



PALEONTOLOGICAL RECORD OF SIZE SPECTRA IN HOLOCENE

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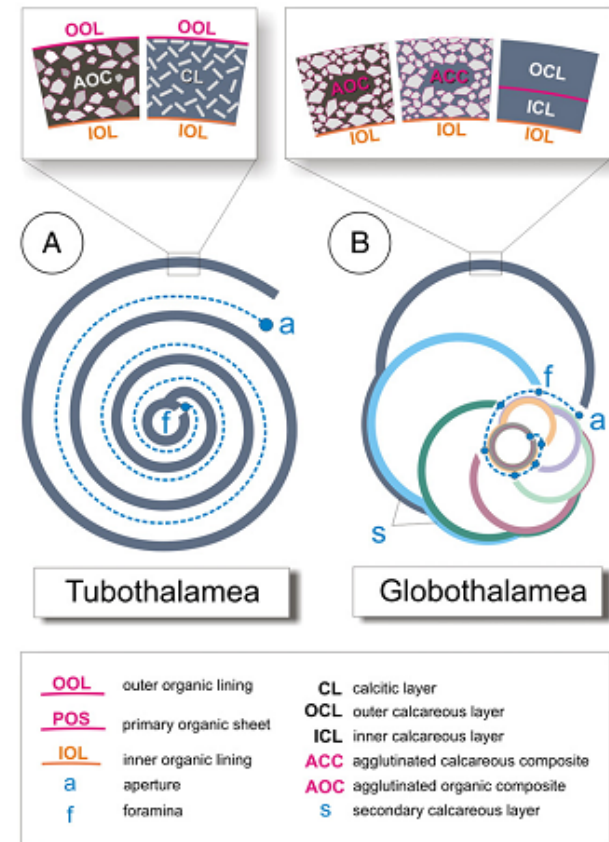
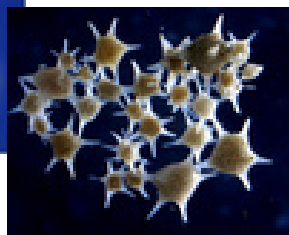
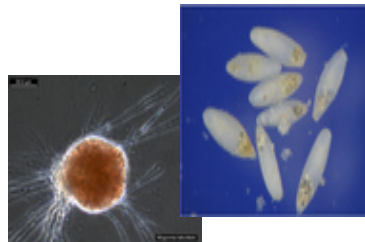


