



Universiteit Utrecht

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

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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. We present here the first results from the lake cores we took on Barentsøya and Edgeøya, in combination with recent *Salix polaris* leaf material collected during landings, to allow for plant physiological climate reconstructions on fossil leaf material.

In W-Spitsbergen several lake cores have been studied before (\* Birks et al., 2004). On Edgeøya and Barentsøya, no lake sediments have been investigated until now. Several proxies will be used for palaeo-environmental and palaeo-climatological reconstructions, providing a unique record of climate change over the last 2000 years. Chronology will be based on <sup>210</sup>Pb dating, AMS-<sup>14</sup>C dating on *Salix* leaf fragments in combination with tephrochronology.

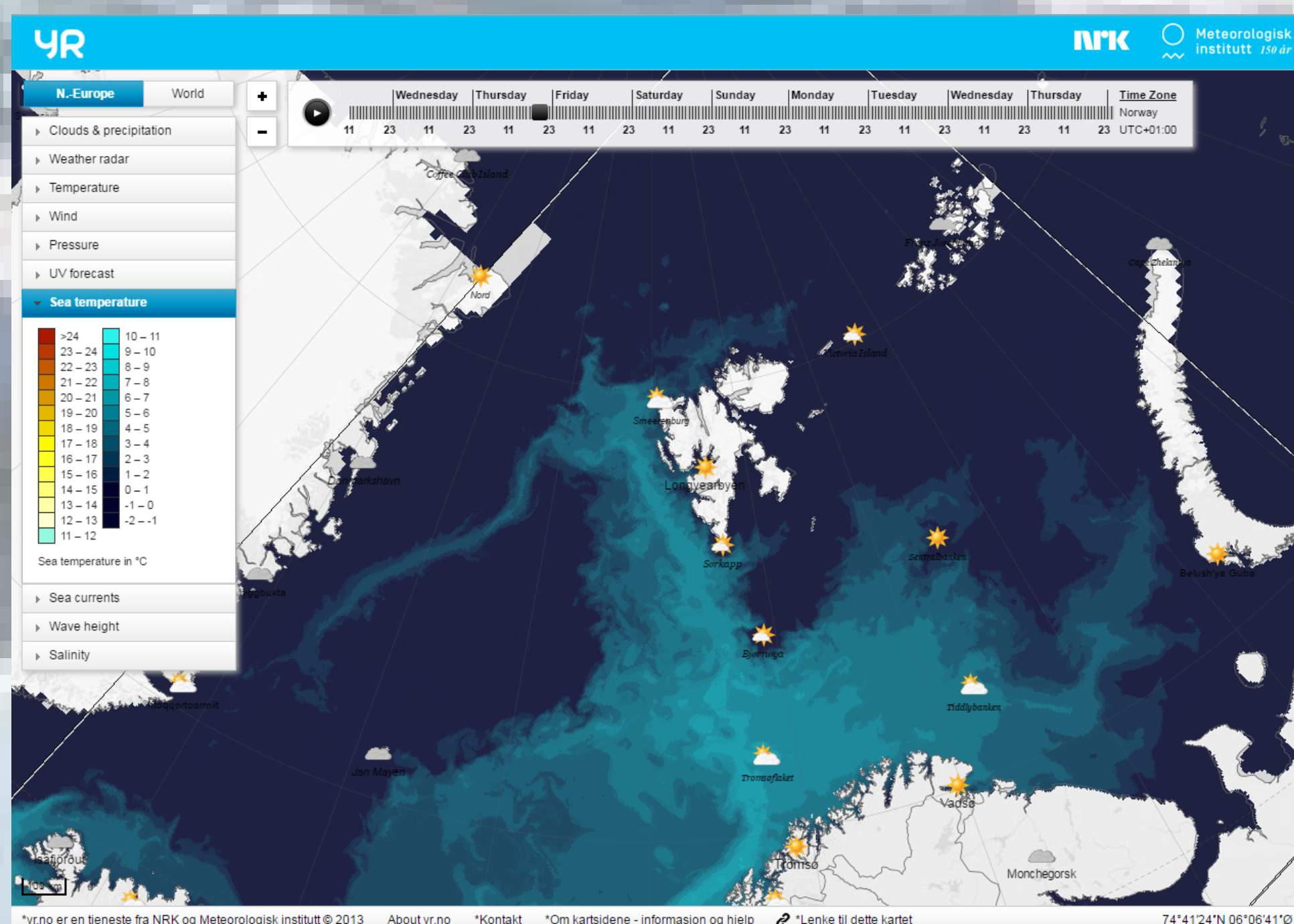


Fig.1: The Spitsbergen Current forms the Polar limb of the N-Atlantic circulation. The relative warm water results in a strong W-E temperature gradient over Svalbard, with average temperature differences over 5°C between Hornsund and N-Edgeøya (A & B in Fig.2 & 3). This area is particularly vulnerable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

