

GREEN EDGE

The post-glacial opening of Nares Strait, NW Greenland, and its implication on productivity in Northernmost Baffin Bay: Preliminary results from marine sediment cores

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Glacial Context

During the last glacial maximum (~18 ka BP), the Canadian Arctic Archipelago (CAA) was covered by grounded ice (the Innuitian Ice Sheet, IIS) that prevented any exchange of water between the Arctic Ocean and Baffin Bay. As the climate warmed and the Greenland and Innuitian Ice Sheets retreated, the low-lying channels of the CAA were submerged by sea water. Converging lines of evidence in the hereby shown dataset, along with other studies (England et al., 1999, Jennings et al., 2011) point to the opening of Nares Strait - which underlay the former confluence of GIS and IIS - at around 9.2 cal ka BP.

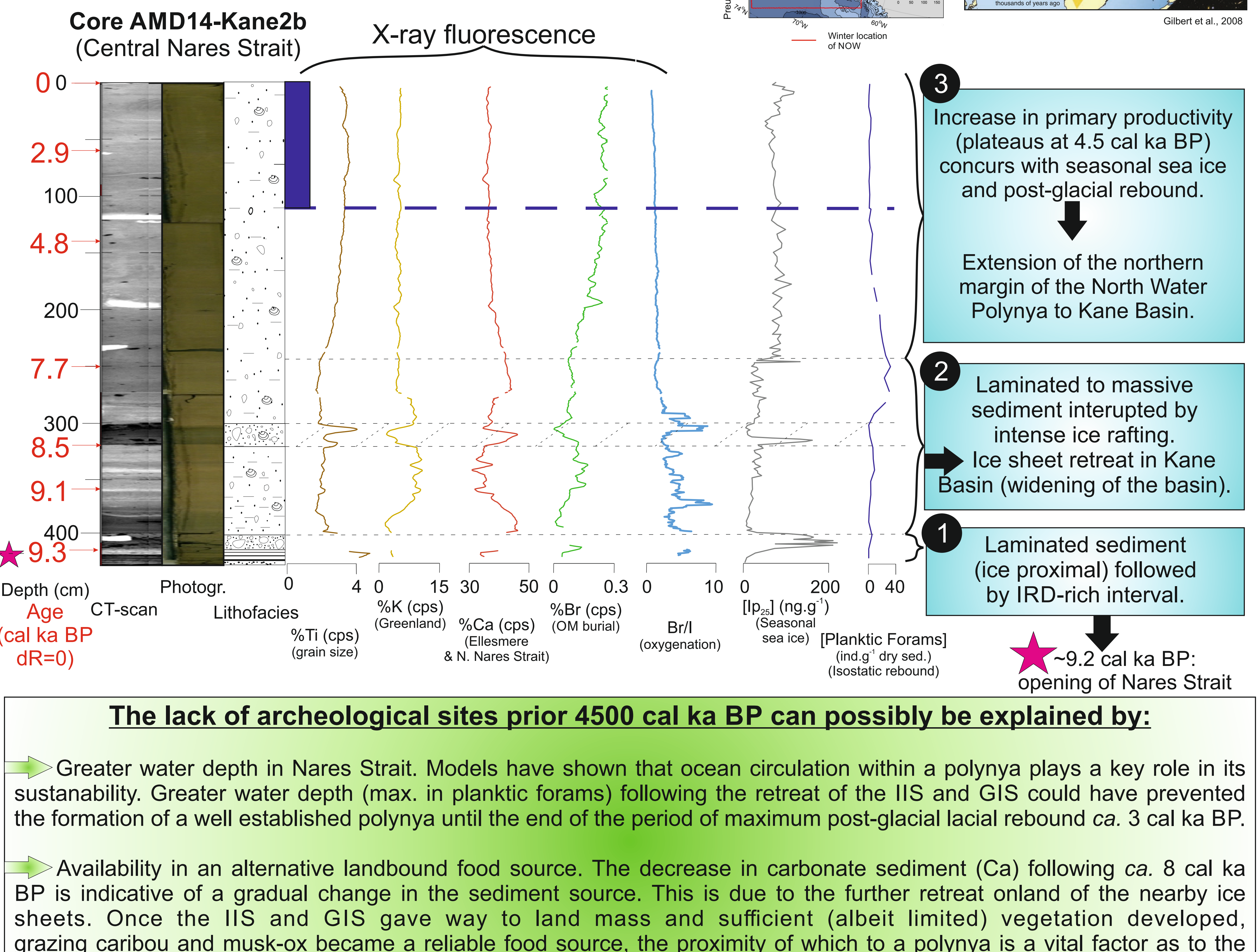
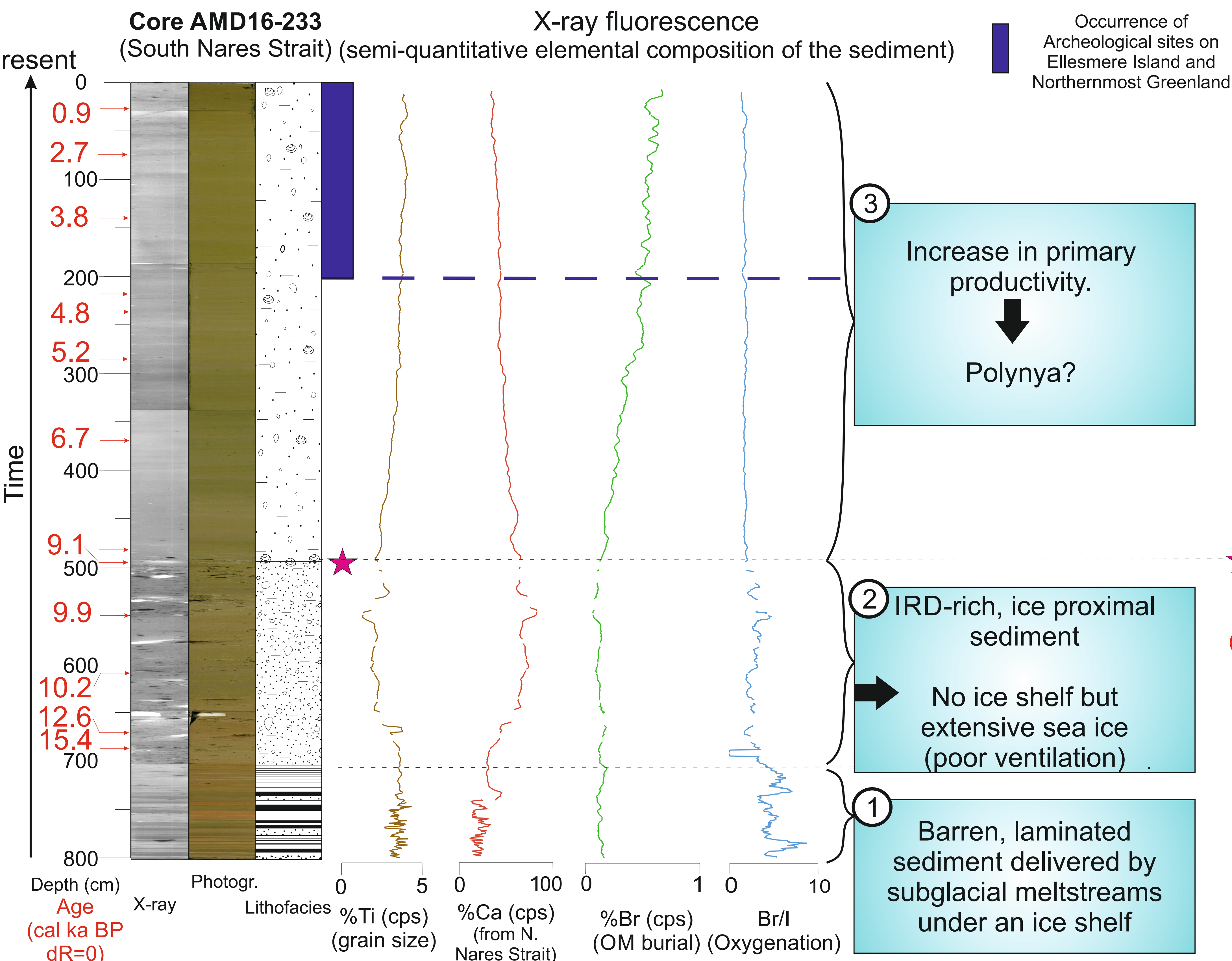
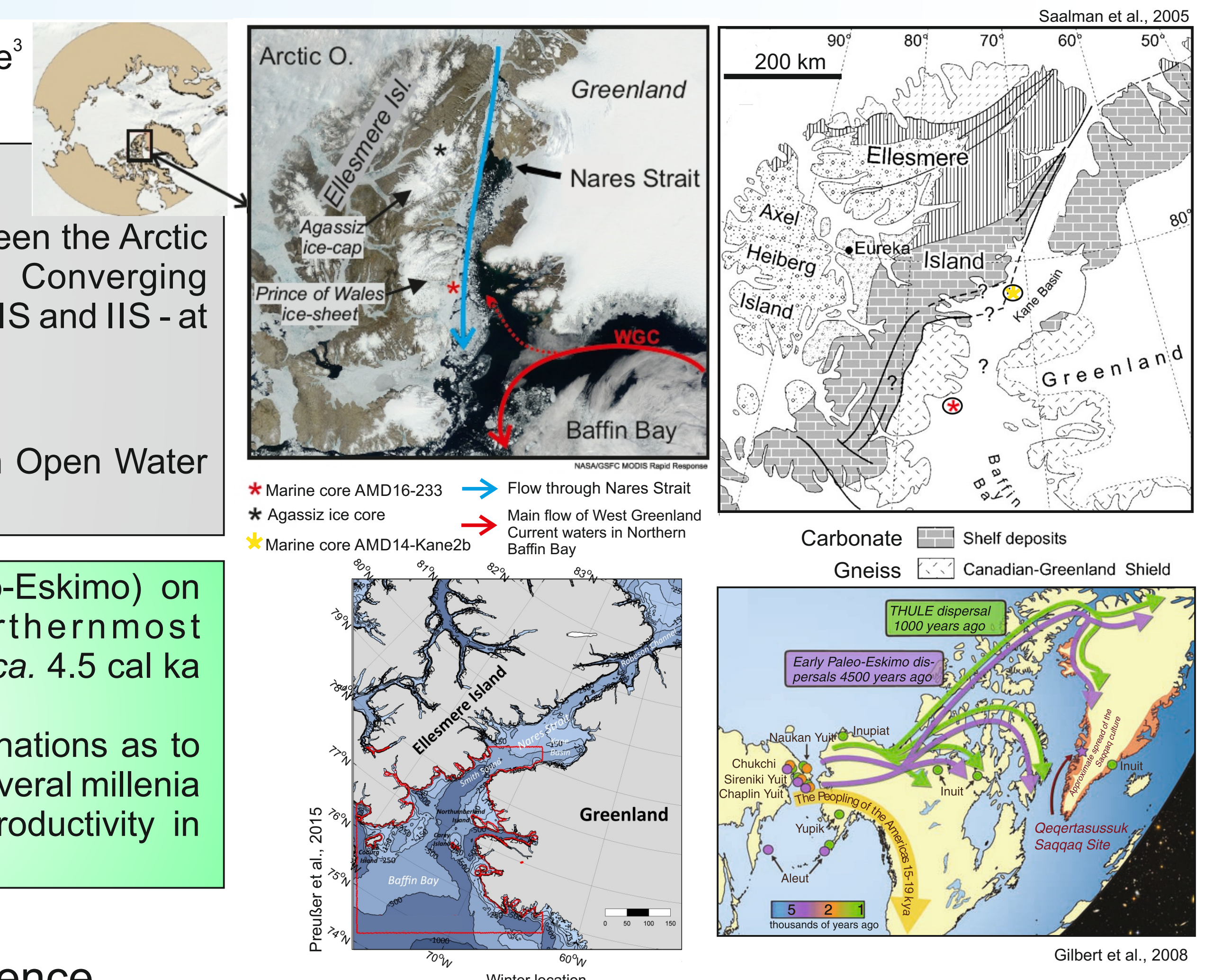
Current importance of Nares Strait

