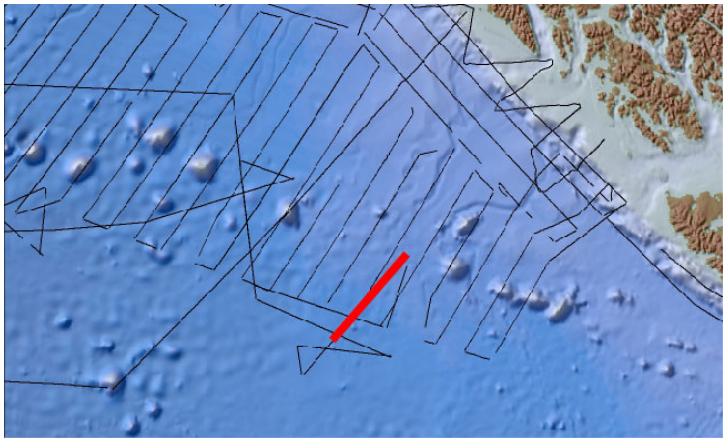




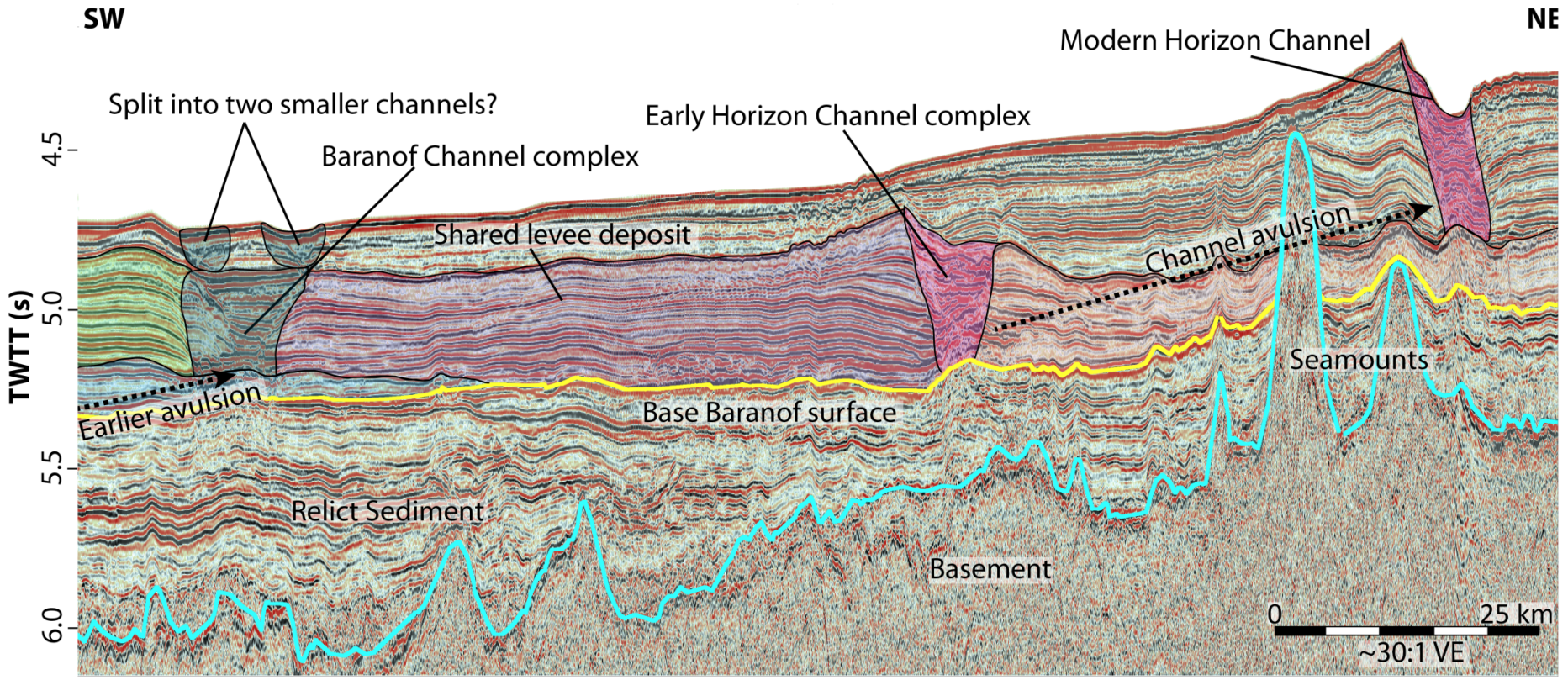
Early Baranof Channel



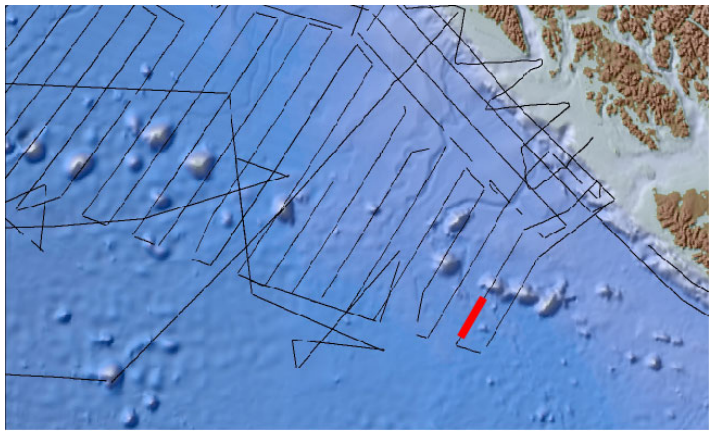


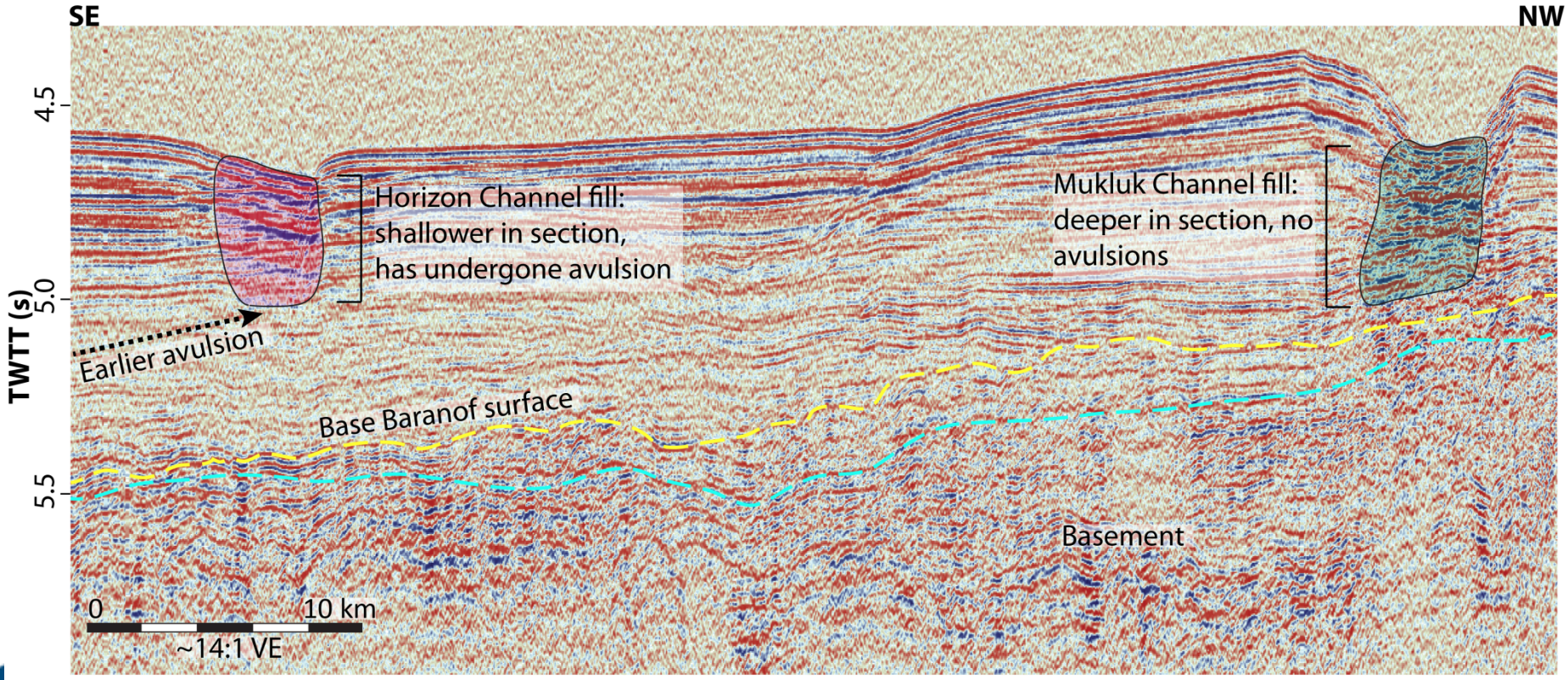


Baranof -> Horizon

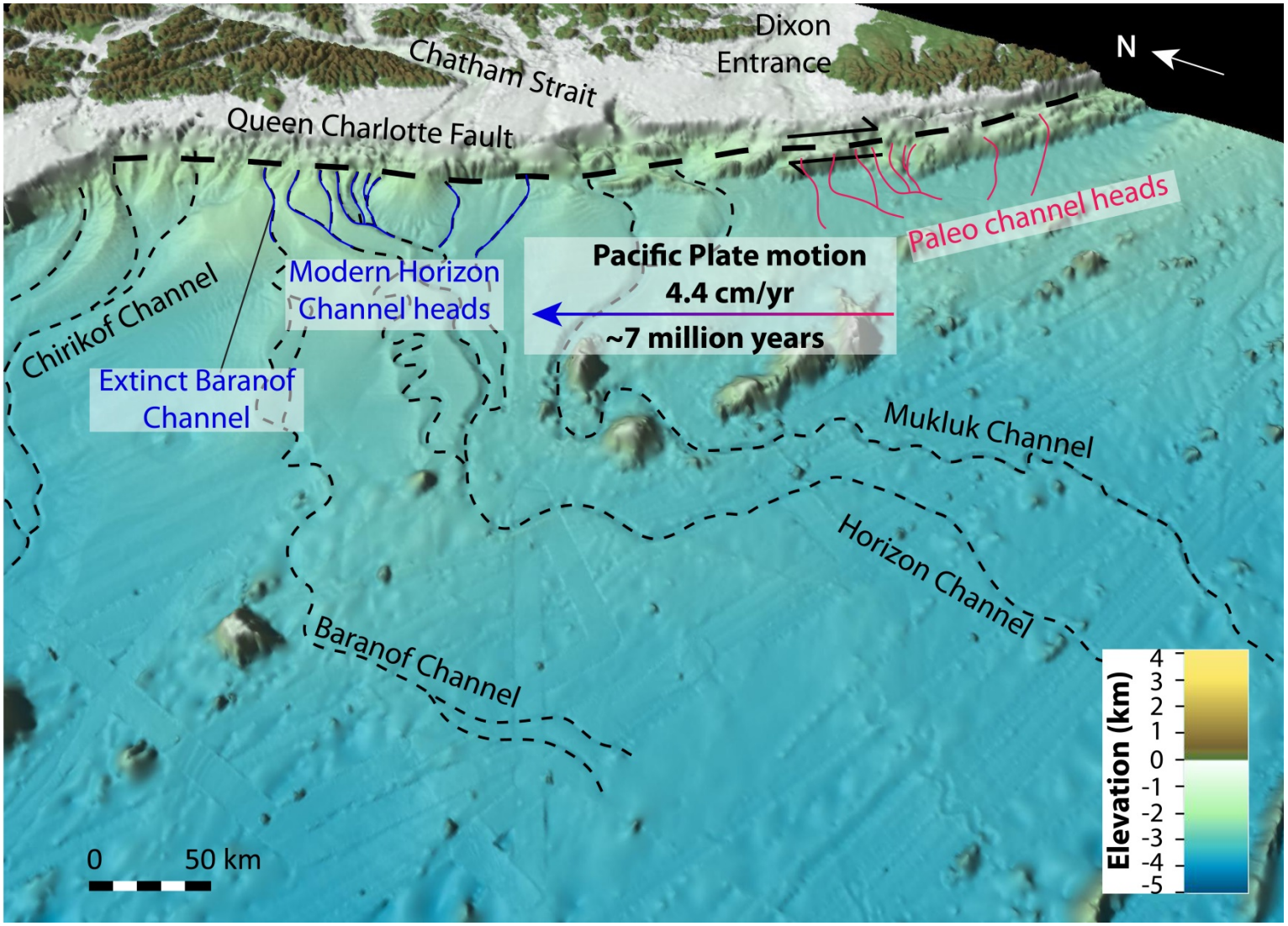


