Climate and environmental changes during the last 2000 years on Barentsøya and Edgeøya (E-Svalbard)

Wim Hoek[1*], Lineke Woelders[2], Keechy Akkerman[1,3], Tom van Hoof [3], Rikke Møller-Just[1,4], Friederike Wagner-Cremer[1]

[1] Department of Physical Geography, Faculty of Geosciences, Utrecht University, the Netherlands *w.z.hoek@uu.nl

[2] Division of Geology, KU Leuven, Belgium

[3] TNO - Netherlands Organisation for Applied Scientific Research, the Netherlands

[4] Department of Geoscience, Aarhus University, Denmark

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Faculty of Geosciences

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During the SEES.nl expedition in August 2015, a multi-disciplinary team of scientists had the opportunity to collect a range of samples and study a.o. climate, flora, fauna, and human behaviour in E-Svalbard.
Here we present the first results from lake cores from Barentsøya and Edgeøya (E-Svalbard), adding information to the studies so far limited to W-Spitsbergen. Recent *Salix polaris* leaf material collected during landings is used for plant physiological climate reconstructions on fossil leaf material in the records.

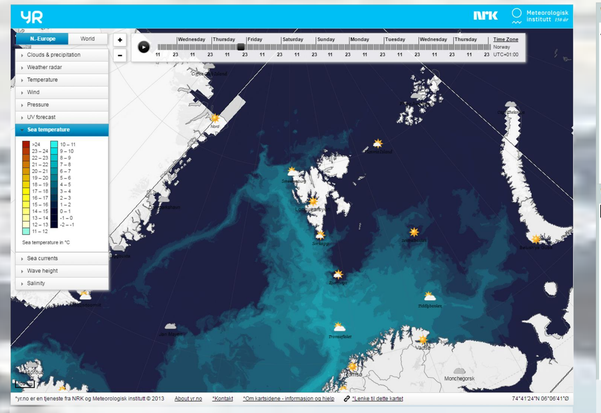

Fig.1: The Spitsbergen Current forms the Polar limb of the N-Atlantic circulation. The relative warm water results in a strong W-E temperature gradient over Svalbard, with average temperature differences over 5°C between Hornsund and N-Edgeøya (A & B in Fig.2 & 3). This area is particularly vulnerable for past and future climate and environmental change.

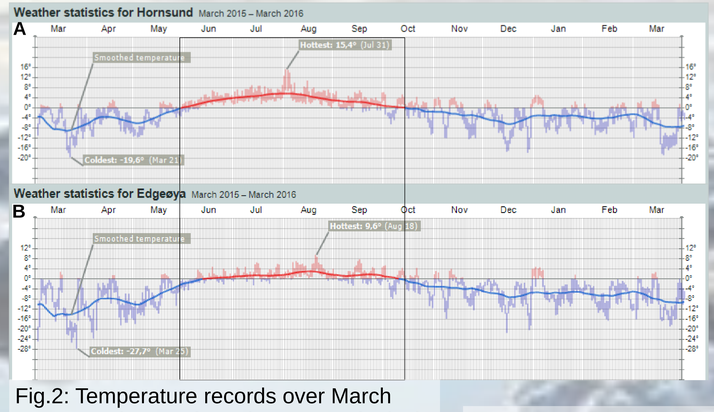

Fig.2: Temperature records over March 2015-March 2016 from the meteorological stations Hornsund (A) and N-Edgeøya (B). Note that not only the average values, but also T_{max} and T_{min} differ with several degrees, leading to a considerably shorter growing season on Edgeøya.
Source: www.yr.no/place/Norway/Svalbard/

Fig.3: Svalbard with meteorological stations, lake core locations, and landing spots of the SEES expedition where recent *Salix polaris* leaf material has been collected. These leaves, in combination with meteorological data will be used to build a calibration dataset for growing season changes.

