

New perspectives on the glaciation of the Barents Sea

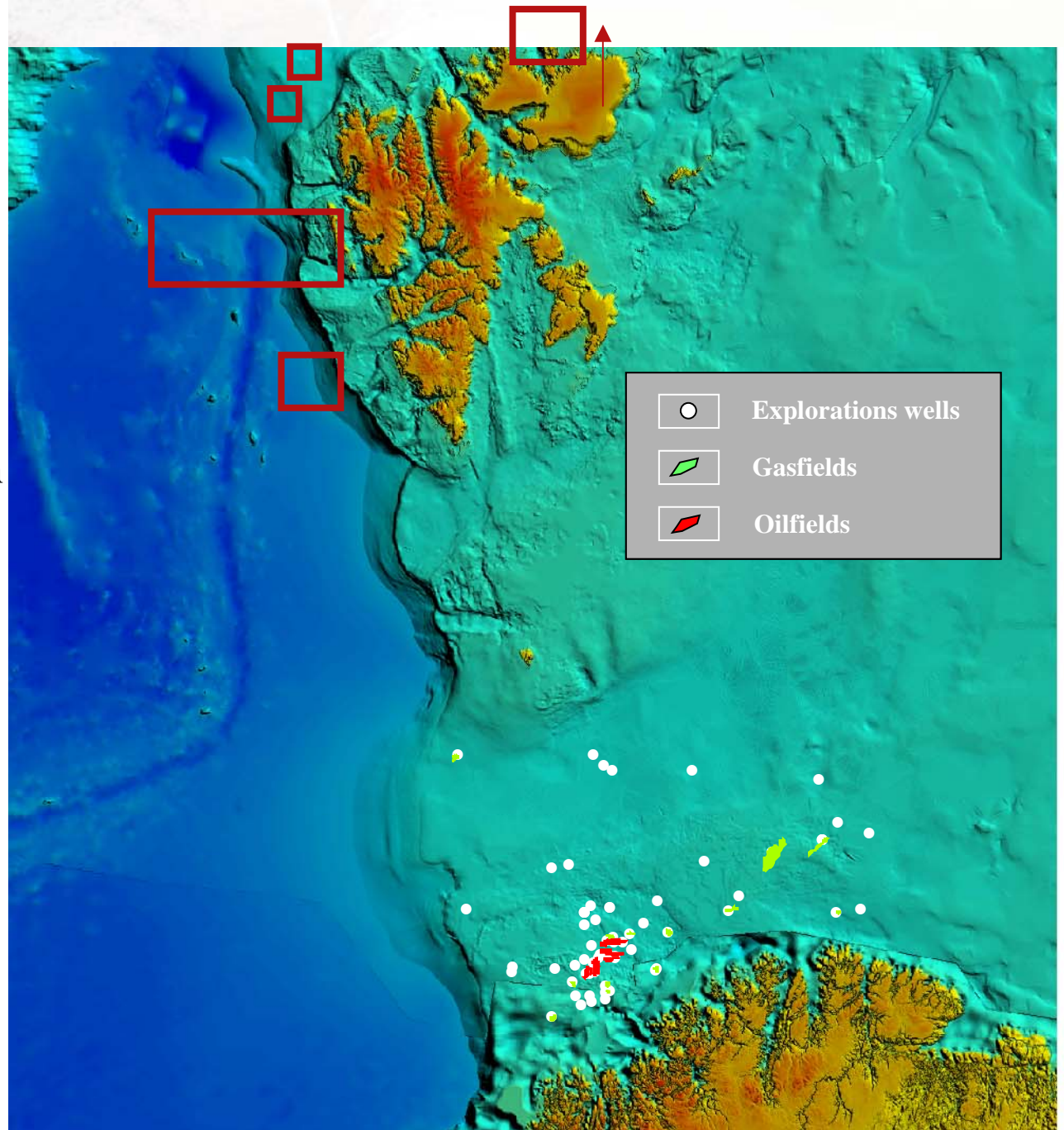
Jochen Knies, Geological Survey of Norway

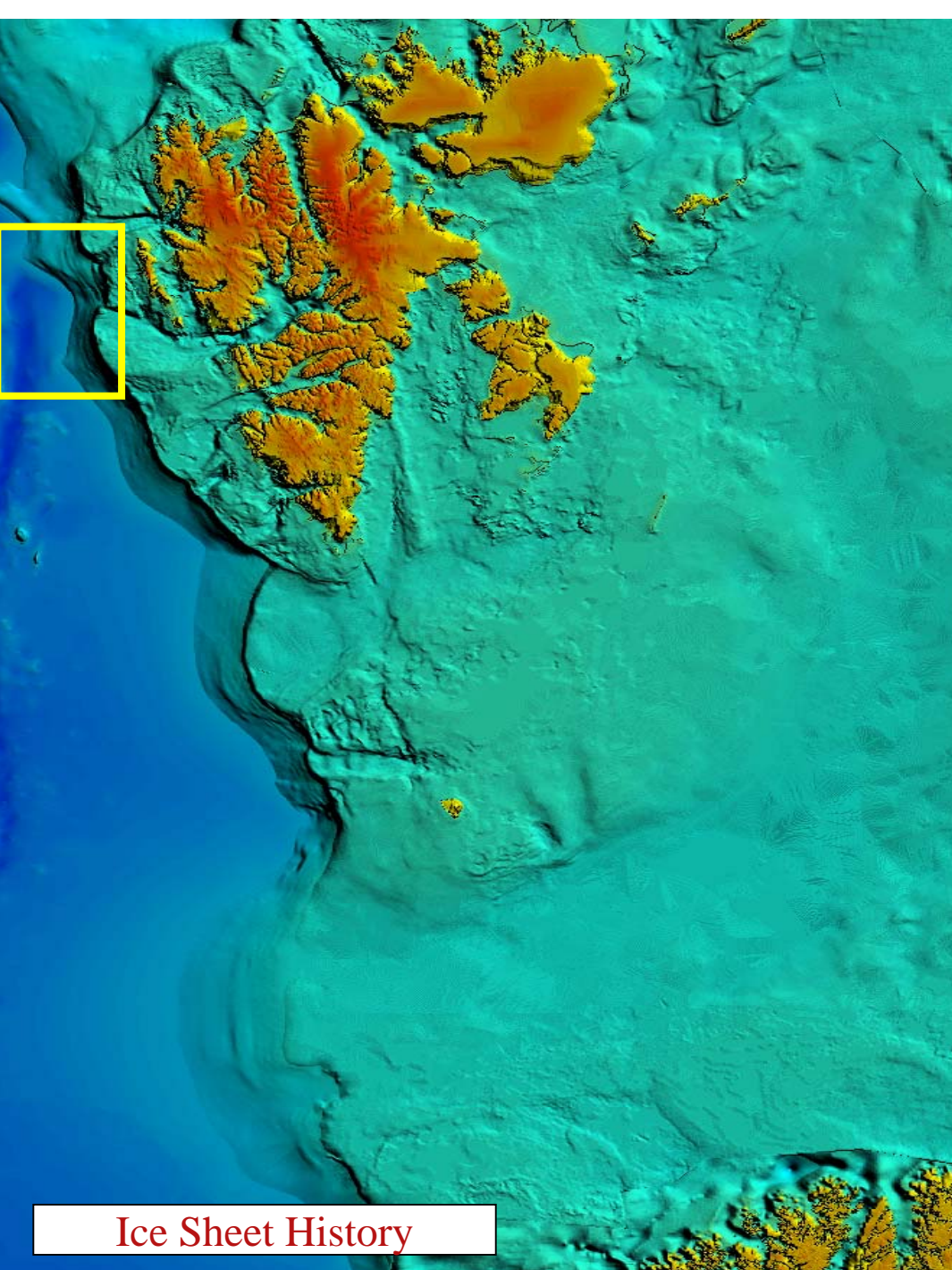
Tertiary Source Rocks
(~17 Ma)

Neogene Glaciation
(~15 Ma)

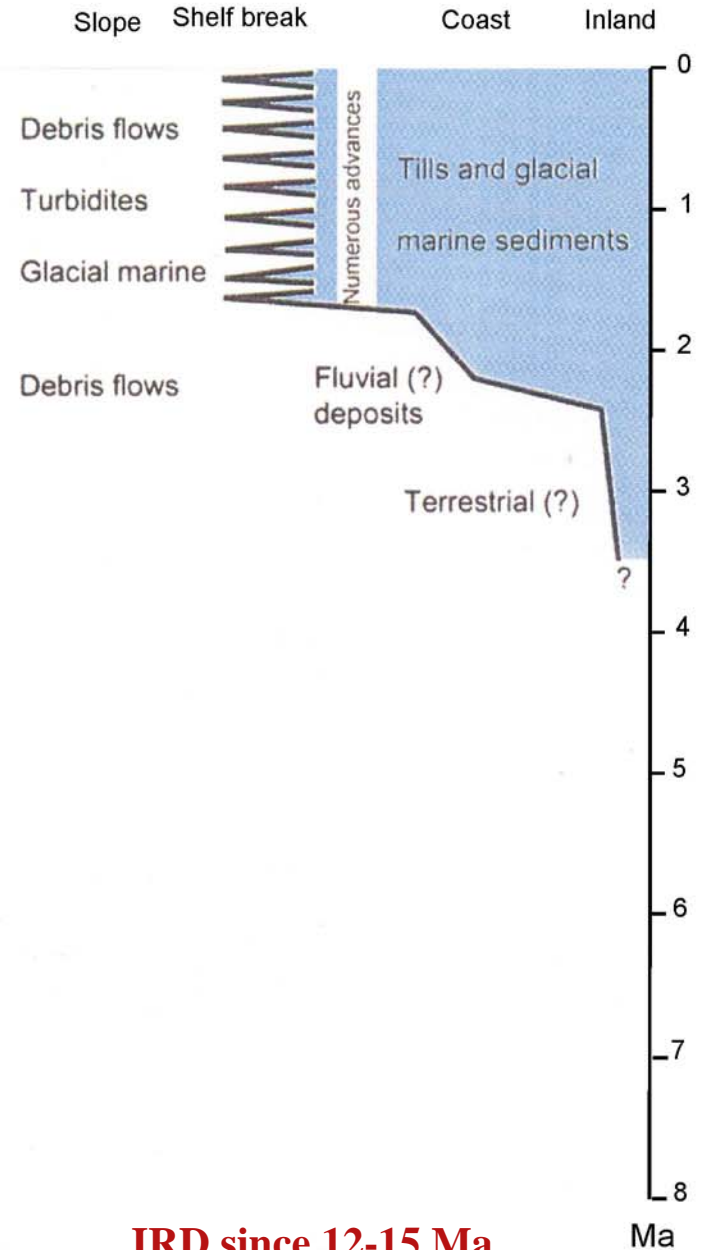
Large-scale Northern
Hemisphere Glaciation
(~2.7 Ma)?

Glacial Impact on
Reservoir Stability



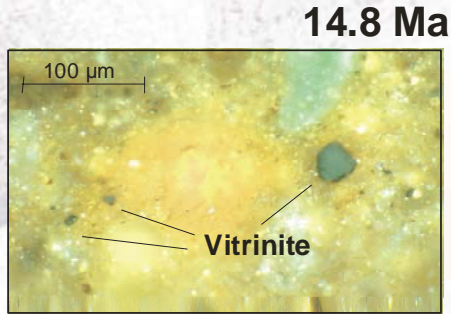


SVALBARD/BARENTS SEA



IRD since 12-15 Ma

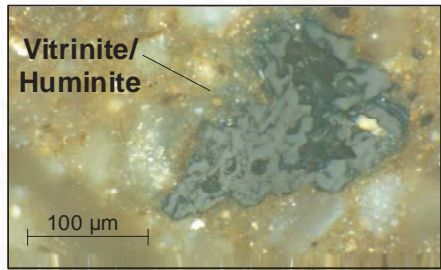
Neogene Glaciation (~15 Ma)?: Evidence from the Fram Strait