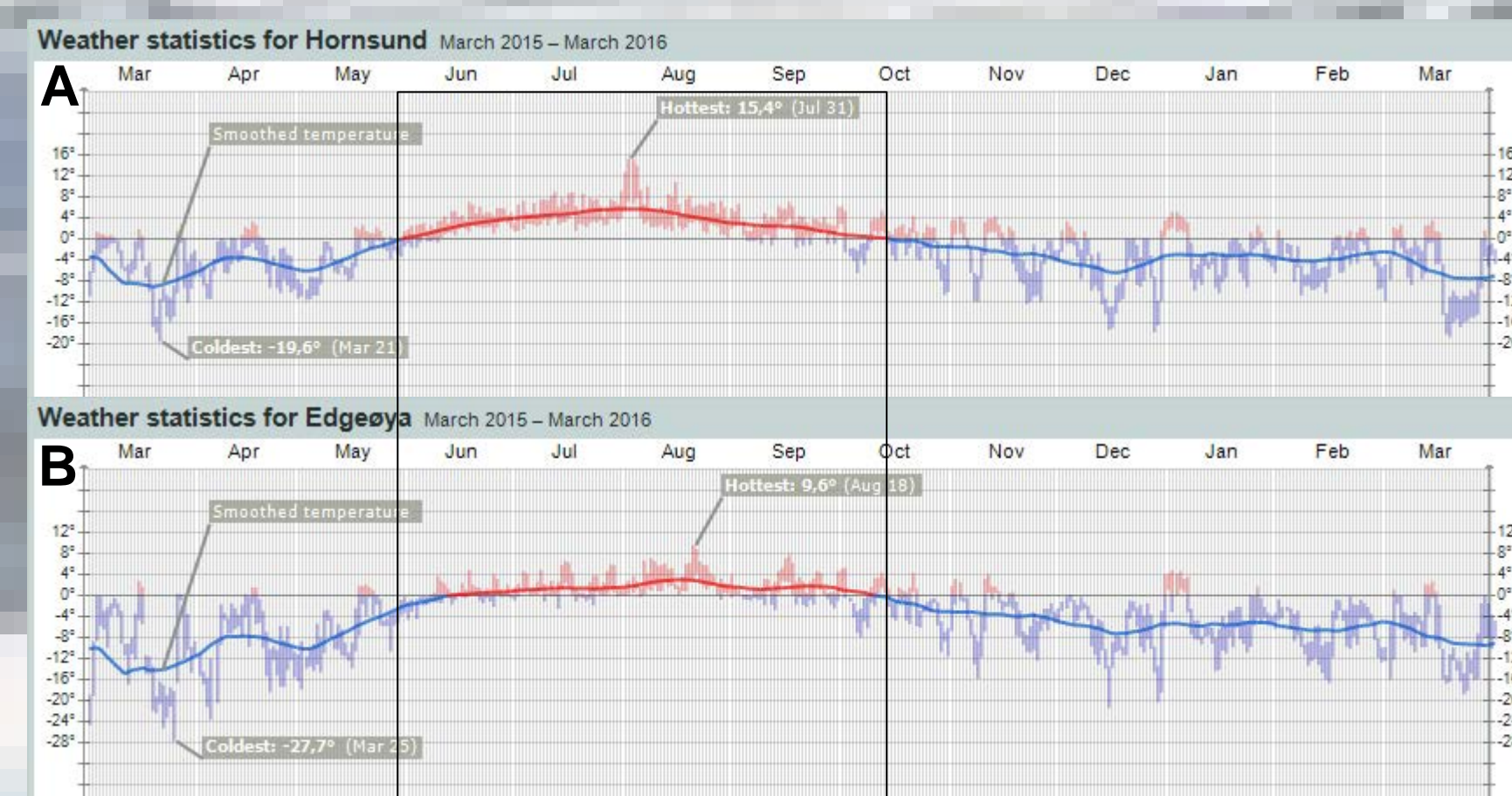


Fig.2: Temperature records over the last year from the meteorological stations Hornsund (A) and N-Edgeøya (B). Note that not only the average values, but also T<sub>max</sub> and T<sub>min</sub> differ with several degrees, leading to a considerably shorter growing season on Edgeøya.