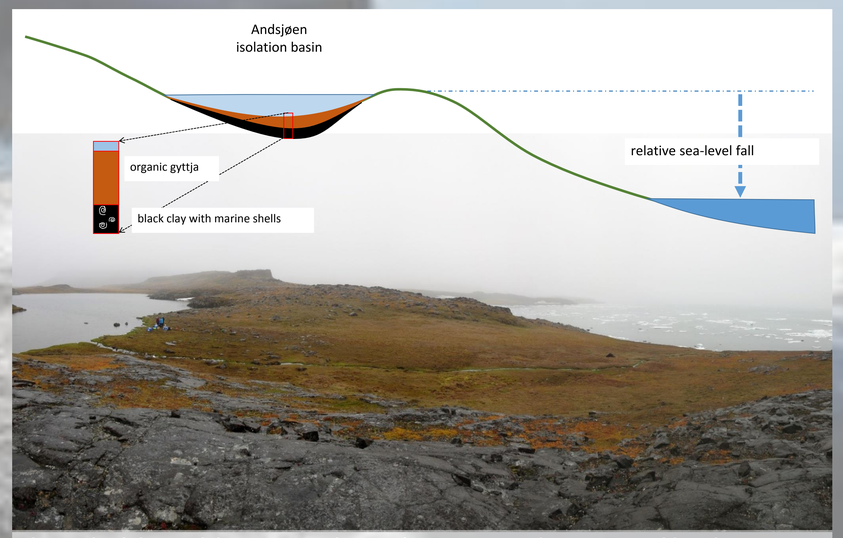

Fig.4: The lake Andsjøen at Sundneset (S-Barentsøya) at +15m asl has been formed in intrusive dolorites and became disconnected from the sea due to isostatic uplift since deglaciation. Based on a relative sea-level reconstruction using ^{14}C-dated driftwood in coastal terraces in this region (Bondevik *et al.,* 1995: Polar Research), we estimate that the isolation took place some 2500-3000 yrs ago.

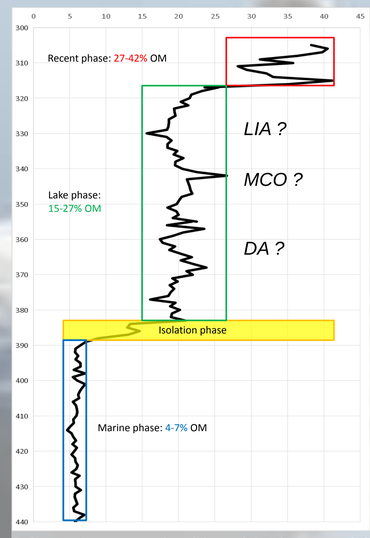

Fig.5: Loss-on-ignition (LOI) record from the core at Sundneset. The core had been taken in the deepest part of the lake with a water depth of 300 cm. The upper part of the organic lake deposits shows higher values of organic matter, related to an increase of *Pediastrum* algae as evidenced by the first palynological analyses, probably related to recent climate change.

Several proxies will be used for palaeo-environmental and palaeo-climatological reconstructions, providing a unique record of climate change over at least the last 2000 years. Chronology will be based on ^{210}Pb dating, AMS-^{14}C dating on *Salix* leaf fragments in combination with tephrochronology.
The LOI results hint towards a Little Ice Age, Medieval Climate Optimum and Dark Ages climate signal.

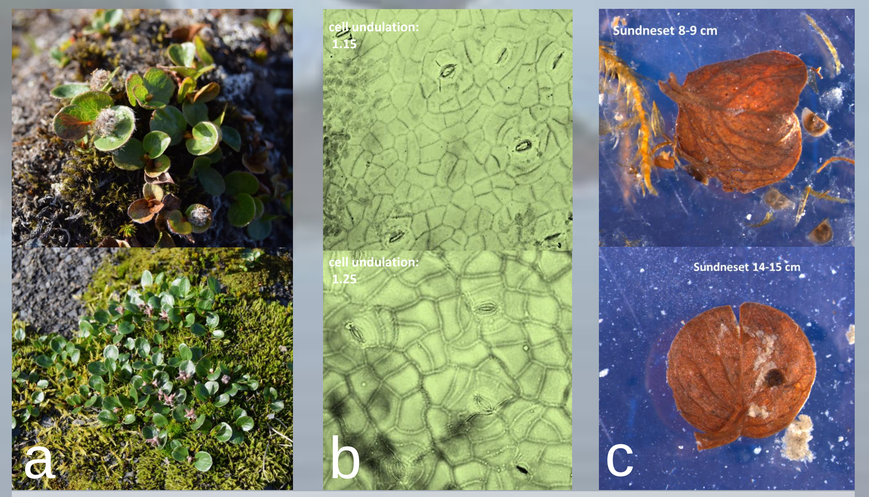

Fig.6 a: *Salix polaris* is the only “tree” species in E-Svalbard, only a few cm tall.
b: Microscope images of the cuticle layer of collected *Salix polaris* leaves from N-Barentsøya (above) and S-Spitsbergen (below), showing a clear difference in cell size, most likely linked to a difference in growing season.
c: Fossil leaf material, which is abundantl and well preserved throughout the lake sediment core from Sundneset.