14.8 Ma

Vitrinite

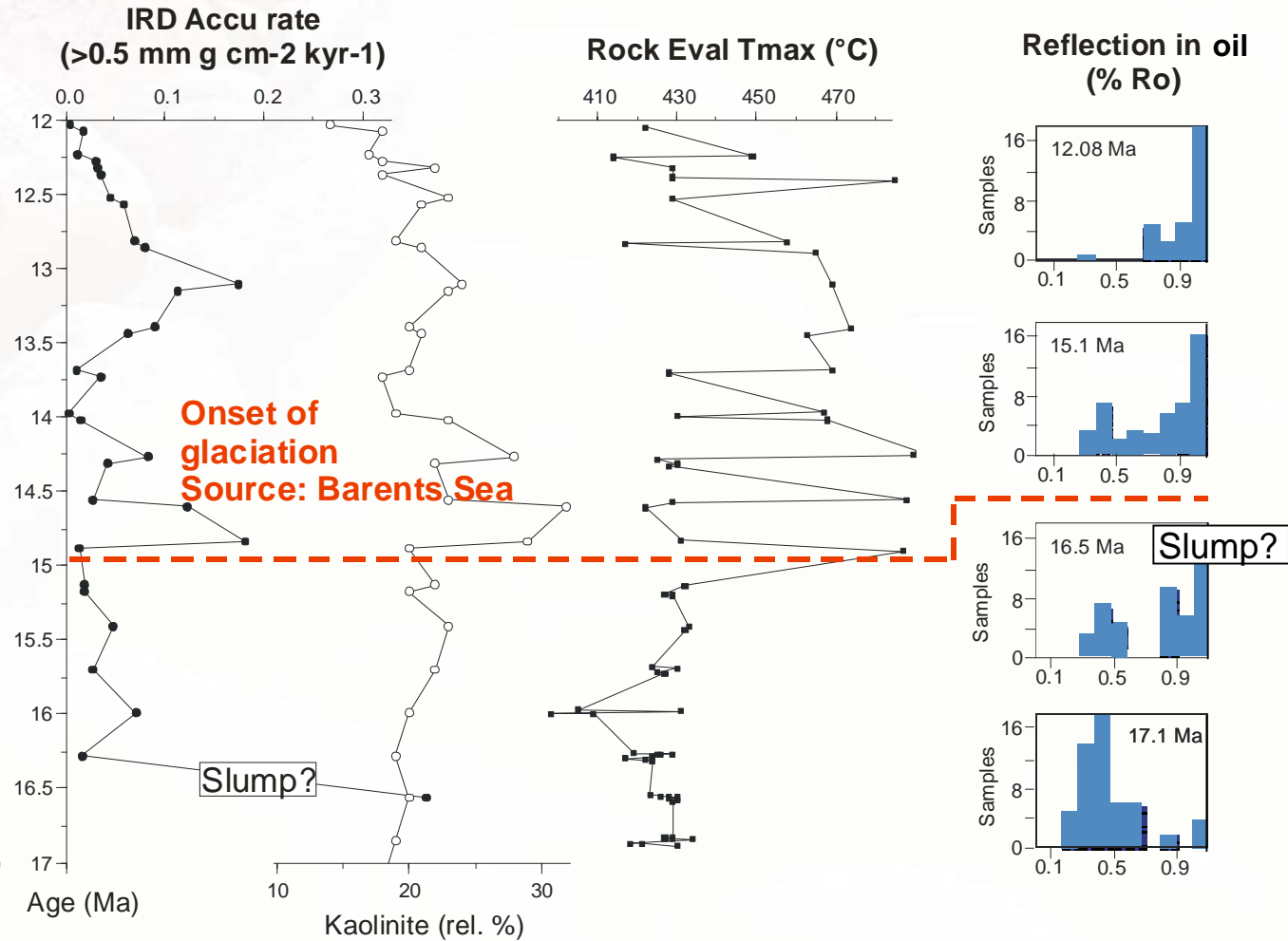
Source: distal, long transport, glacial



17.1 Ma

Vitrinite/
Huminite

Source: proximal, short transport, fluvial



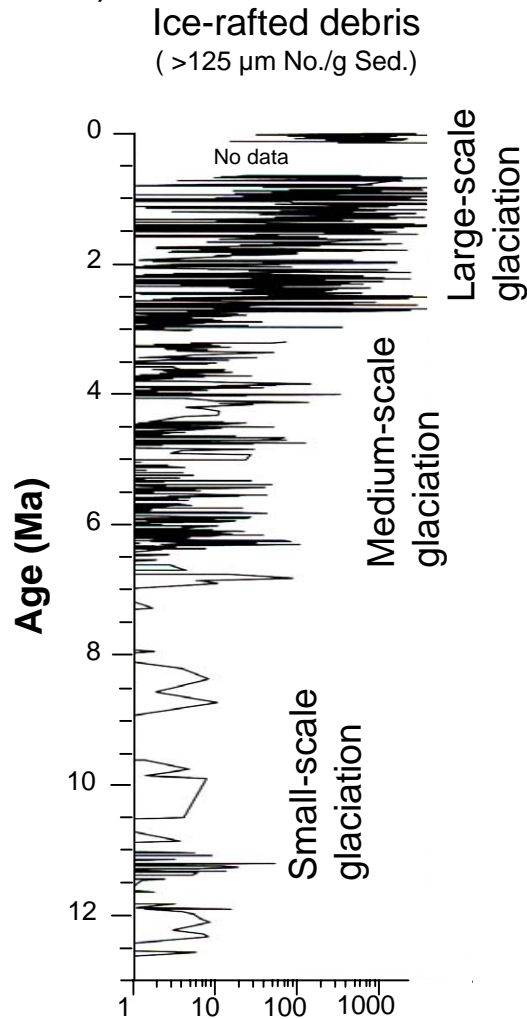
Winkler et al. 2002

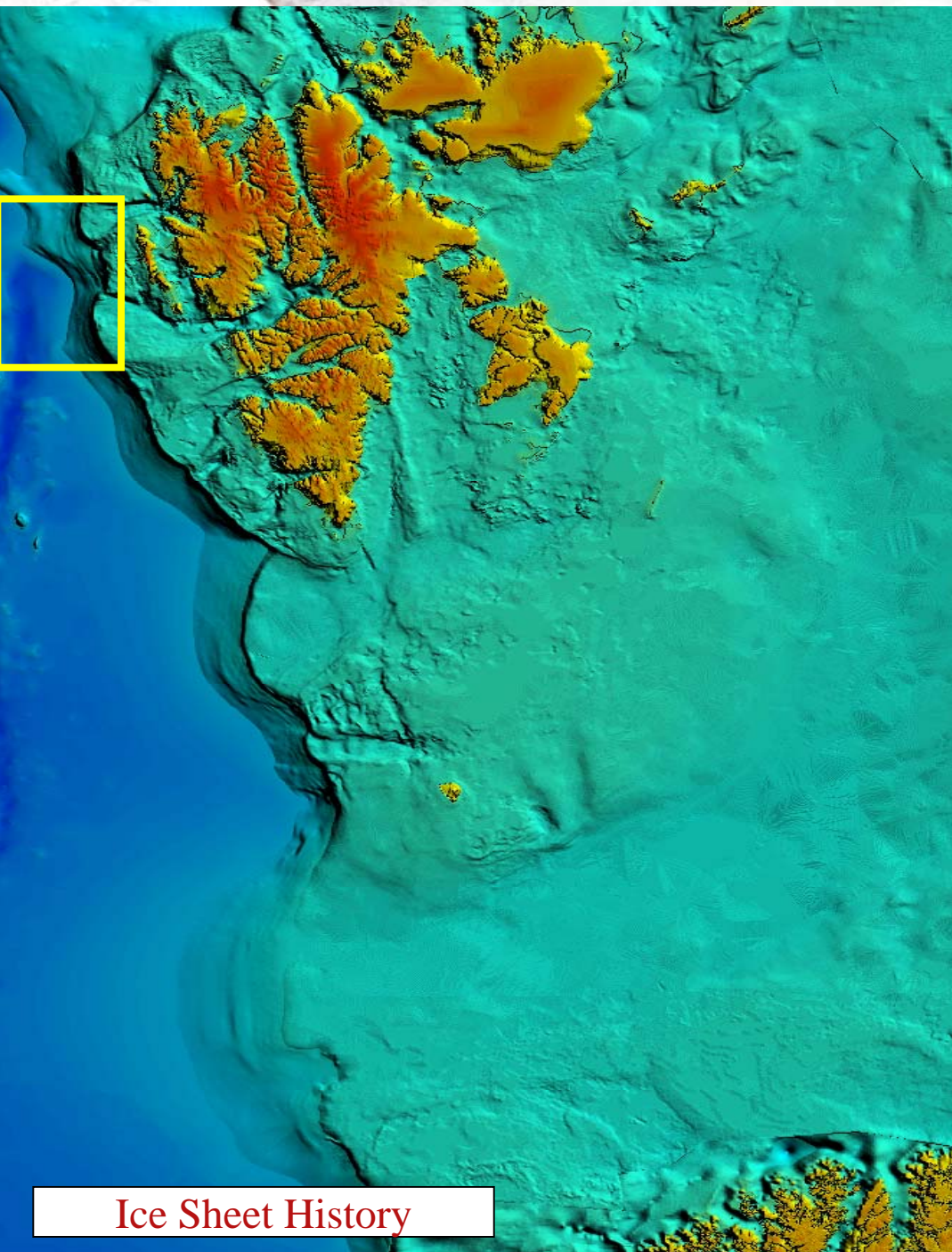


Extend our stratigraphies: Another tripartition

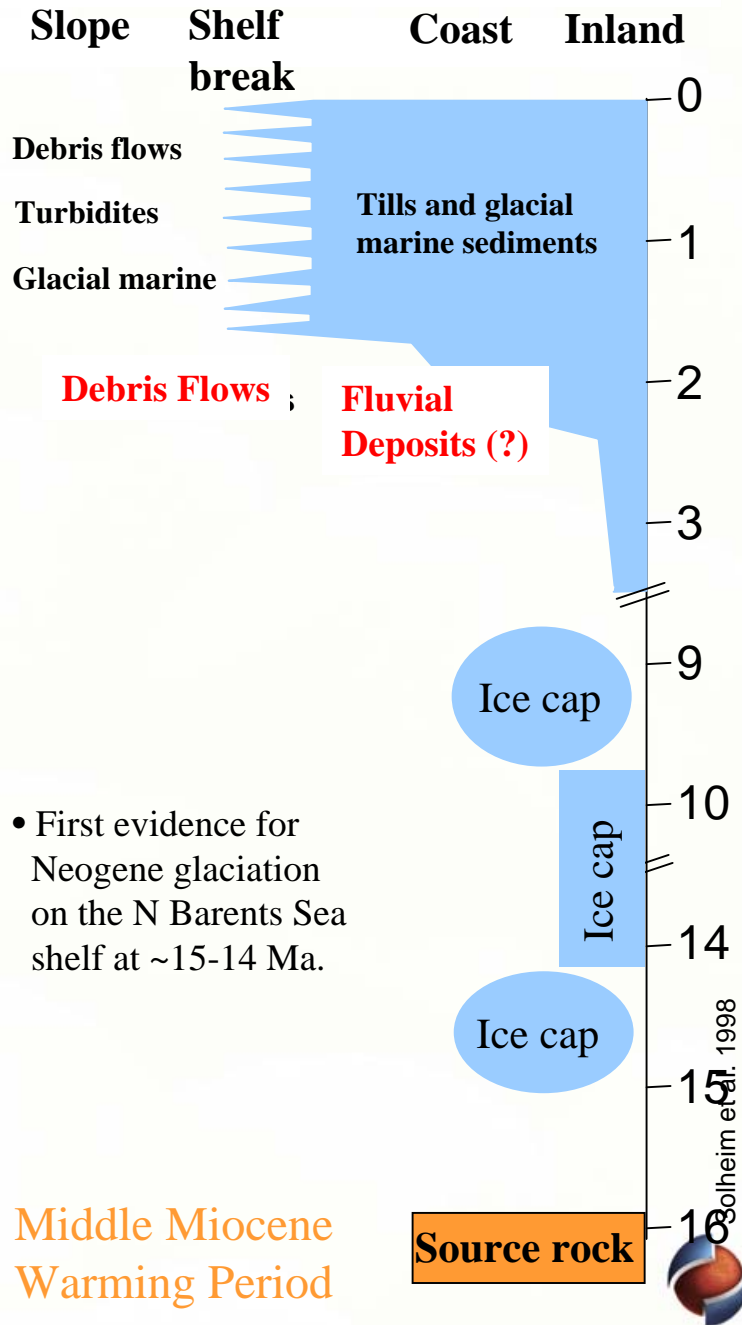
ODP Sites 644/642 (Vøring Plateau)

Fronval & Jansen (1996)

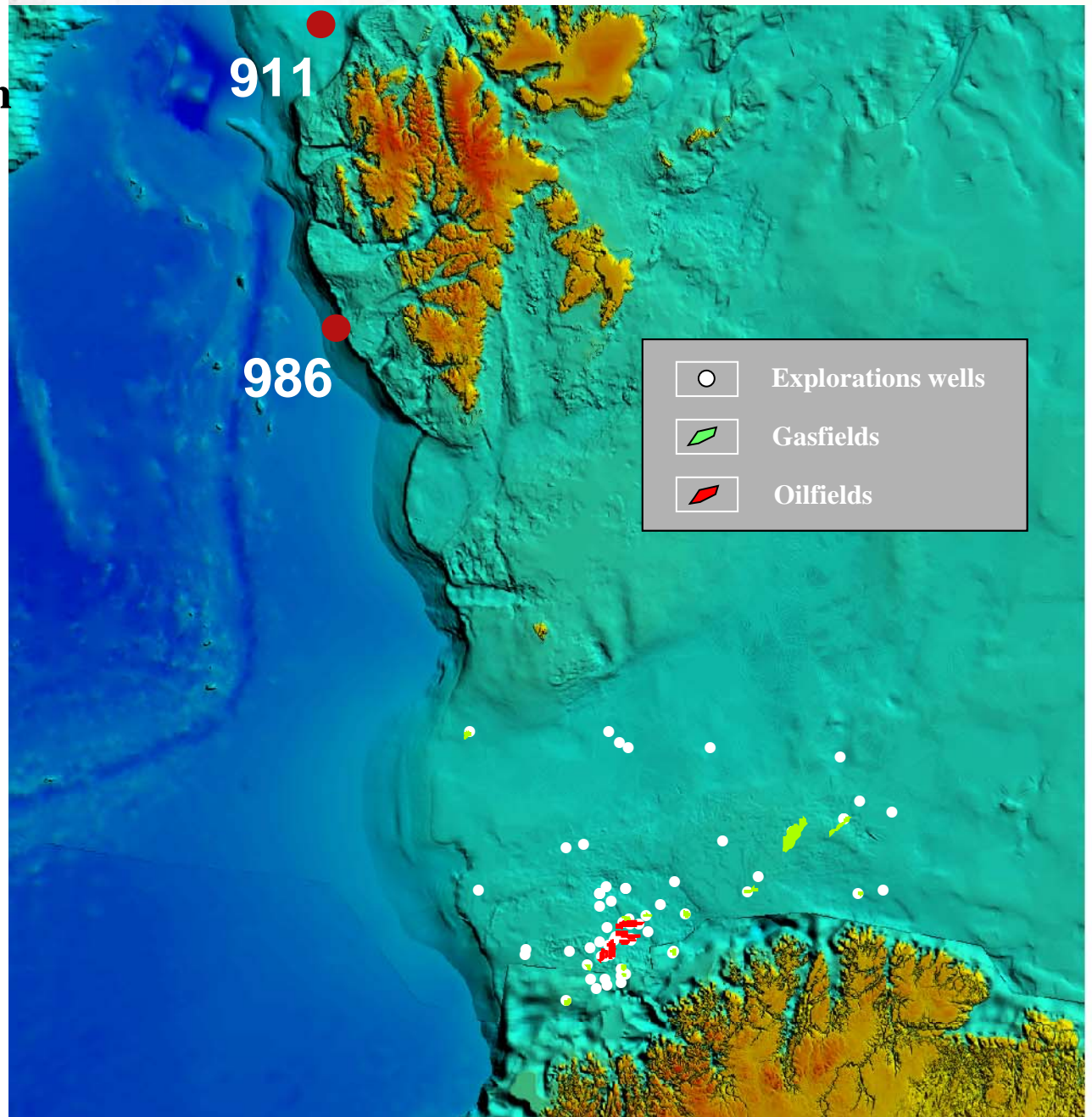




Ice Sheet History

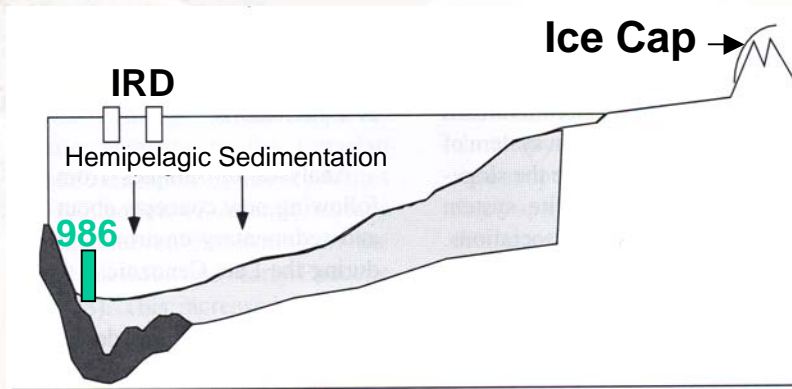


Large-scale Northern Hemisphere glaciation (~2.7 Ma)?