Foraminifera

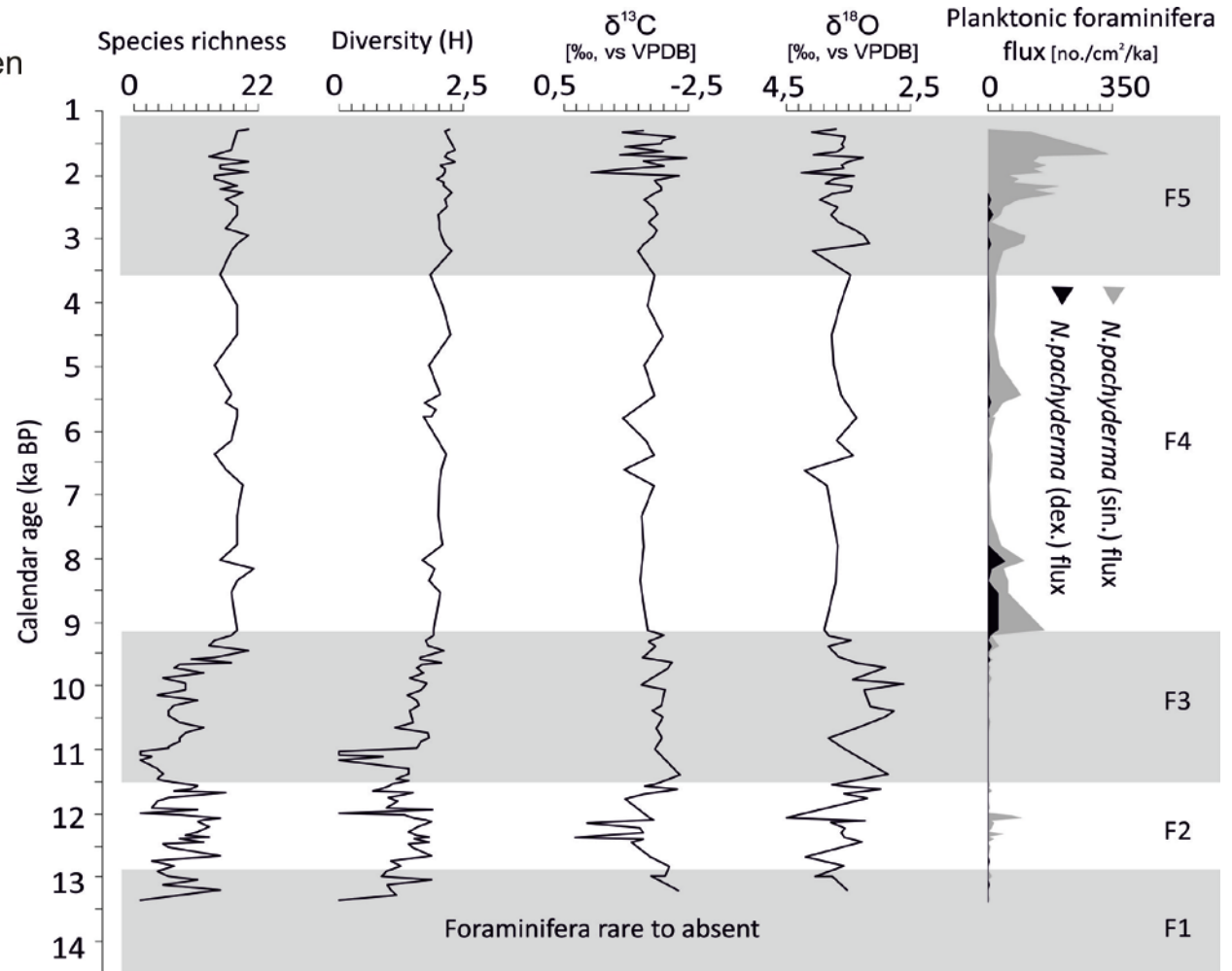
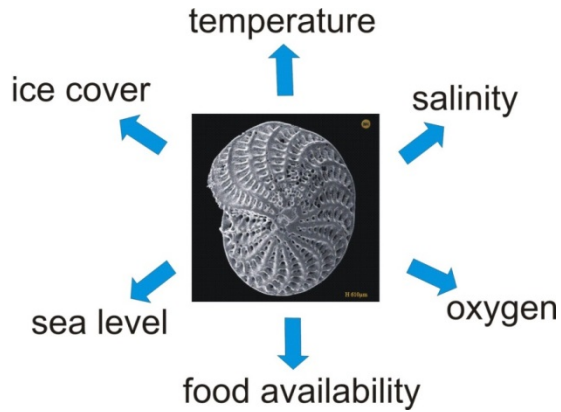
- A group of mainly marine Protists
- Characterized by granulated reticulopodia and presence of shell (test)
- 5,000 modern and 40,000 fossil species
- Well preserved in fossil record

Test:

