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Glacial Deposited Sediments: Evidence for Ice Sheets along Northern Rim of Beringia

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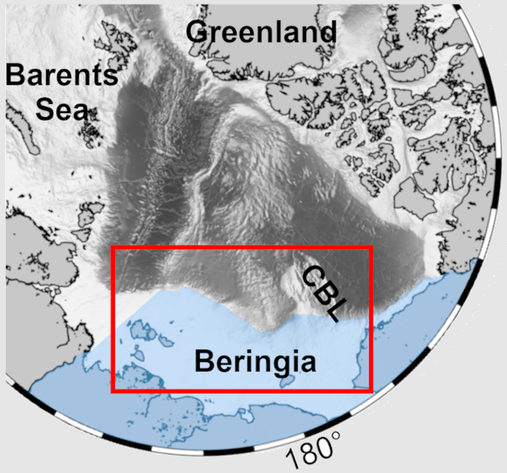
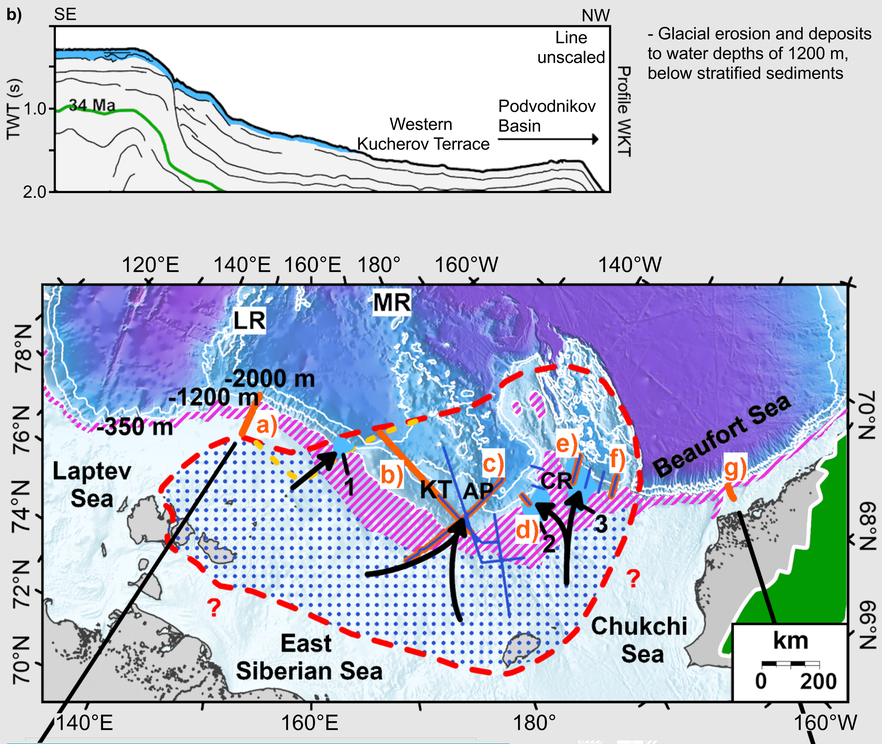
1. Introduction

During Pleistocene, large ice sheets developed in many regions around the Arctic Ocean. Geological onshore mapping in Beringia, the region between the Lena River in East Siberia and the Mackenzie River in Canada, restricts the extent of grounded ice to a widespread mountain glaciation. However, geophysical data of the last two decades imaged a complex pattern of glaciogenic erosion of even the shallow shelf areas to water depths of up to 1200 m. These results include the indication for several ice streams which are able to transport large amounts of sediments to the contiental margins. Those sediments are depostied on continental slopes with dips <4°.

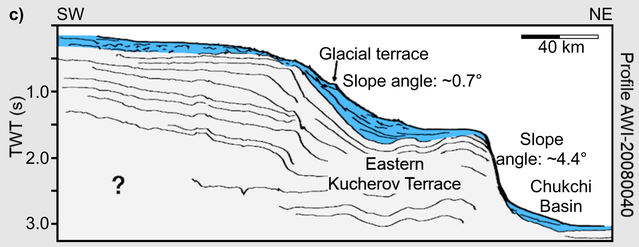
We use published and reprocessed 2D multi-channel seismic reflection data from R/V Marcus G. Langseth located between 147°E in the East Siberian Sea to the to 149°W in the Beaufort Sea to investigate in greater detail the glacial deposited sediments along the northern margins of Beringia.