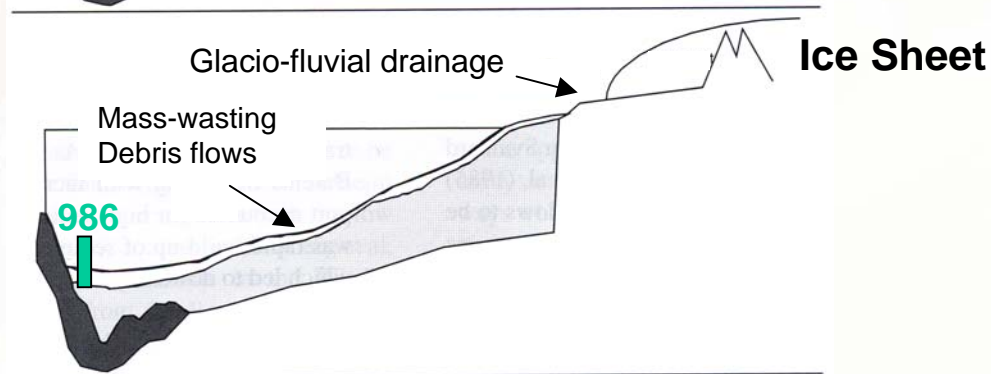


Margin Development – western Svalbard

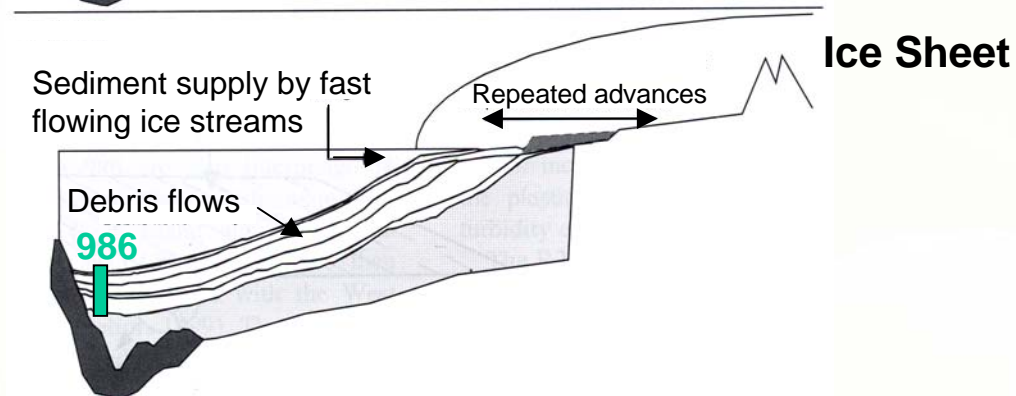
>2.5 Ma
IRD (ODP Leg 151)