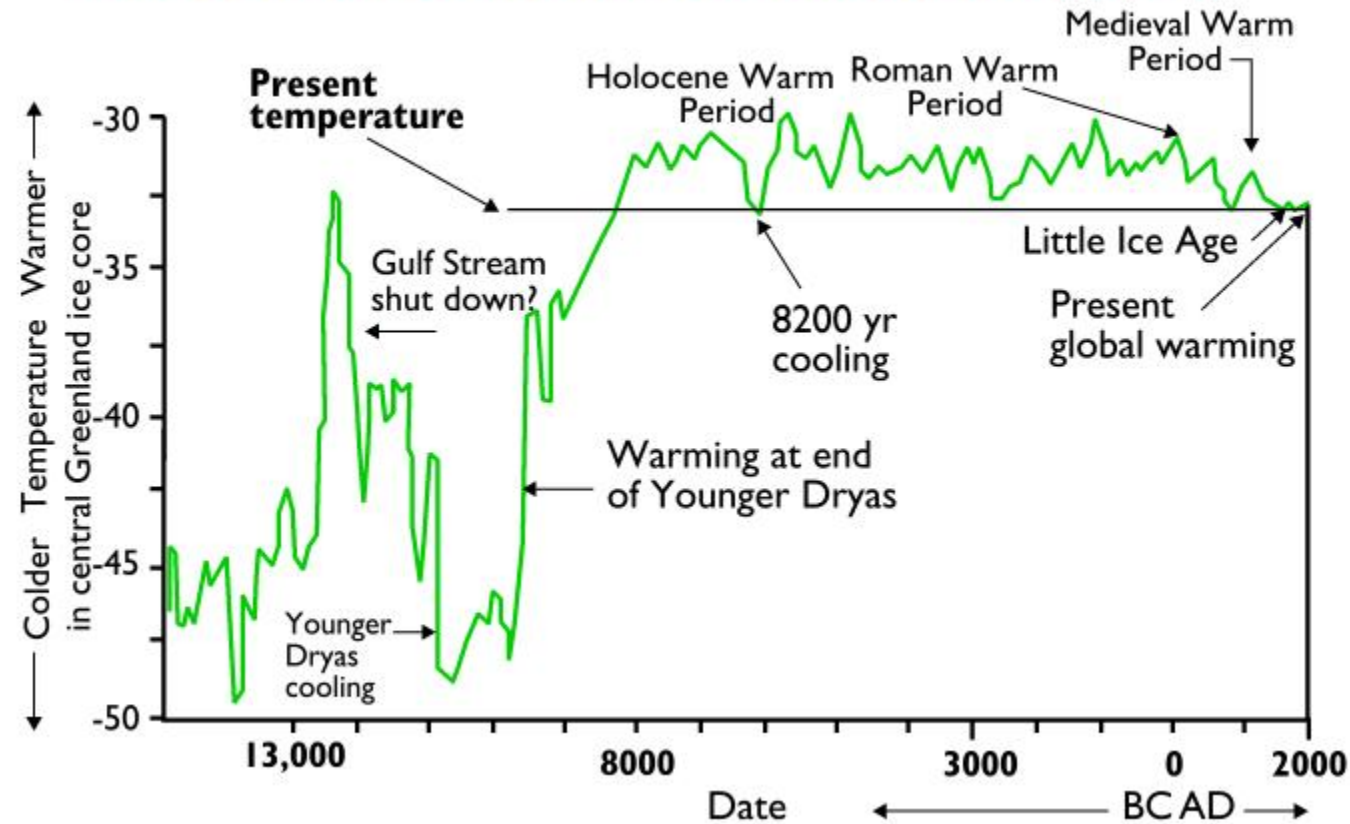
- organic
- agglutinated
- calcareous



Proxy – indirect source of information



TEMPERATURE CURVE LAST FIFTEEN THOUSAND YEARS

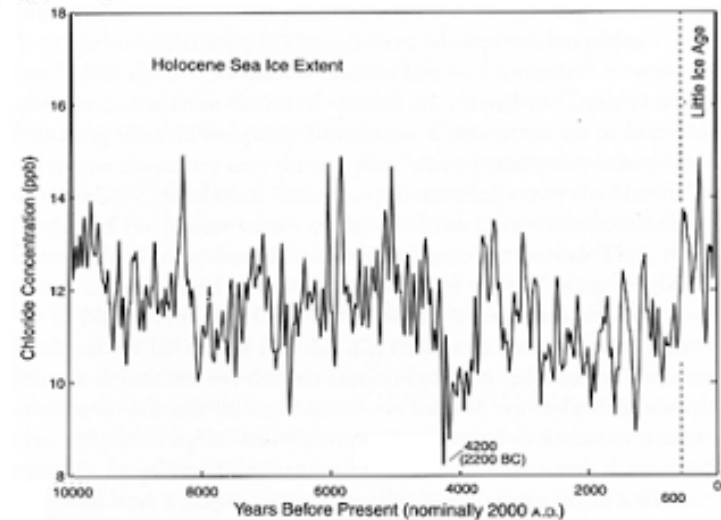


Why Holocene?

Gradual decrease of sea ice extent in the Arctic Ocean and the glaciers on land since ~ 11.5 ky BP.