2. Results

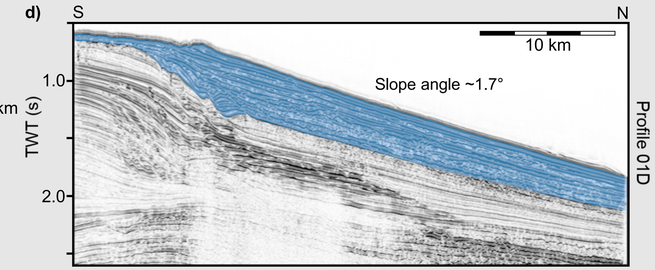


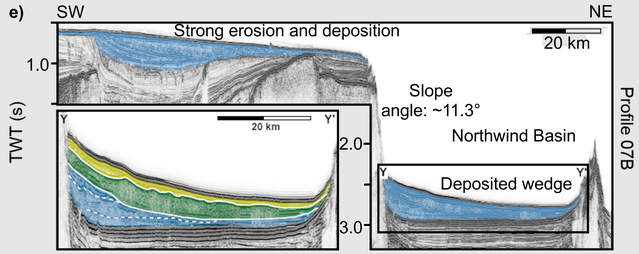
- Glacial erosion and deposits to water depths of 1200 m, below stratified sediments



- up to 325 m thick glacial deposits and shelf extension
- Glacial terrace on slope in 650 m water depths

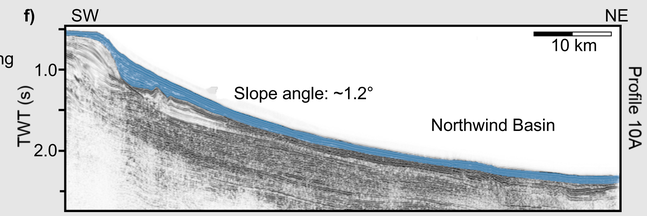
- Located at the head of Western Bathymetric Trough
- 380 m thick glacial deposited sediments, 6 km shelf extension

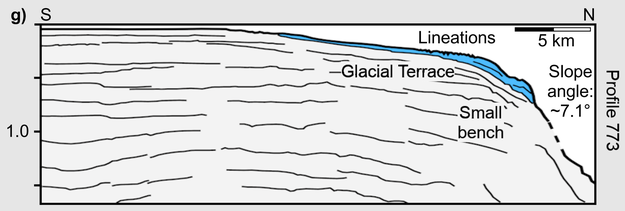




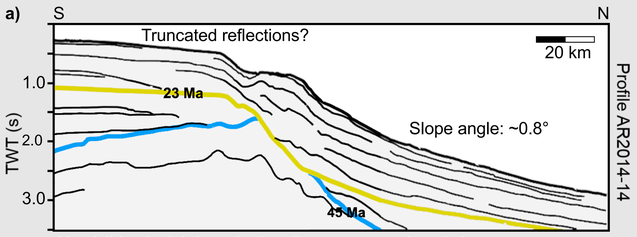
- No progradation, instead 360 m thick deposited wedge in Northwind Basin
- Hints for 3-5 glacial advances by reflections in wedge
- Erosion of pre-glacial sediments on the shelf

- 255 m thick prograding sequences, rapidly thinning basinward
- shelf progadation 1km
- less sediment amount compared to Profile 07B





- No prograding sequences
- Glacial terrace with 40 m till
- Canyon systems on slope



- No visible glacial deposited sediments on contiental slope
- truncated reflections on shelf?

3. Conclusion

Ice sheet(s) influenced margins from the Northwind Ridge to the Kucherov Terrace. The Beaufort and western East Siberian Margin were either not glaciated or less intense glaciated

Largest glacial depocenters at the eastern Kucherov Terrace, in the western Northwind Basin and at the flank of the western Chukchi Plateau. Was there an ice stream on Kucherov Terrace?

Three to five glacial advances through Broad Bathymetric trough are identified.

Glacial erosion by grounded ice is observed to water depths of at maximum 1200 m.

Glacial terraces of younger ice sheet advances in 450 m - 650 m water depths

Little evidence for a massive glaciation of the Beringian Shelf, only northern margins of Beringia are affected.

Map Legend

- Bathymetry: 4000 2000 0 m
- Trough
- Glacial Deposits
- Assumed ice sheet extent (Niessen et al., 2013 and this study)
- Proposed ice sheet extent (Niessen et al., 2013)
- Mountain glaciation
- Shelf area aerial exposed
- High density of iceberg scours

Abbreviations: 1 - DeLong Trough, 2 - Western Bathymetic Trough, 3 - Broad Bathymetric Trough, AP - Arlis Plateau, CBL - Chukchi Borderland, CR - Chukchi Rise, KT - Kucherov Terrace, LR - Lomonosov Ridge, MR - Mendeleev Ridge

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