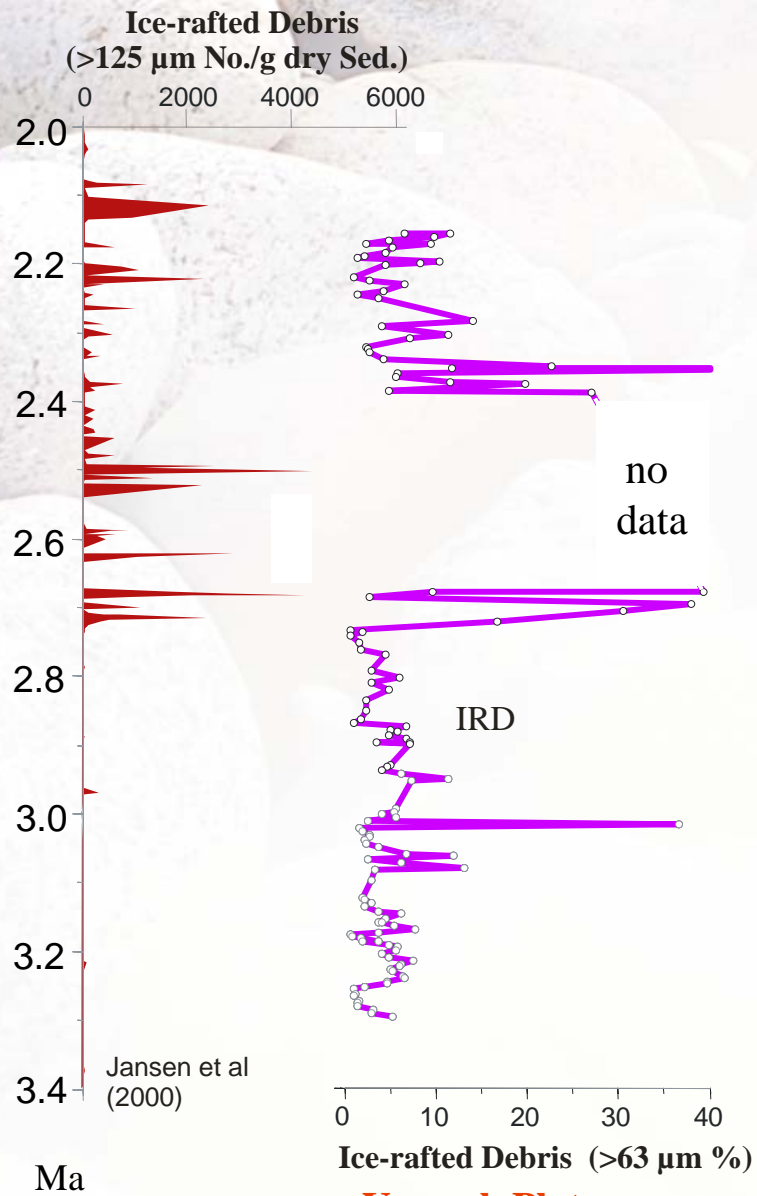
<2.3-1.6 Ma



<1.4 Ma

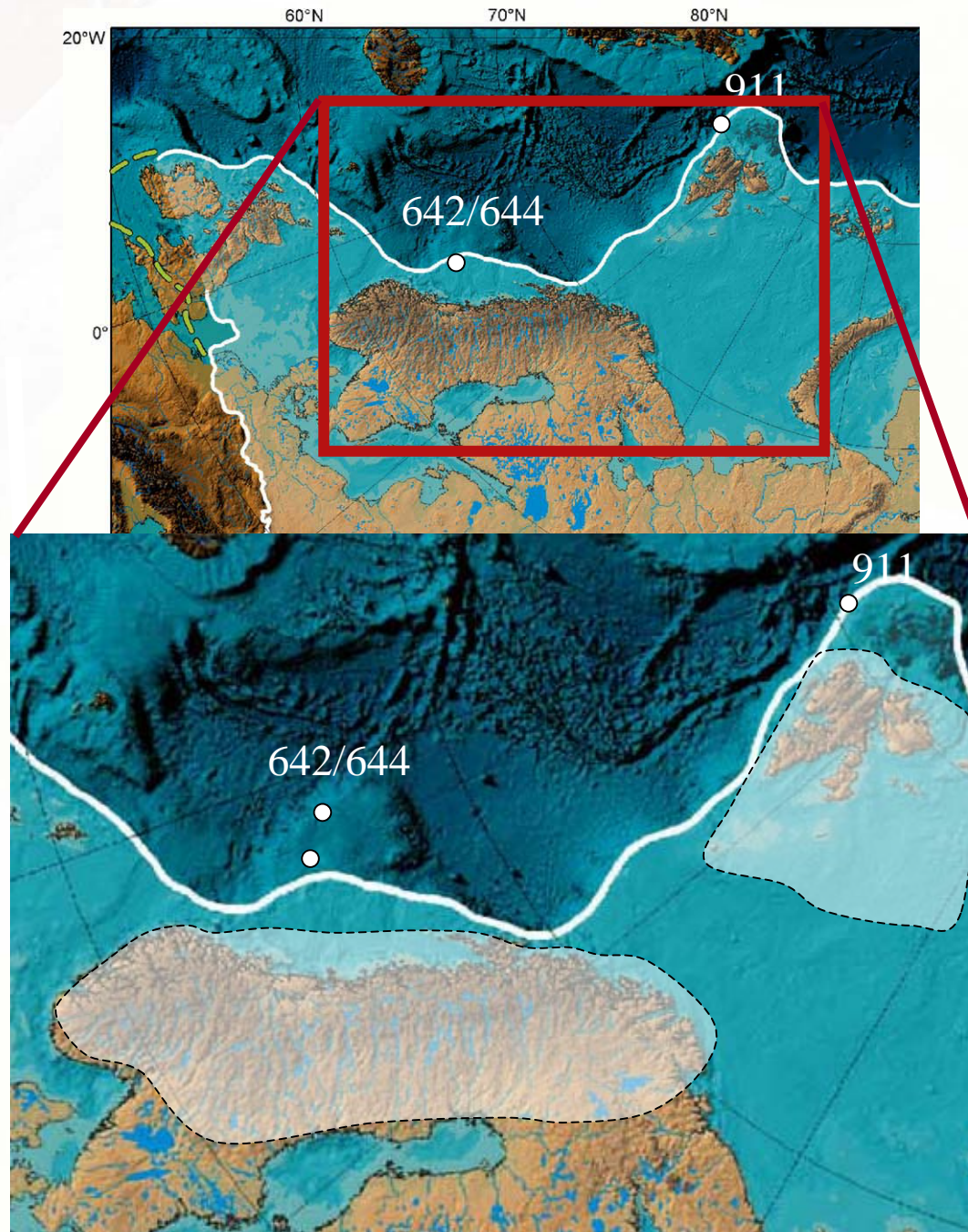


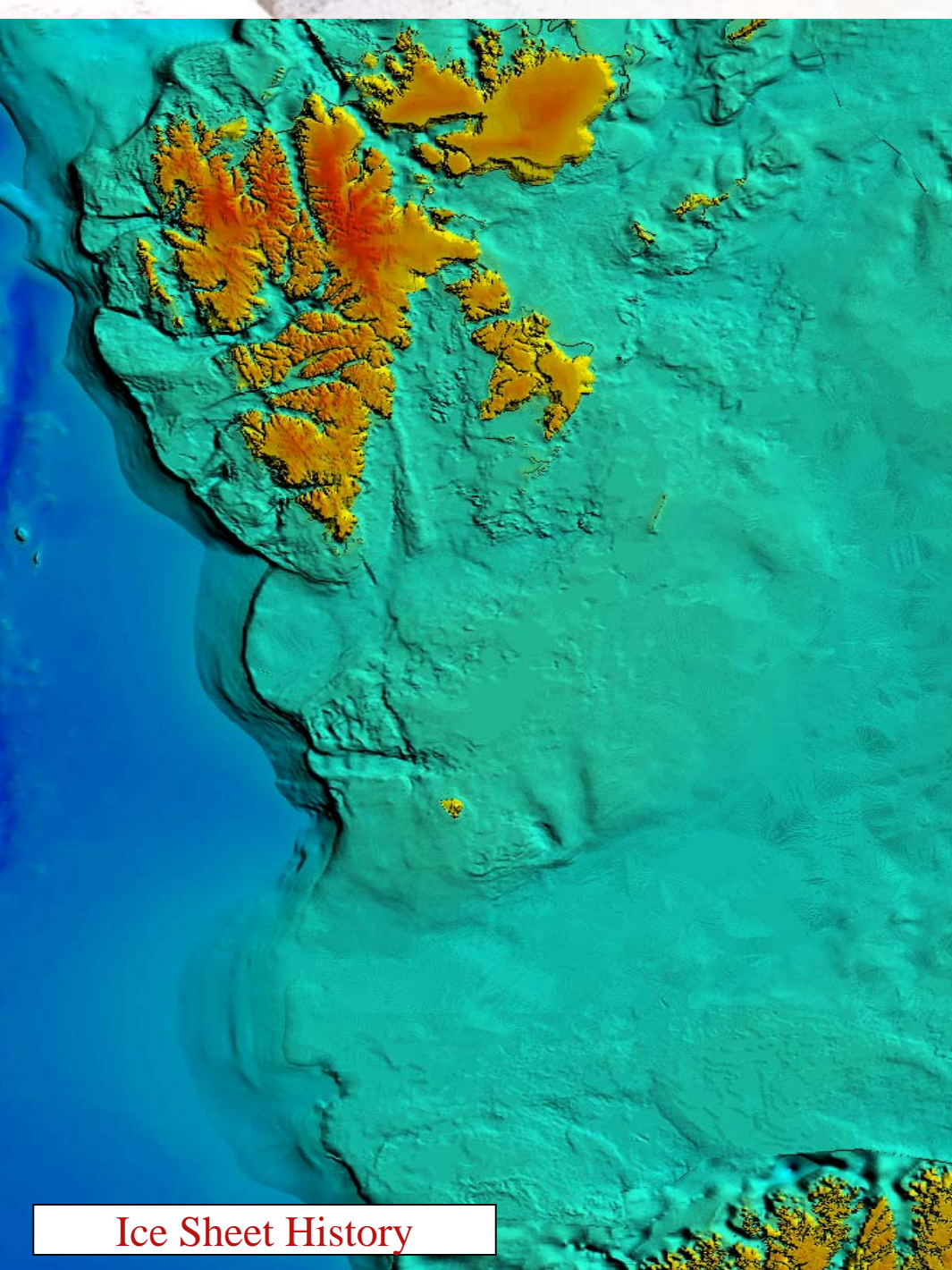
Vøring Plateau



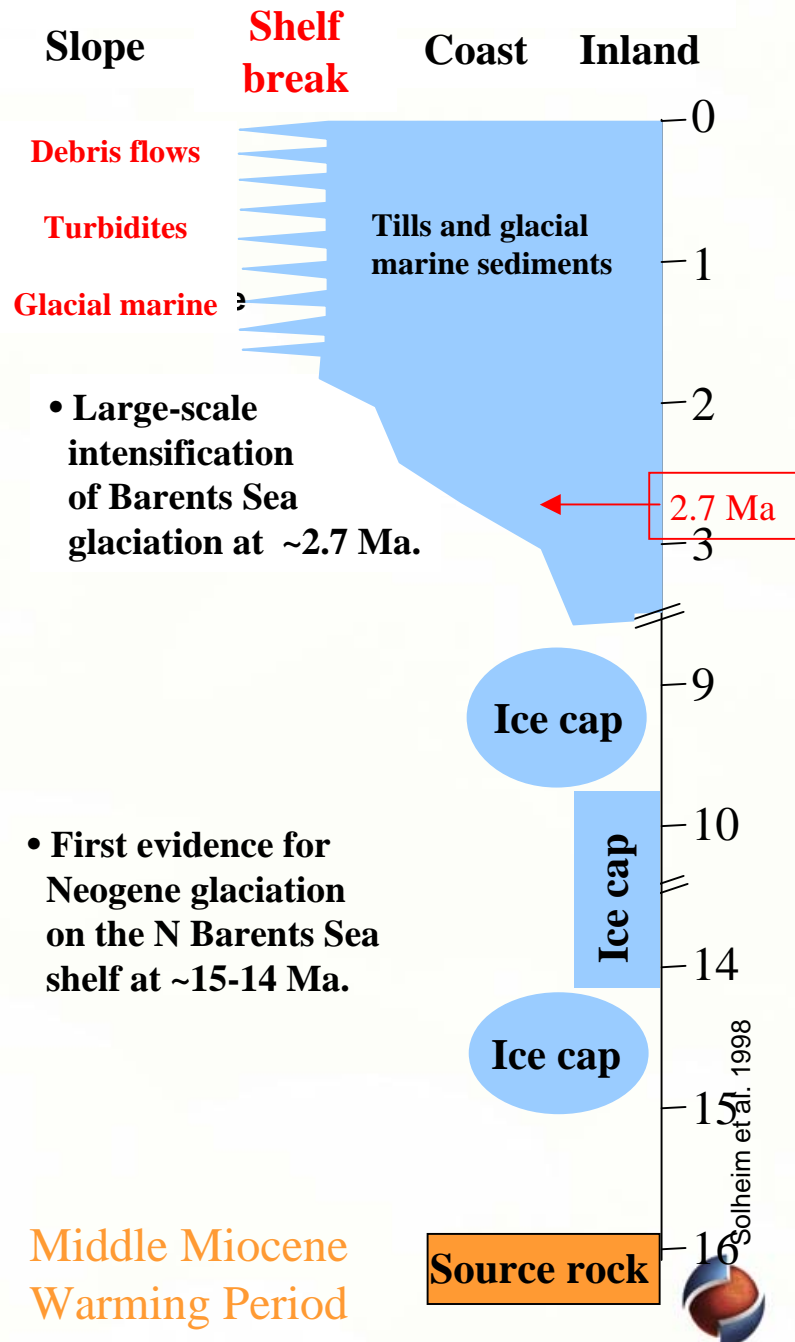
Yermak Plateau

Knies et al. (2002)

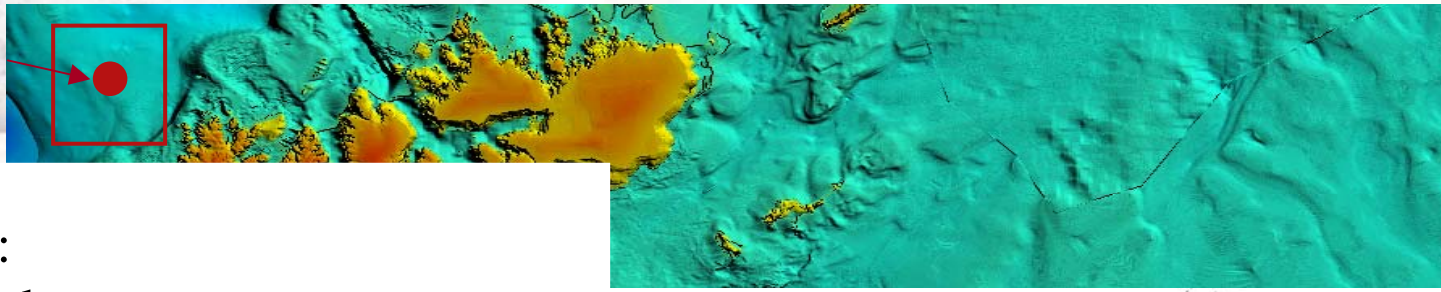




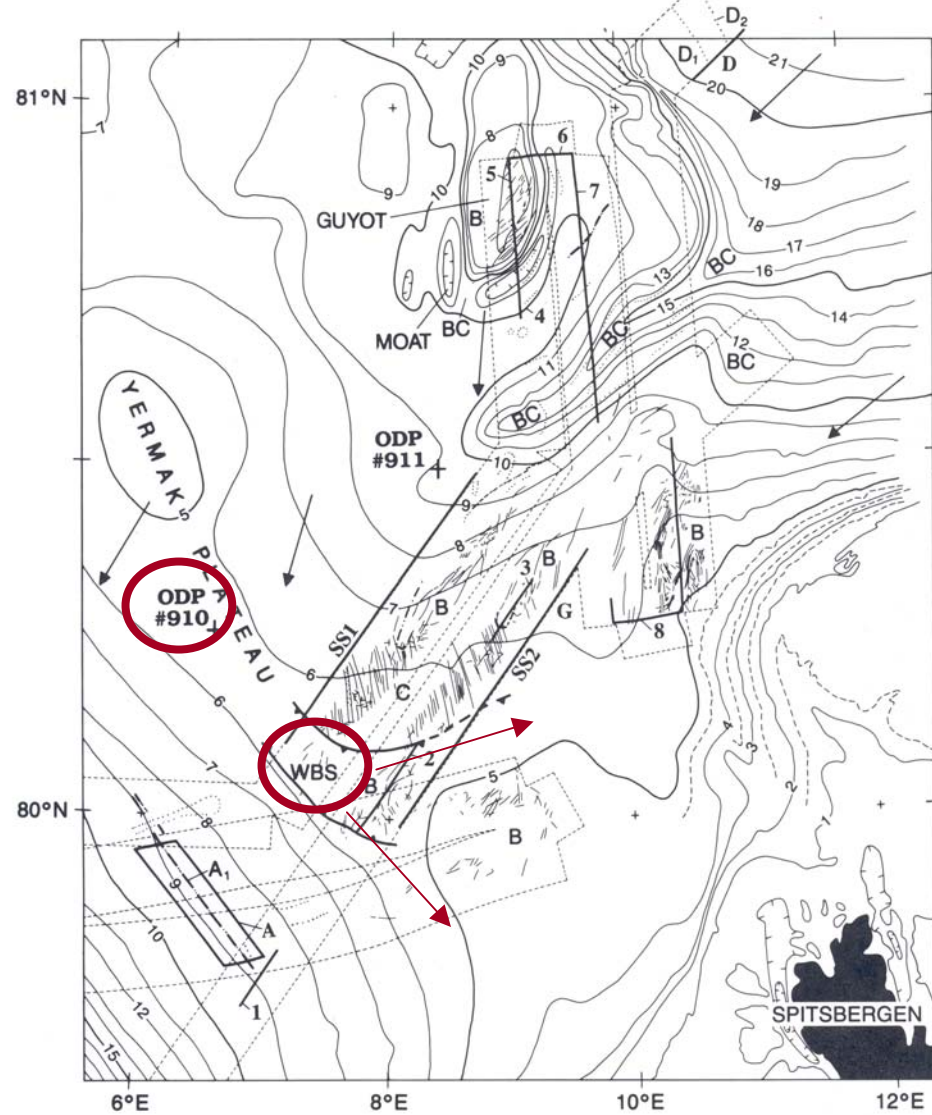
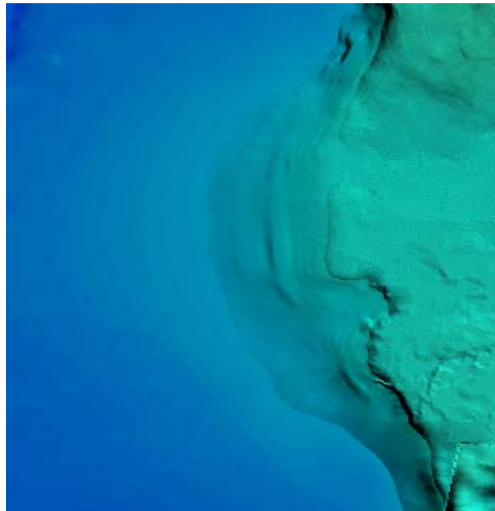
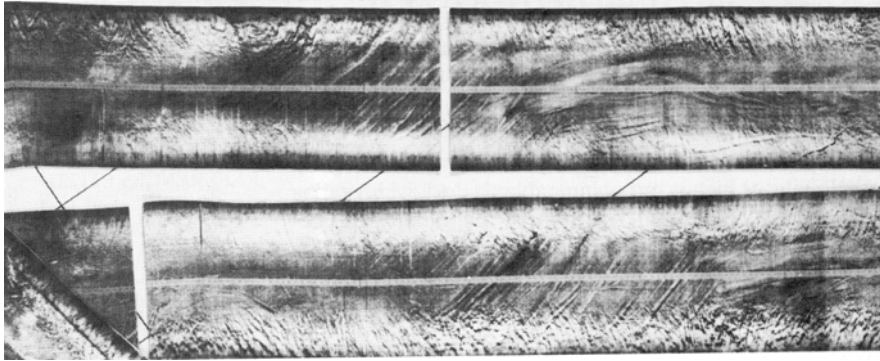
Ice Sheet History



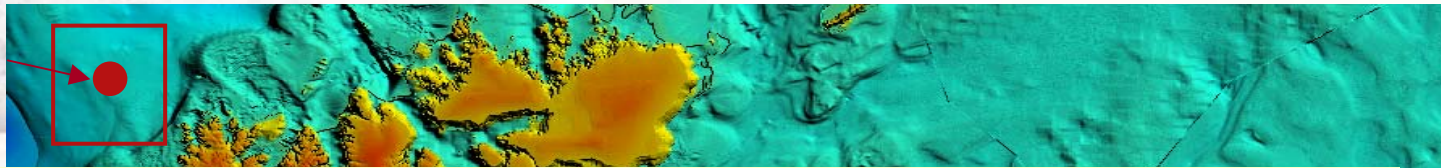
ODP Site 910



Vogt et al. (1994):
Iceberg ploughmarks
(450--~850 m bsf)