Consequences for:

- terrigenous input
- exchange of heat and moisture between ocean and land
- thermohaline circulation and deep water formation



Global climatic forcing of deep-sea benthic foraminiferal test size during the past 120 m.y.

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- Test size of a largest specimen as a representative of test size
- The median of the test size depends on number and size of juveniles.
- Fluctuations in size corresponded to changes in global climate.

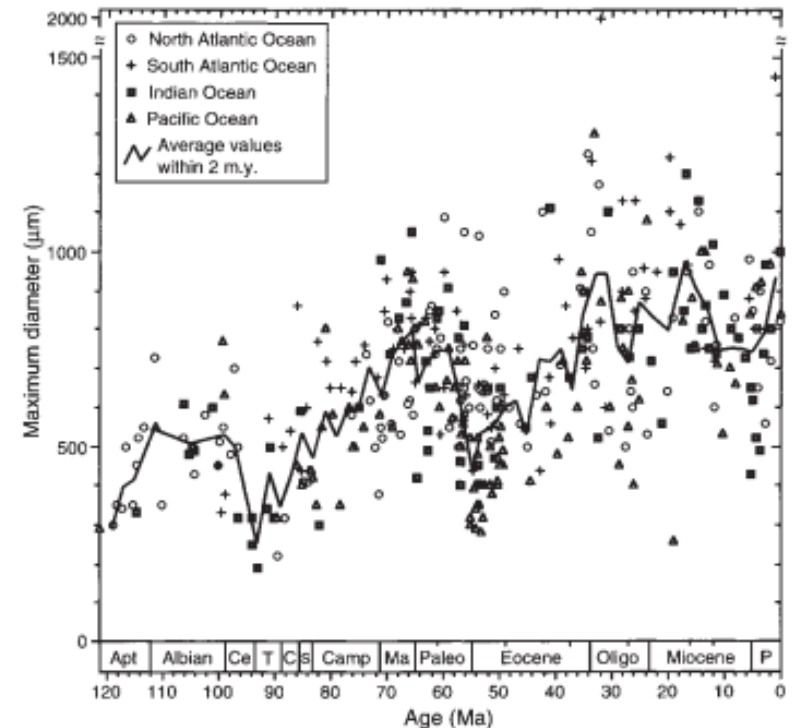


Figure 2. Stratigraphic distribution of maximum diameter of largest specimens among deep-sea calcareous trochospiral benthic foraminifera in each sample during past 120 m.y. Largest specimens in each sample belong to 16 genera such as *Cibicidoides*, *Oridorsalis*, *Gyroidinoides*, *Gavelinella*, *Linaresia*, *Nuttallides*, *Nuttallinella*, *Stensioeina*, and *Hanza-waia*. Apt—Aptian, Ce—Cenomanian, T—Turonian, C—Coniacian, S—Santonian, Camp—Campanian, Ma—Maastrichtian, Paleo—Paleocene, Oligo—Oligocene, P—Pliocene.

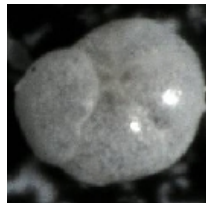
How the size structure of benthic foraminifera community off Spitsbergen responded to climatic and hydrological changes?

Tasks:

1. Assessment of size structure of selected benthic foraminifera species.
2. Assessment of size structure of the whole foraminiferal assemblages.
3. Assessment of Foraminifera test size as a proxy of environmental record.