Today, Nares Strait is a key gateway in the regional productivity in that it not only supplies nutrient-rich Pacific water to Northern Baffin Bay, but it sustains the very existence of the North Open Water (NOW) polynya through the occurrence of sea ice arches.

Our data

Two sediment cores were retrieved in central (Kane Basin) and southern (Trinity Fjord) Nares Strait within or nearby the NOW polynya. The multi-proxy investigation of these records offers a unique window onto the paleoenvironmental evolution of the Strait during the Holocene (past ca. 10 cal ka). Effective organic matter burial (Br) associated with primary productivity shows a clear increase in Trinity Fjord after the opening of Nares Strait at ~9.2 cal ka BP. However the increase in primary productivity in Central Nares Strait is delayed until 7.7 cal ka BP and seems to be intimately linked with stronger seasonal sea ice (Ip25) and the post-glacial shoaling of the basin (planktic foram abundance).

Human settlement (early Paleo-Eskimo) on Ellesmere Island and Northernmost Greenland is further delayed to ca. 4.5 cal ka BP (Schledermann, 1980). We propose two tentative explanations as to why the Paleo-Eskimo arrived several millenia after the initiation of primary productivity in Northern Baffin Bay.



The lack of archeological sites prior 4500 cal ka BP can possibly be explained by:

- Greater water depth in Nares Strait. Models have shown that ocean circulation within a polynya plays a key role in its sustainability. Greater water depth (max. in planktic forams) following the retreat of the IIS and GIS could have prevented the formation of a well established polynya until the end of the period of maximum post-glacialacial rebound ca. 3 cal ka BP.
- Availability in an alternative landbound food source. The decrease in carbonate sediment (Ca) following ca. 8 cal ka BP is indicative of a gradual change in the sediment source. This is due to the further retreat onland of the nearby ice sheets. Once the IIS and GIS gave way to land mass and sufficient (albeit limited) vegetation developed, grazing caribou and musk-ox became a reliable food source, the proximity of which to a polynya is a vital factor as to the attractiveness of said polynya.