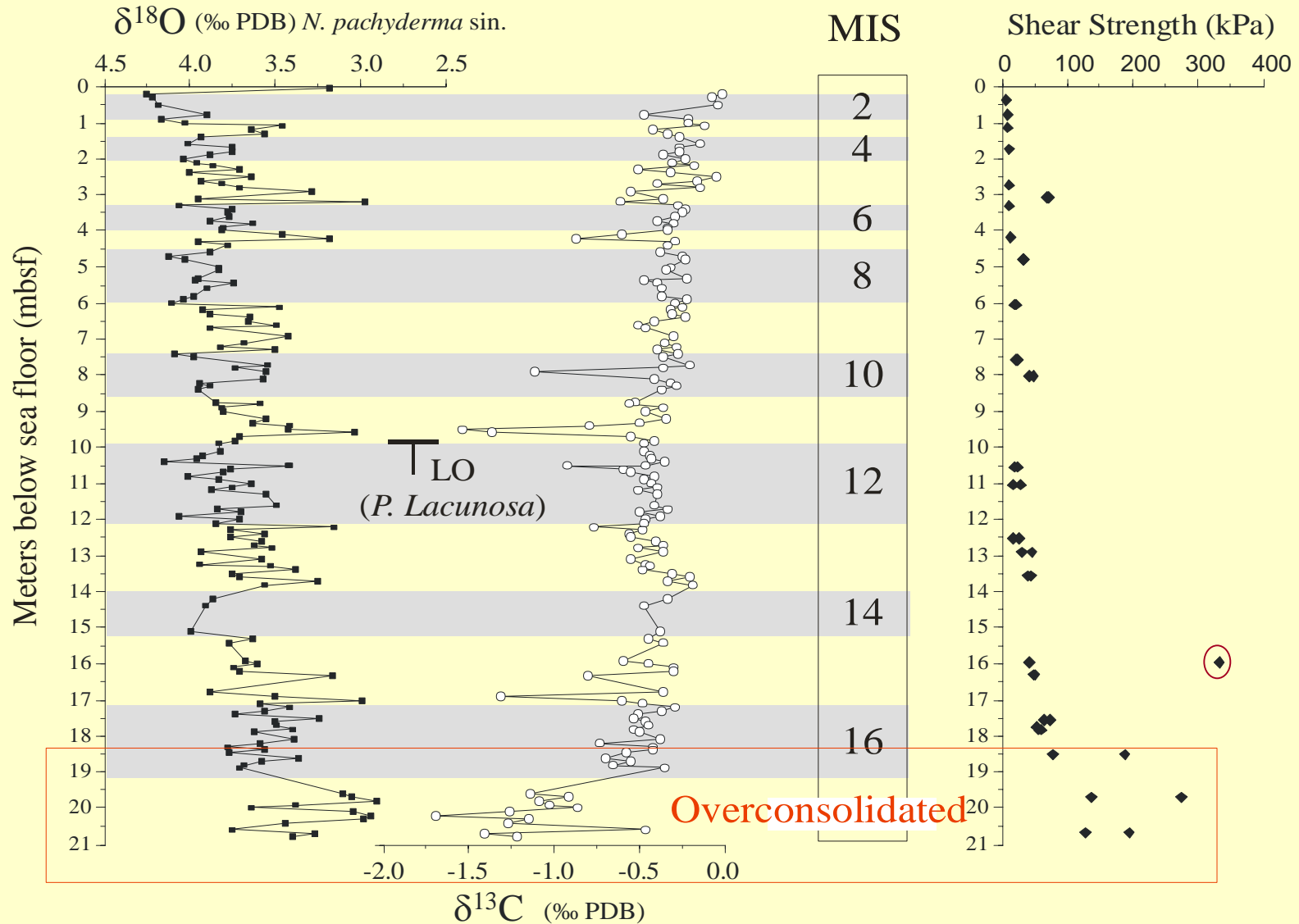


ODP Site 910

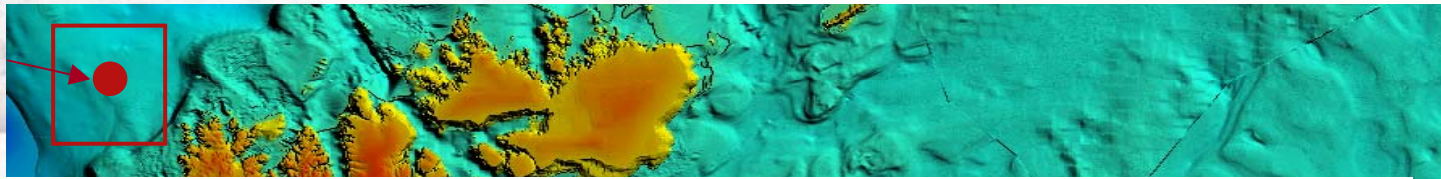


Data from 1997 (Flower 1997)

Site 910A



ODP Site 910

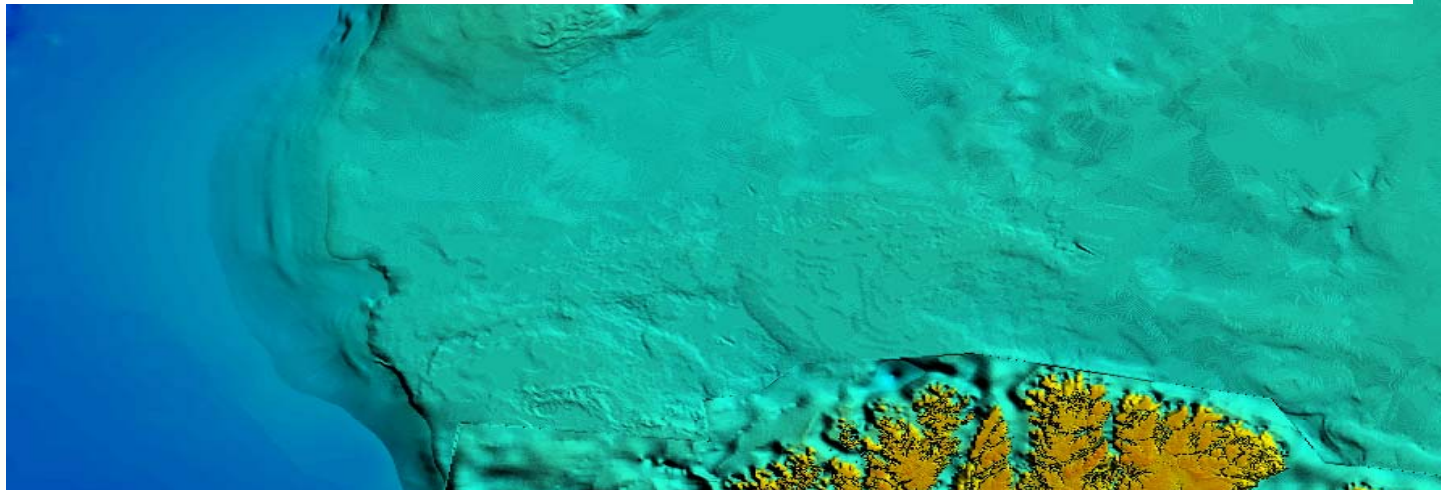


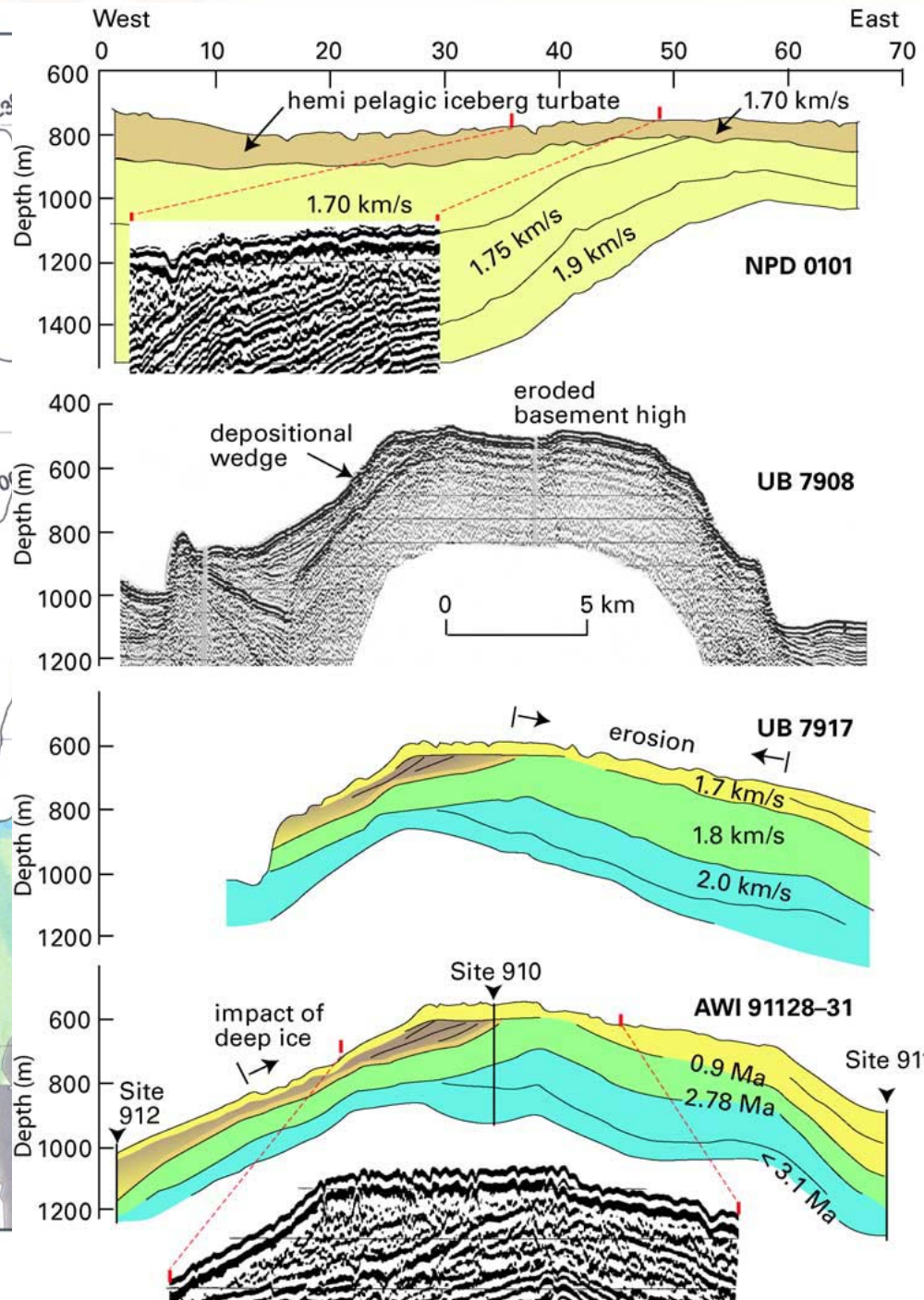
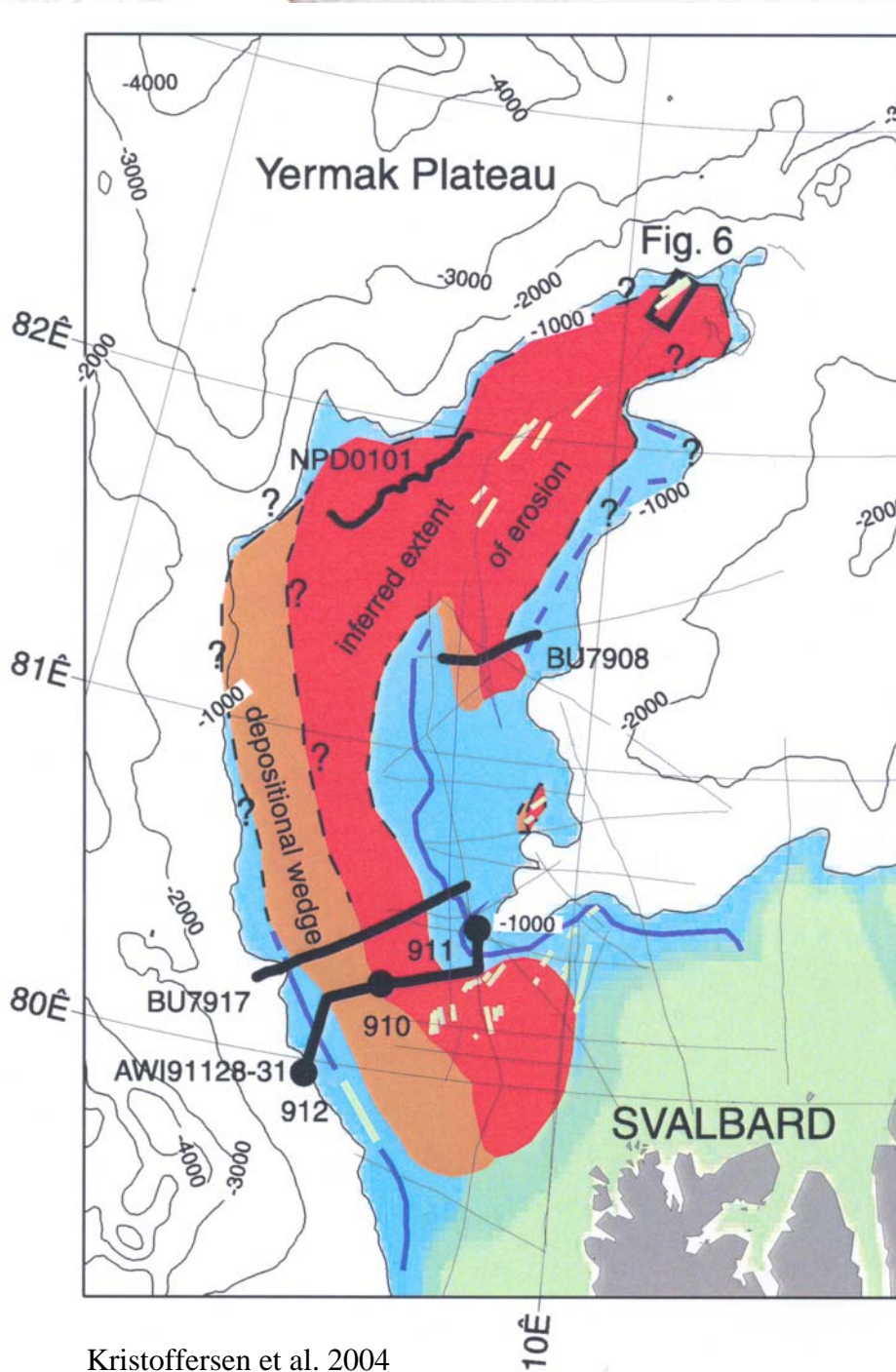
Main Conclusions:

Vogt et al. 1994: iceberg plowmarks <450 to ~850 m water depth

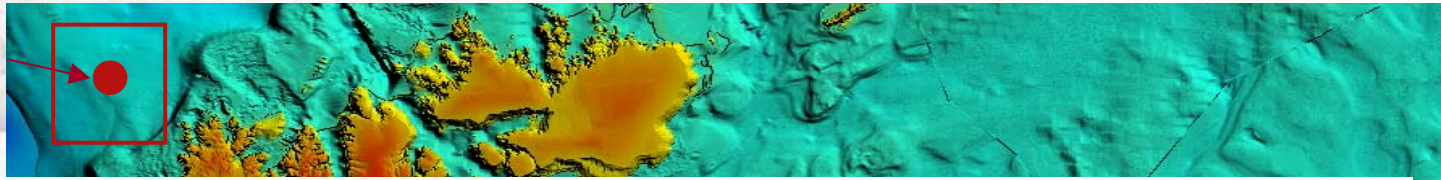
Vogt et al. 1994: 400-600 m grounding ice sheet, N-Svalbard