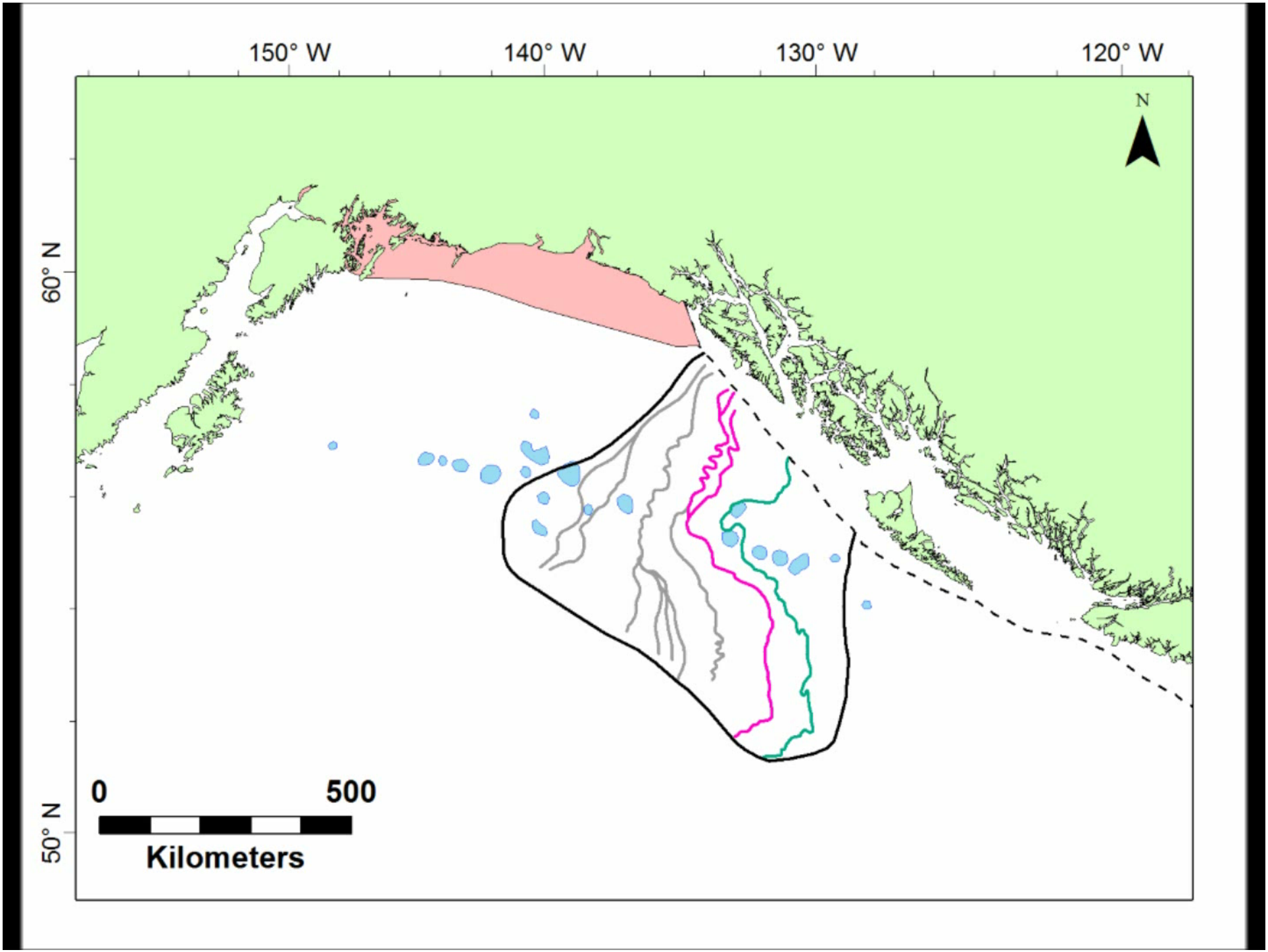
Modern Horizon and Mukluk Channels





Interpretation: Tectonic Influence




150° W
140° W
130° W
120° W
N
60° N
50° N
0
500
Kilometers

Conclusions

New size estimates place the Baranof Fan among the largest deep-sea fans in the world, similar in size to the Mississippi Fan.

Lobe switches and channel avulsions in the Baranof Fan migrated southward with time, starting with the formation of the Baranof Channel, followed by the Horizon Channel, and finally the Mukluk Channel.

Strike-slip motion has influenced channel formation, beheadings, and avulsions. A basic tectonic reconstruction provides an age of ~7 million years for the onset of Fan deposition.

Acknowledgements

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