Source: [www.yr.no/place/Norway/Svalbard/](http://www.yr.no/place/Norway/Svalbard/)

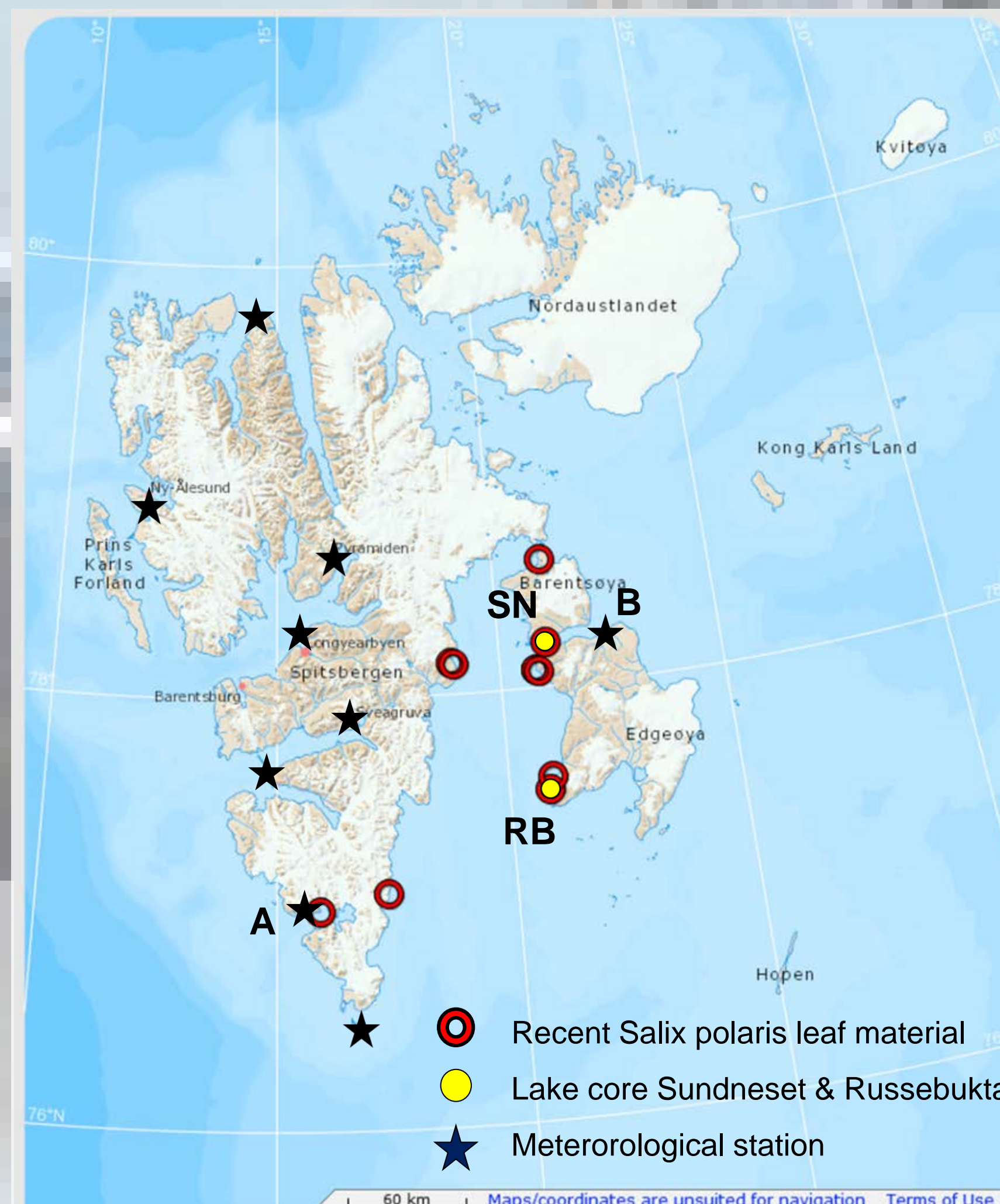


Fig.3: the Svalbard Archipelago with meteorological stations, lake core locations, and landing spots of the SEES expedition where recent *Salix polaris* leaf material has been collected. The recent leaf material, in combination with the meteorological data will be used to build a calibration dataset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