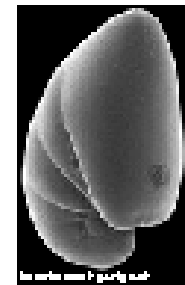
Cibicides lobatulus



Cassidulina reniforme



Elphidium excavatum



Nonionellina labradorica

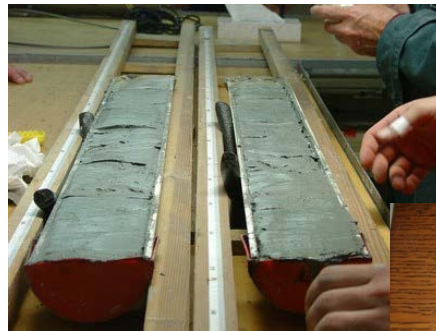
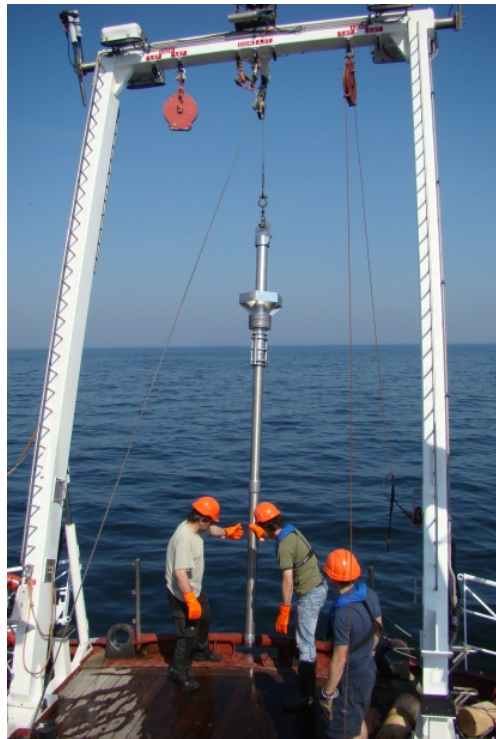
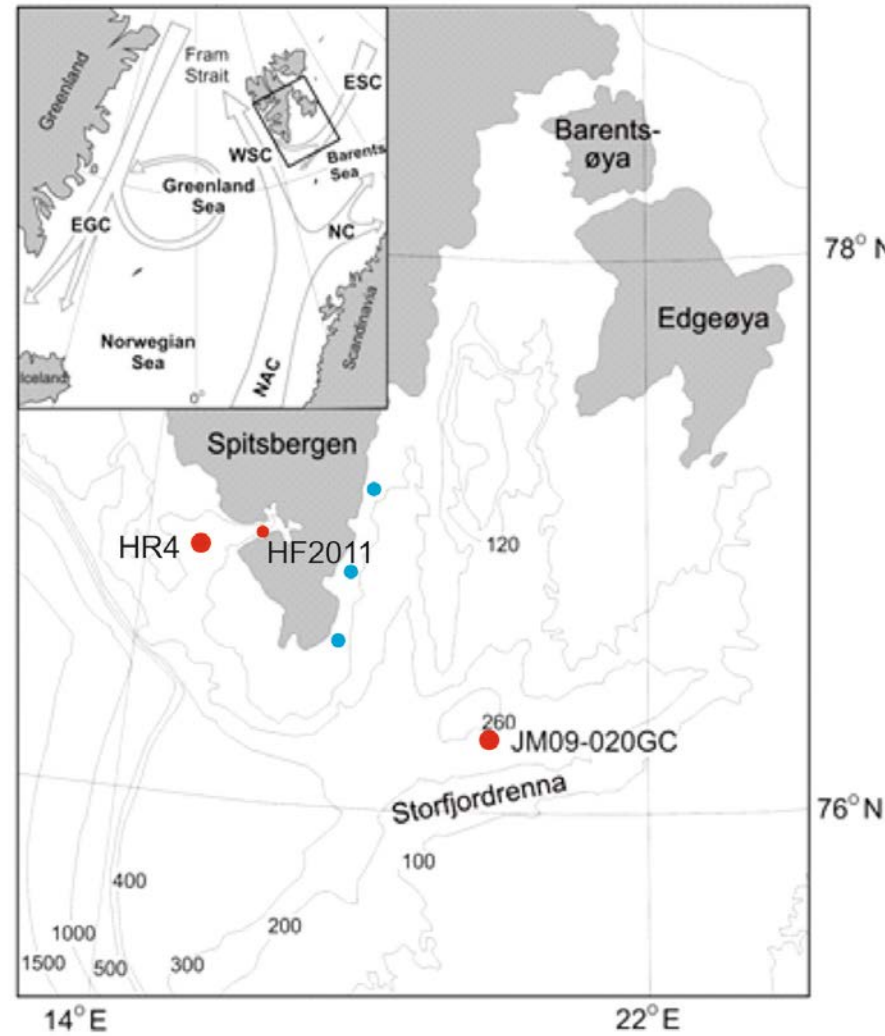
Deliverable:

Manuscript of a paper on size structure of the Svalbard benthic foraminifera as a proxy of environmental variability during the Holocene.