Flower 1997: Overconsolidation in Site 910A due to ice sheet grounding prior to ca. 660 ka (MIS 16/17)





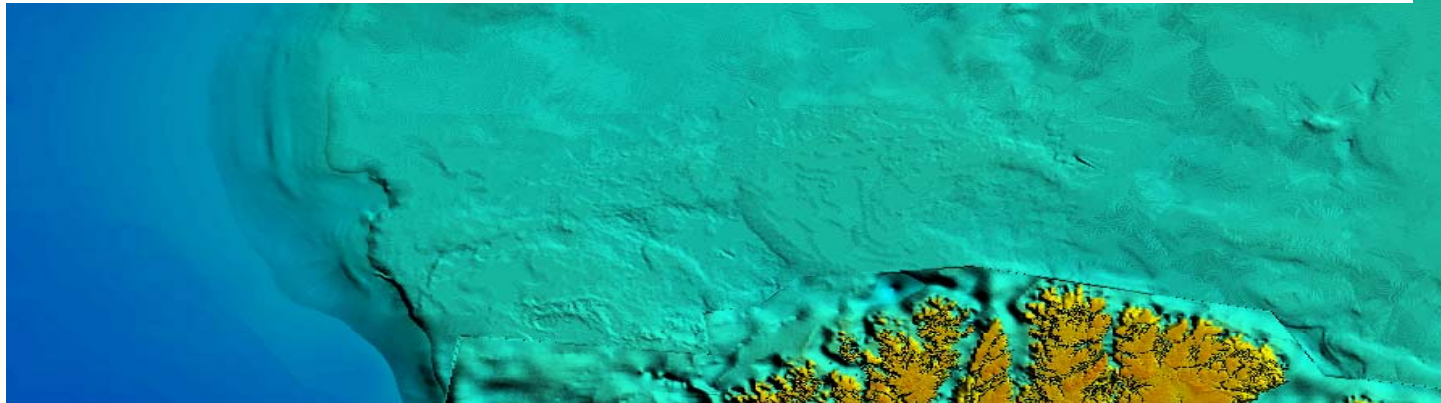
ODP Site 910



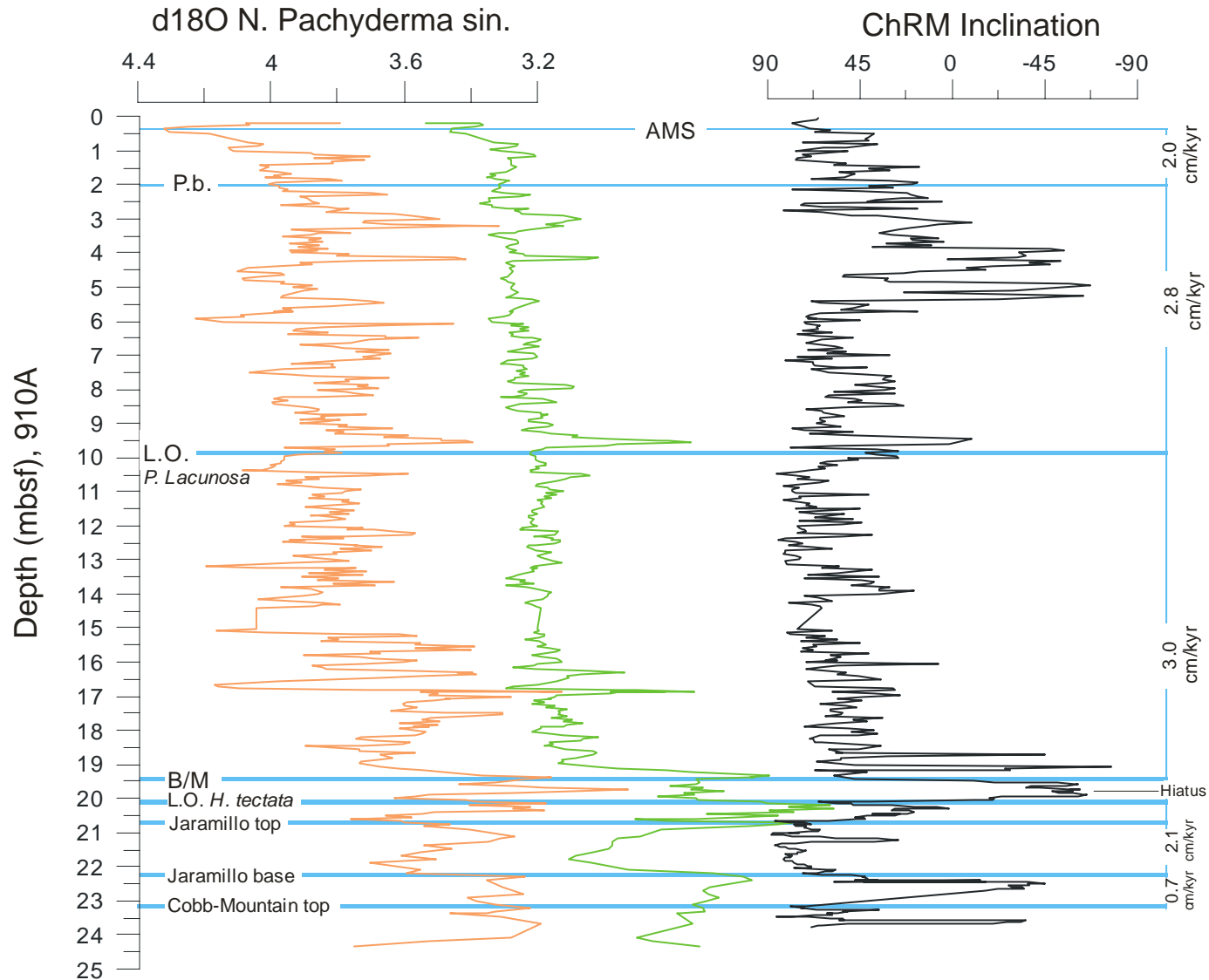
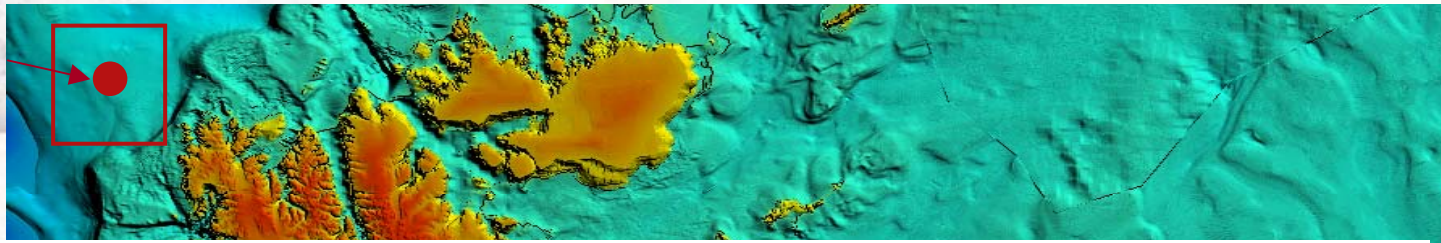
Main Arguments:

???

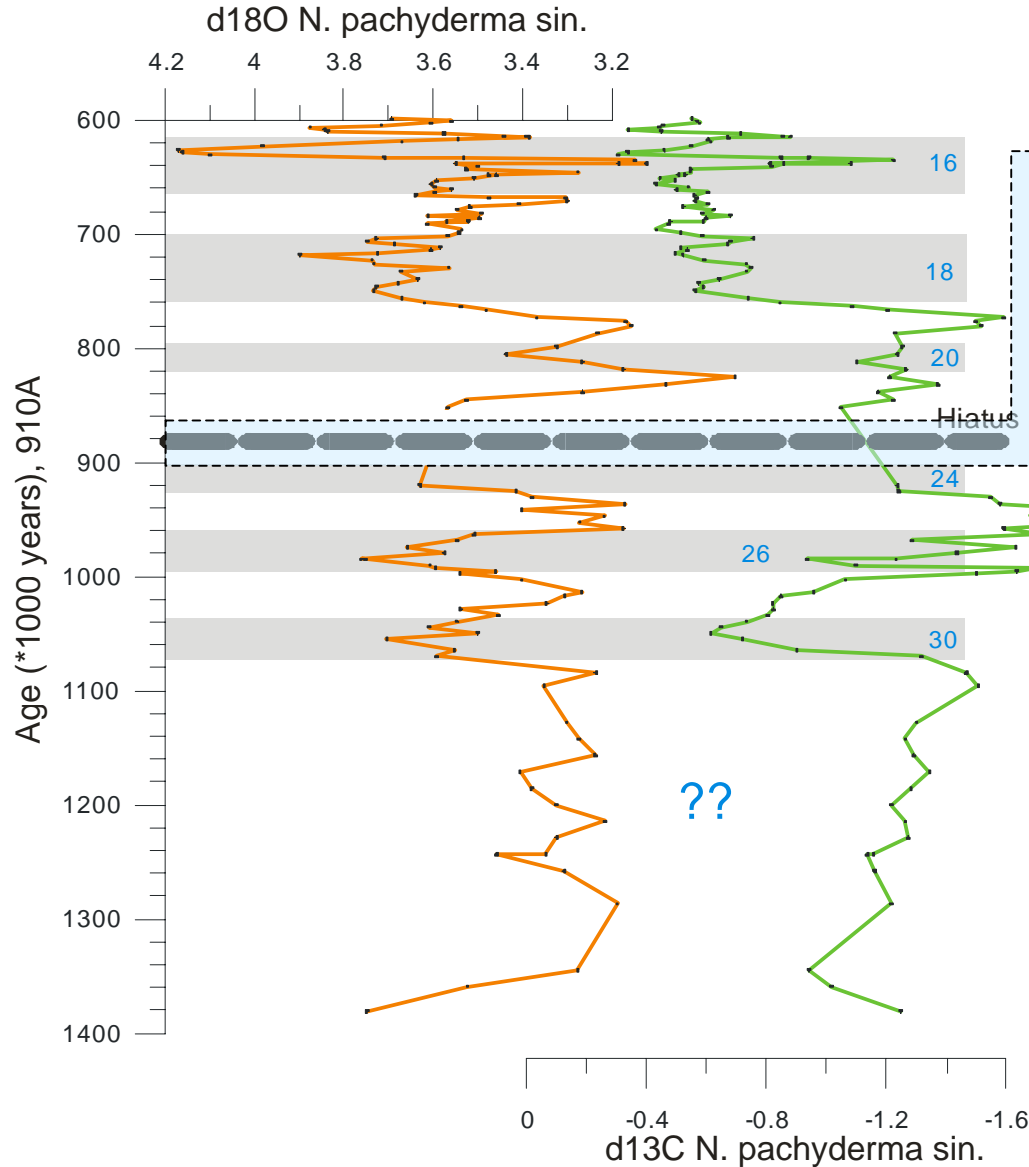
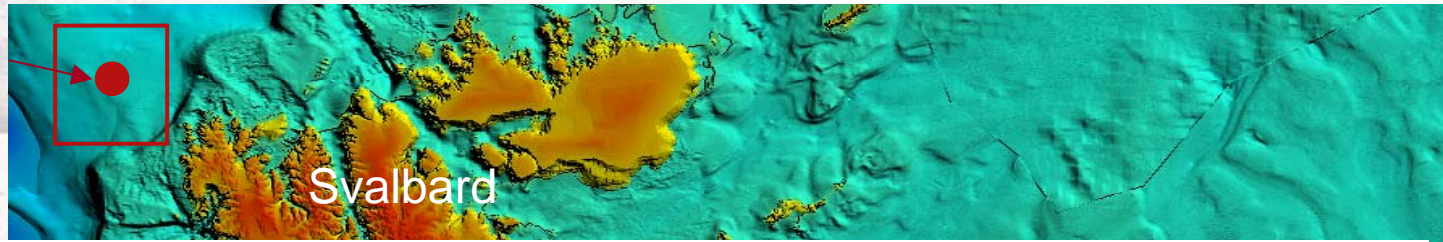
Kristofferson et al.: "We infer that deep draft icebergs exiting the polar basin removed this part of the stratigraphy prior to and/or during MIS 16 and redeposited the material as a wedge to the west."



