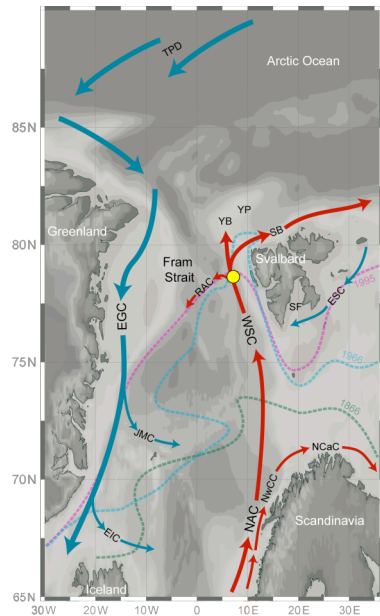


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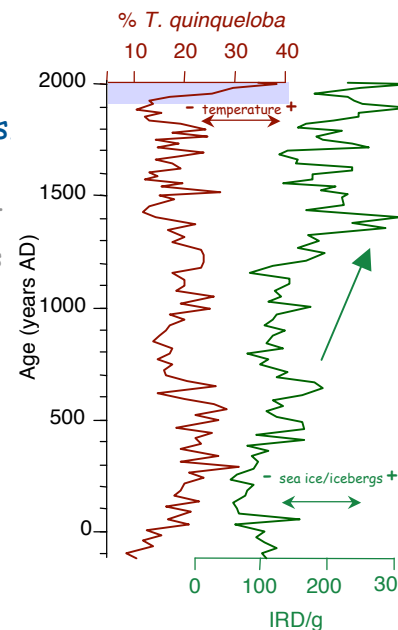
# Holocene Variability of Heat Transport into the Arctic and the Sea Ice Cover



**Fig. 1.** The study area and the most important surface water currents. The core position is marked with a yellow dot. Also shown are the fluctuating locations of the sea ice margin during the past ca 150 years after Vinje (2001).

**Results:** Cooler modern (pre-industrial) climate conditions evolved after 5,000 years before present, simultaneous to the decreasing insolation in the northern hemisphere. Fig. 3 shows the percentages of the subpolar planktic foraminifer species *Turborotalia quinqueloba* - indicative for AW inflow - and the contents of ice-transported material during the last 2000 years. Noticeable are the increasing abundances of sea ice/icebergs during the past 2000 years and a strong rise of *T. quinqueloba* since the past ca 150 years.

**Study area:** The Fram Strait between Greenland and Svalbard is the only deepwater connection between the Arctic Ocean and adjacent subpolar oceans. Large amounts of warm and saline Atlantic Water (AW) derived from the North Atlantic Drift transport most of the heat through eastern Fram Strait to the Arctic basin, (Abb. 1), resulting in year-round ice-free conditions. Arctic sea ice and cold and fresh waters exit the western part of the strait southward along the Greenland shelf. The strong east-west temperature gradient results in higher bioproductivity and sedimentation rates which allows for suitably tracking Holocene climate and paleoceanographic variations



**Fig. 3.** Percentages of the subpolar planktic foraminifer species *T. quinqueloba* and the contents of ice-transported material (IRD) during the last 2000 years.

**Methods:**

Sediment cores (Fig. 2) from the western Svalbard margin (eastern Fram Strait) are studied for the Holocene variability of surface and deep water inflow into the Arctic and the associated shifts of the position of the sea ice margin.

Therefore, micropalaeontological, geochemical, and sedimentological parameters have been studied in multidecadal time resolution.

**References:**

Spielhagen et al. (2011) Enhanced Modern Heat Transfer to the Arctic by Warm Atlantic Water. *Science* 331, 450-453.  
Werner et al. (2011) Atlantic Water advection to the eastern Fram Strait - Multiproxy evidence for late Holocene variability. *Palaeo3* 308, 264-276.



**Fig. 2.** Box core MSM712-1 (ca 40 cm long) contains informations on the climate development during the past ca 2000 years.