Material:

Two sediment cores spanning the Holocene (~ 12 kyr BP) : variability in foraminiferal test size during the Holocene

One core from inner fjord (~ 1000 yr BP): high resolution sedimentological record of changes in an Arctic glacial fjord



Morphometrics

Variety of shapes – how to compare different species?
Is ontogenesis a key?

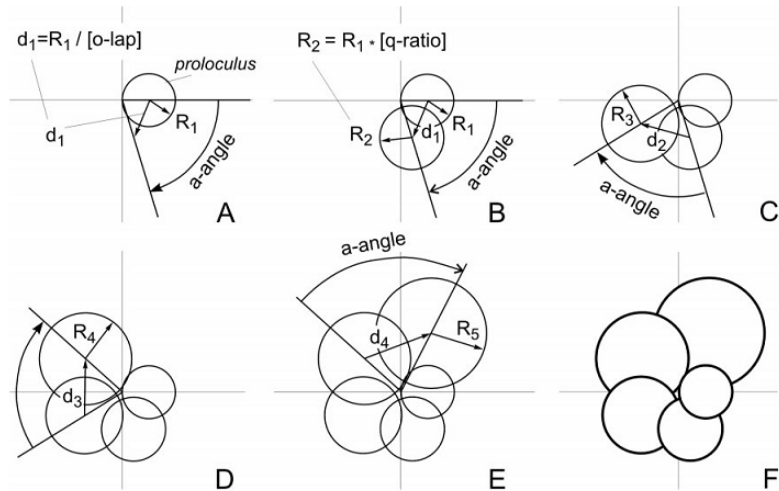
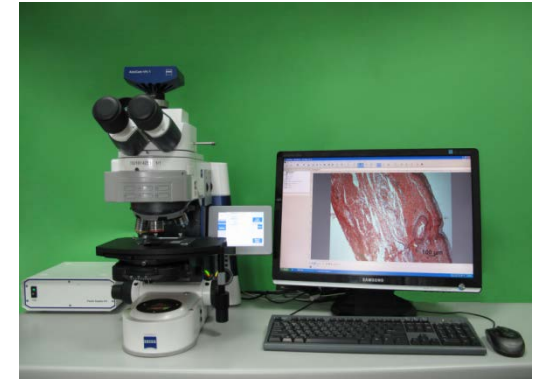


FIGURE 2. Construction of a planispiral foraminiferal shell based on Berger's model (after Berger 1969, modified).

Tyszka & Topa 2005

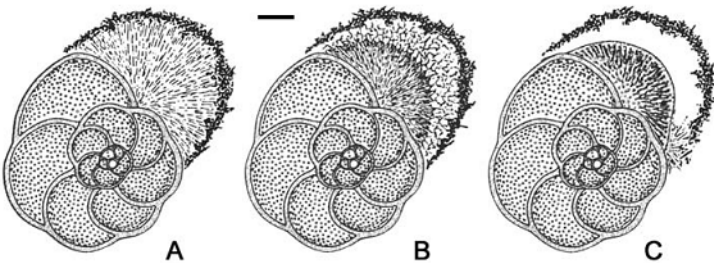
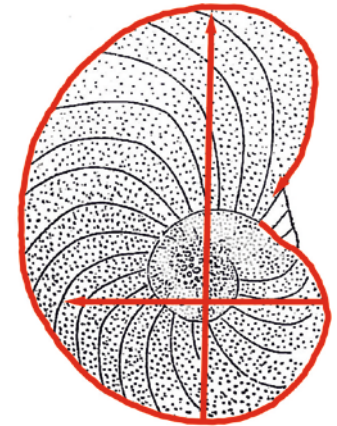


Fig. 3. Formation of a new chamber in *Discorbis bertheloti* (from Grell, 1978, after Le Calvez, 1938, modified). A – fan-shaped rhizopodia spreading from the aperture located on the opposite (umbilical) side; B – retraction of rhizopodia; C – secretion of a new chamber. Scale-bar = 0.5 mm

Tyszka et al. 2005