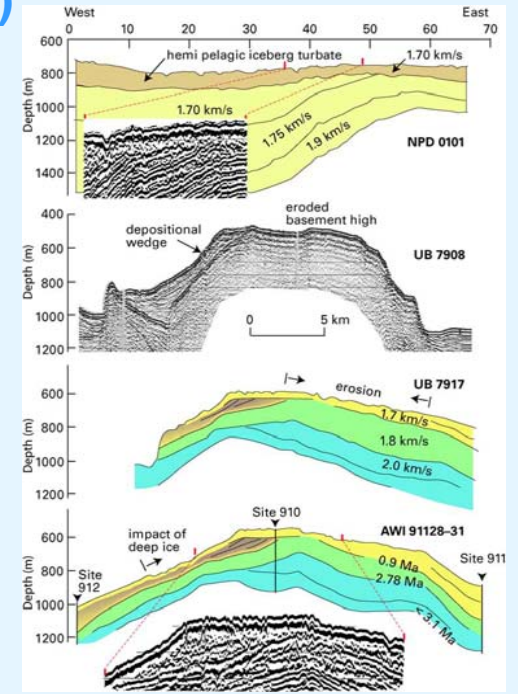
ODP Site 910



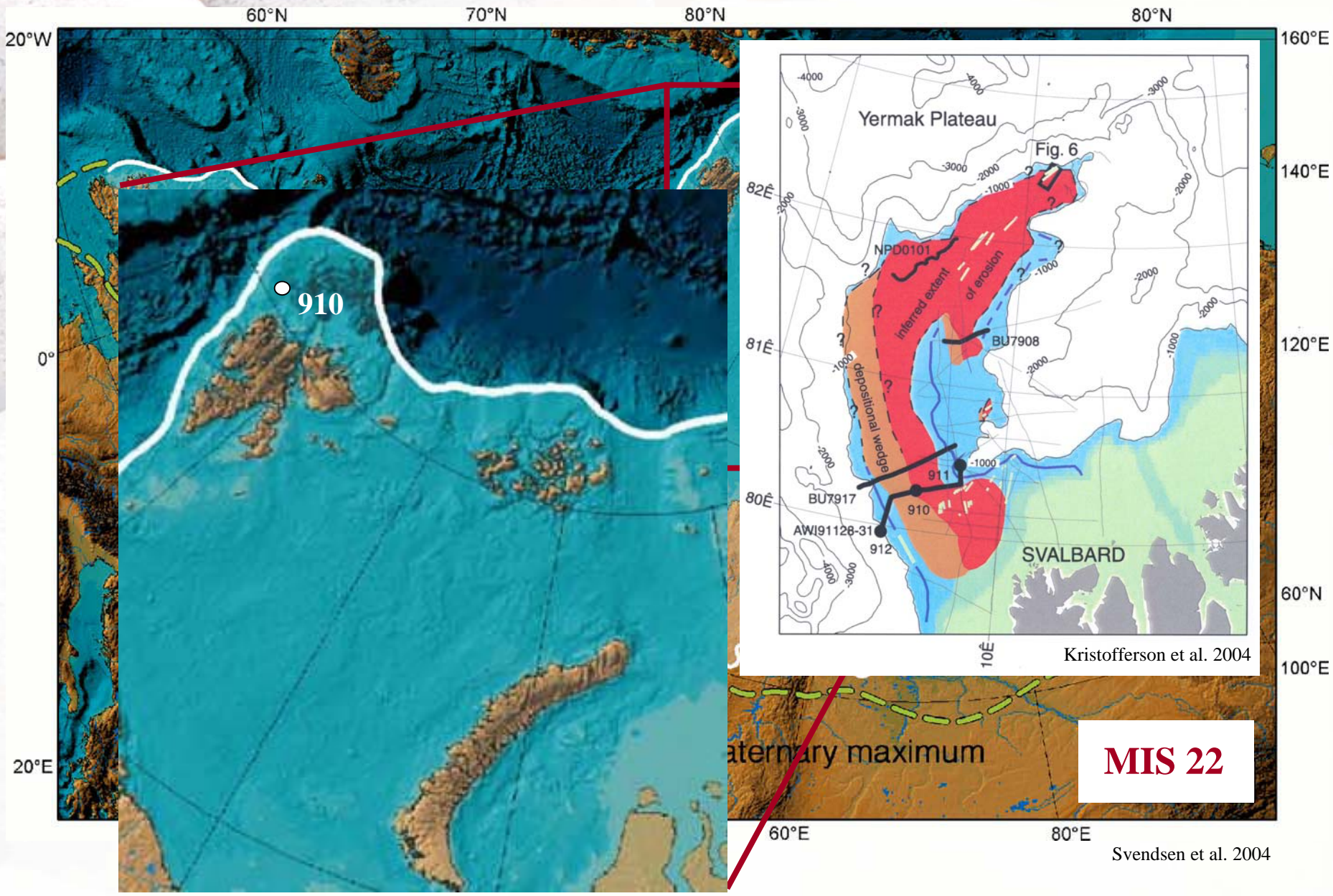
ODP Site 910



Glacial Erosion MIS 22 (~900 ka)

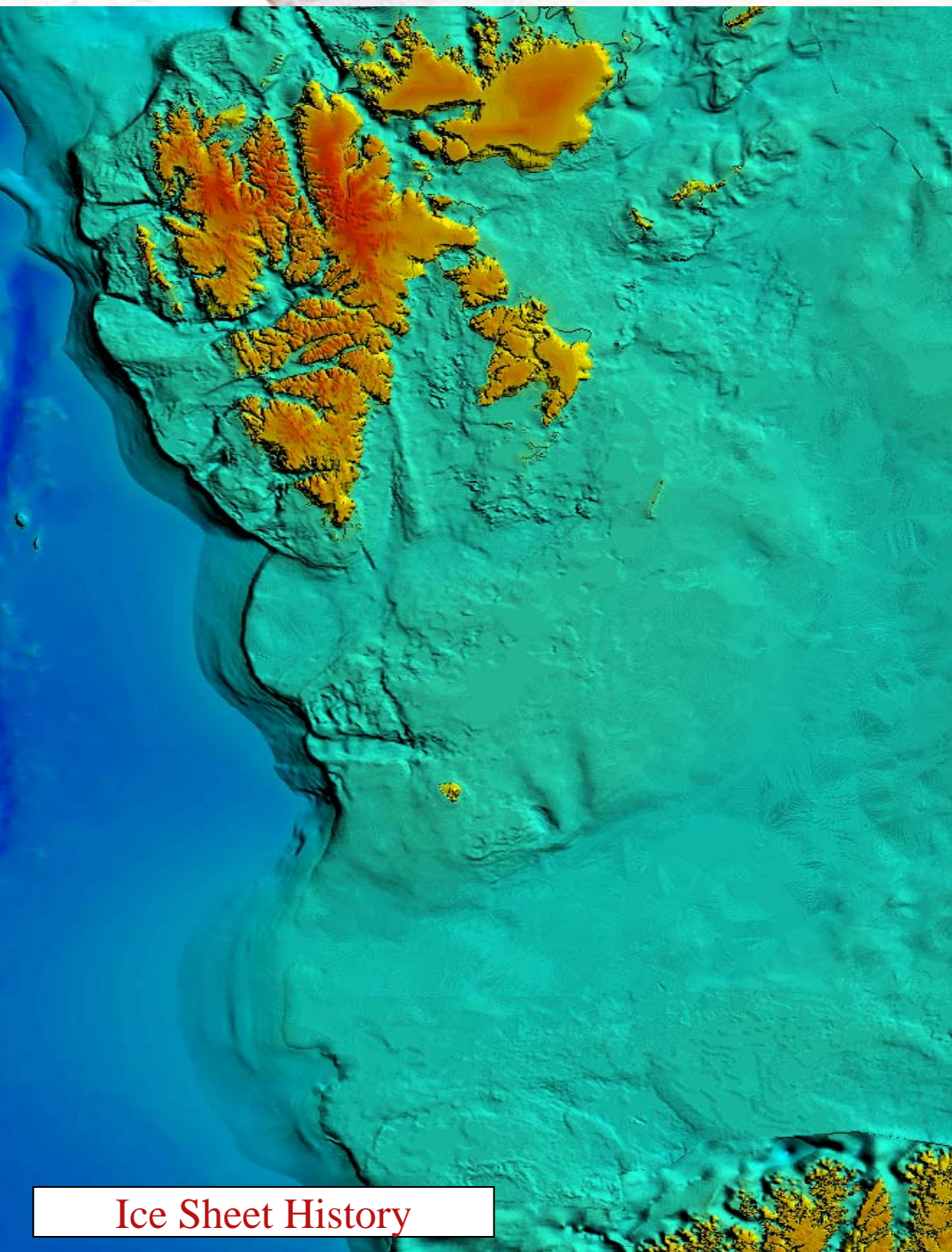


Kristoffersen et al. 2004

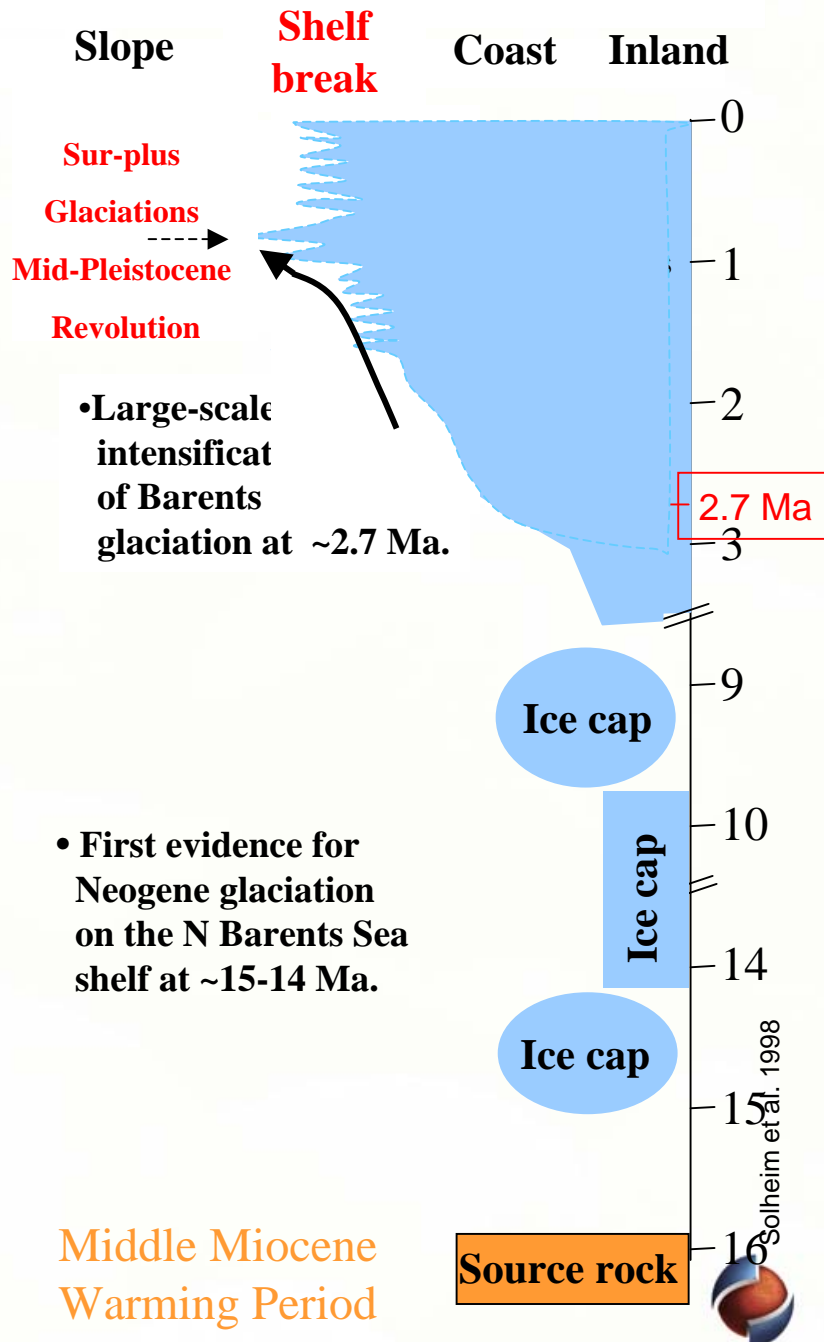


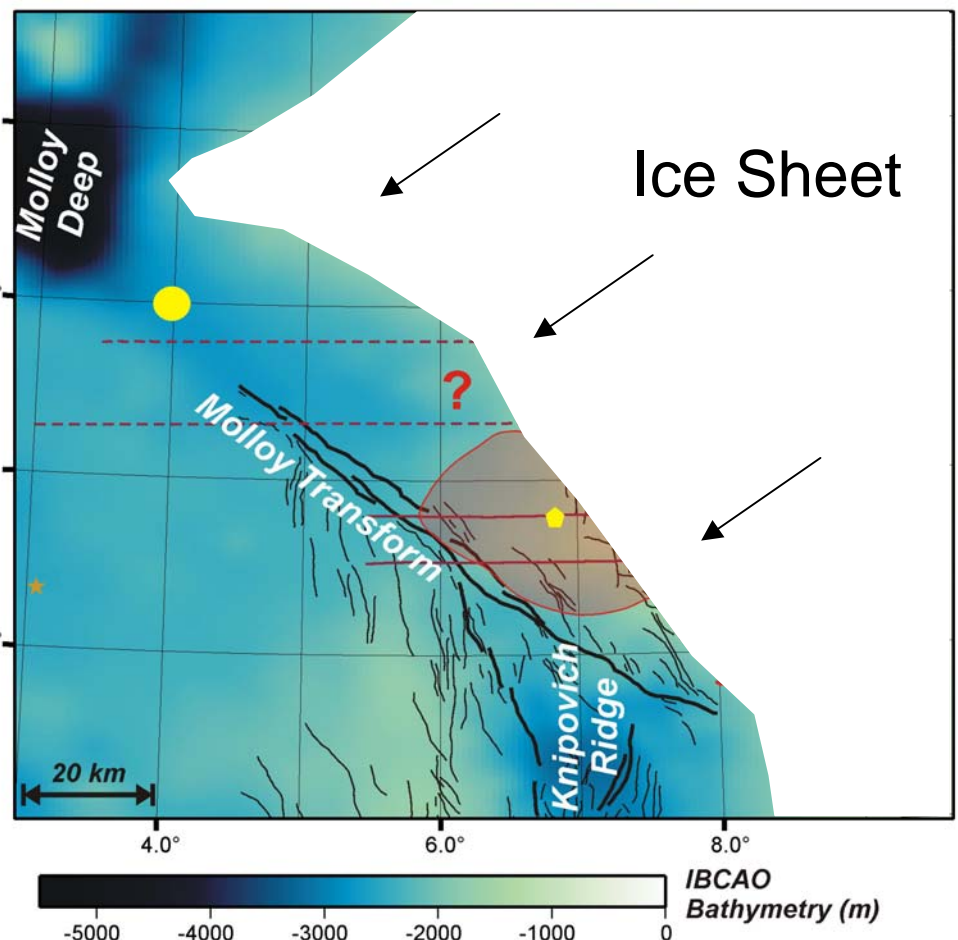
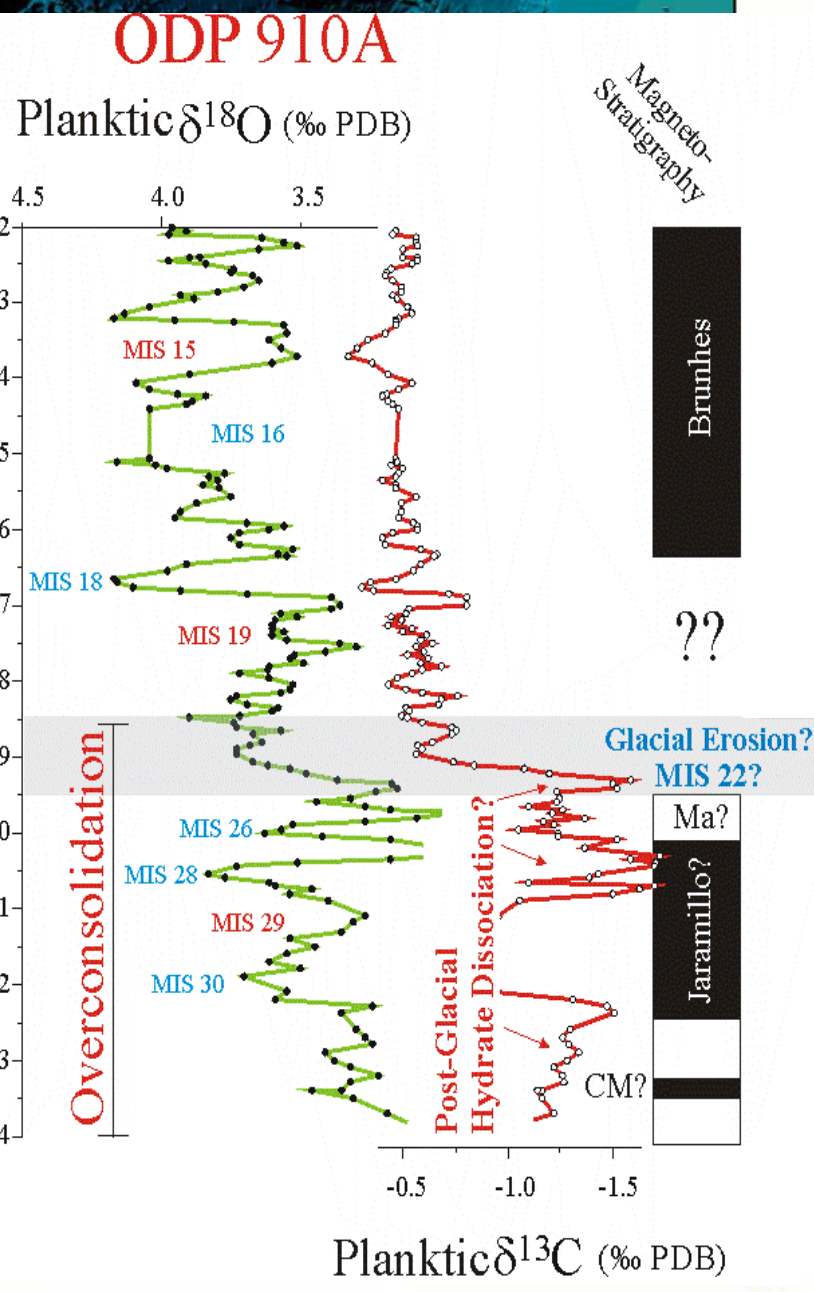
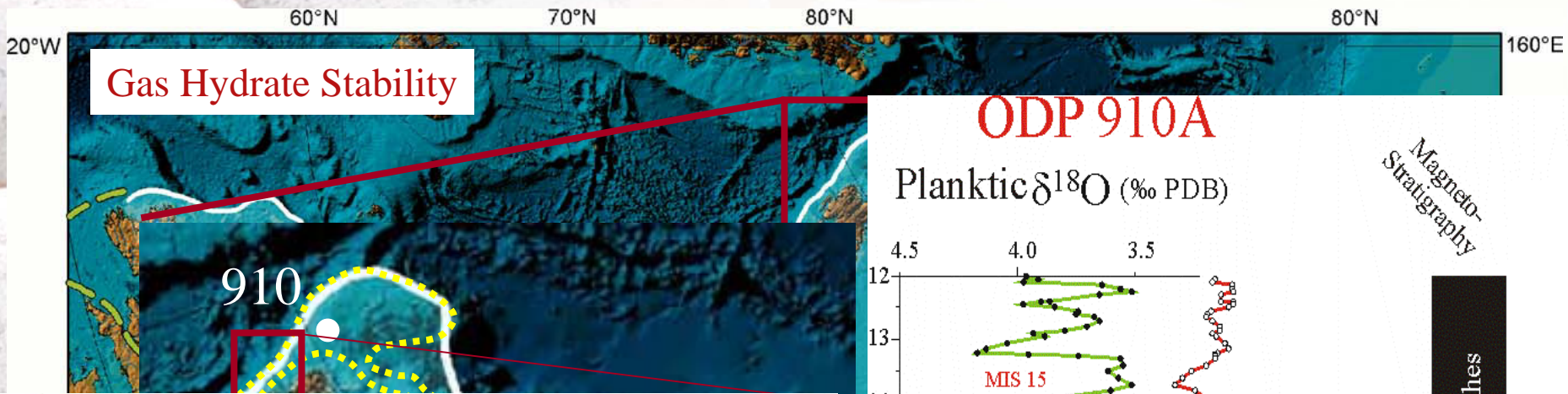
MIS 22





Ice Sheet History

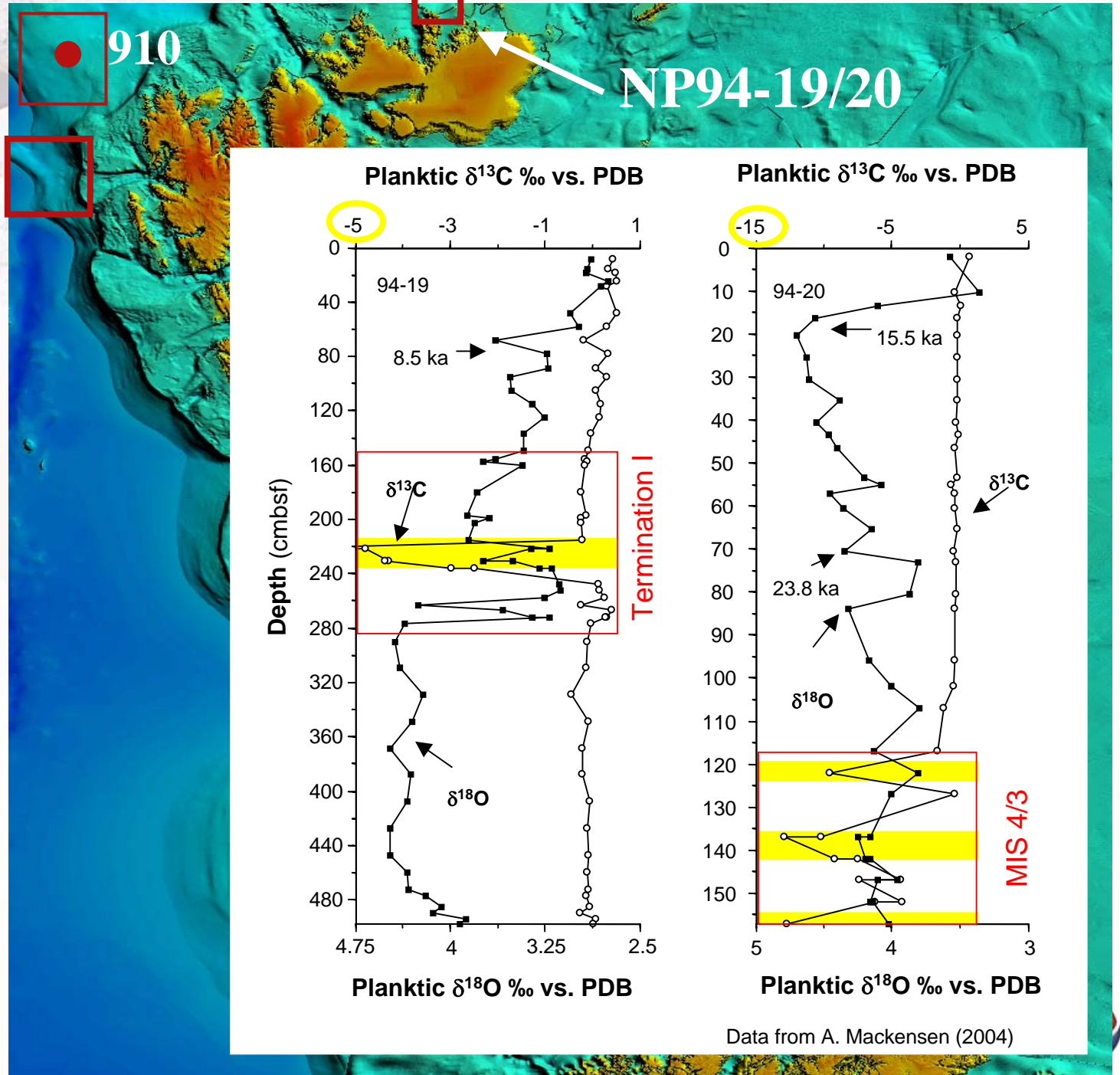




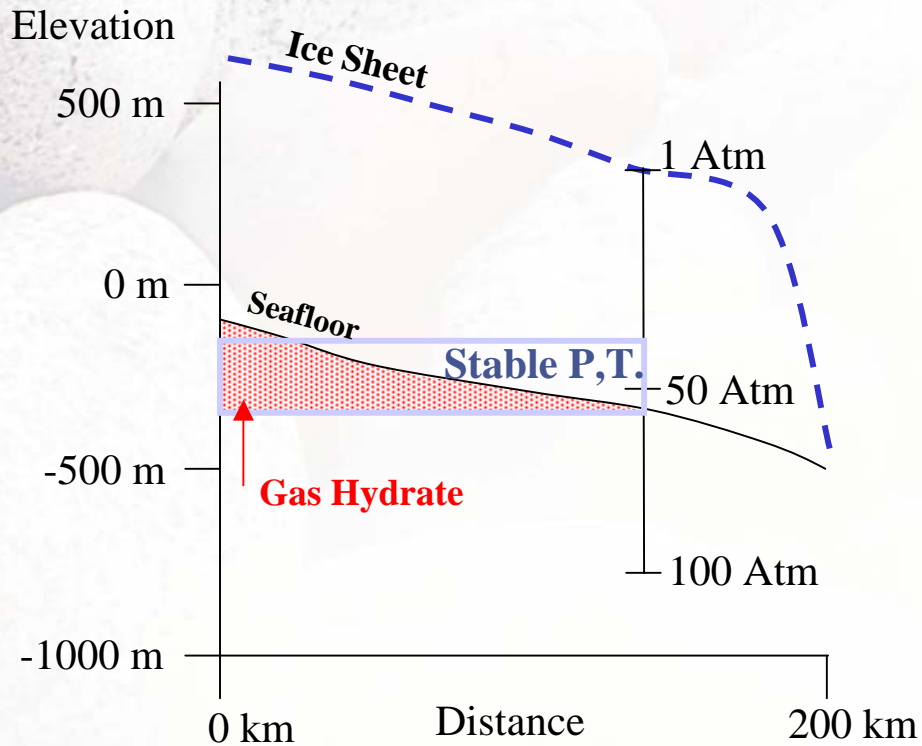
Glacial Impact On Reservoir Stability

Gas Hydrate Dissociation?

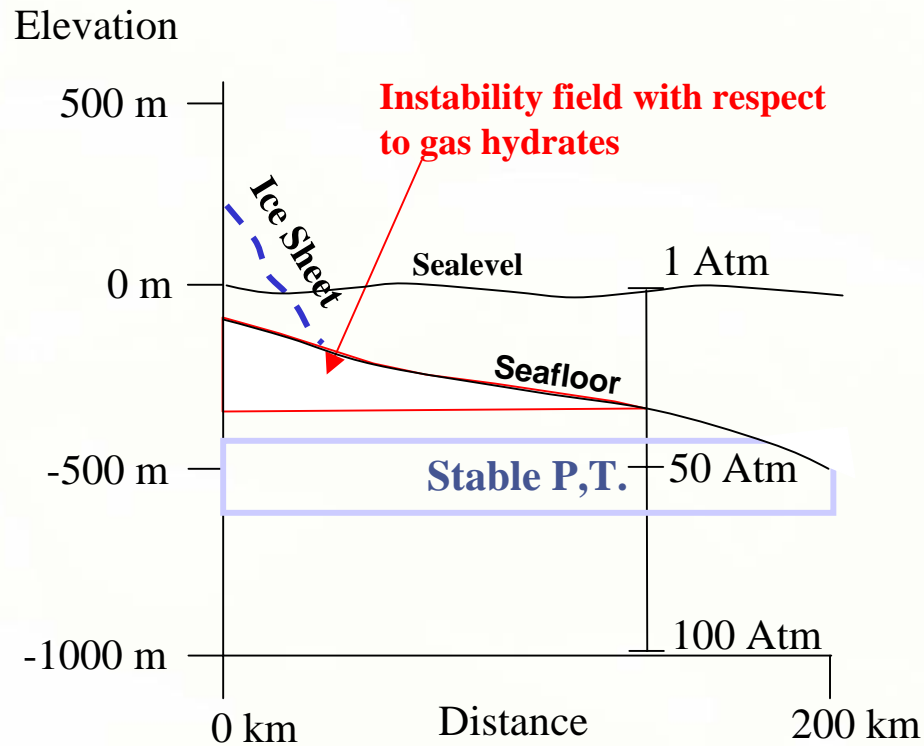
Gas Hydrate Stability



Last Glacial Maximum



Early Holocene



Conclusions

- Deposition of potential source rocks during the Mid-Miocene Warmth (~17-16 Ma).
- First evidence for Neogene glaciation on the N Barents Sea shelf at ~15-14 Ma.
- Large-scale intensification of Barents Sea glaciation at ~2.7 Ma.
- Episodic events of methane hydrate instability after repeated glacial loading and pressure release during the Quaternary (<900 ka).