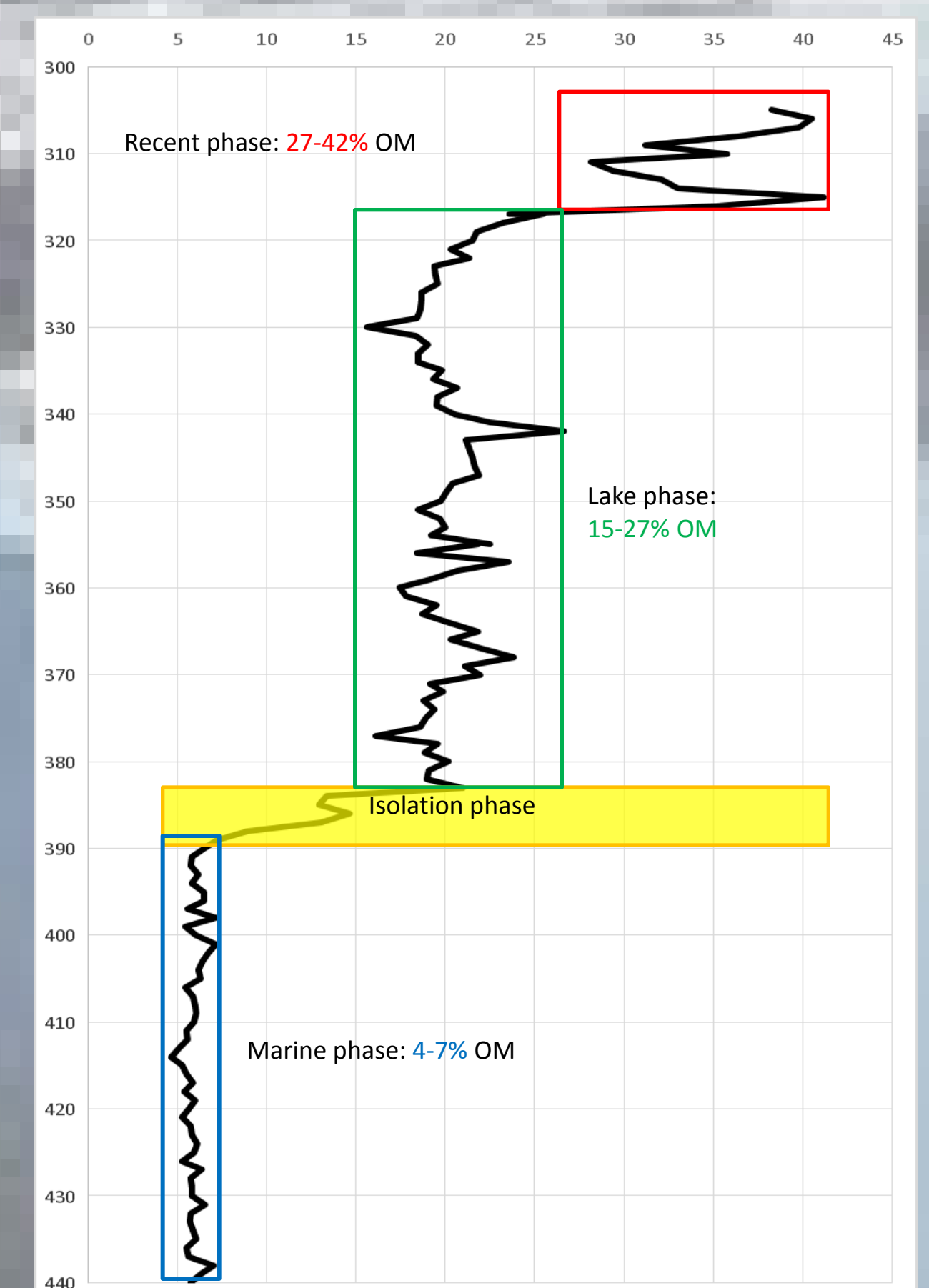


Fig.5: Loss on ignition record from the core at Sundneset. The core had been taken in the deepest part of the lake with a water depth of 300 cm. The upper part of the organic lake deposits shows higher values of organic matter, related to an increase of *Pediastrum* algae as evidenced by the first palynological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

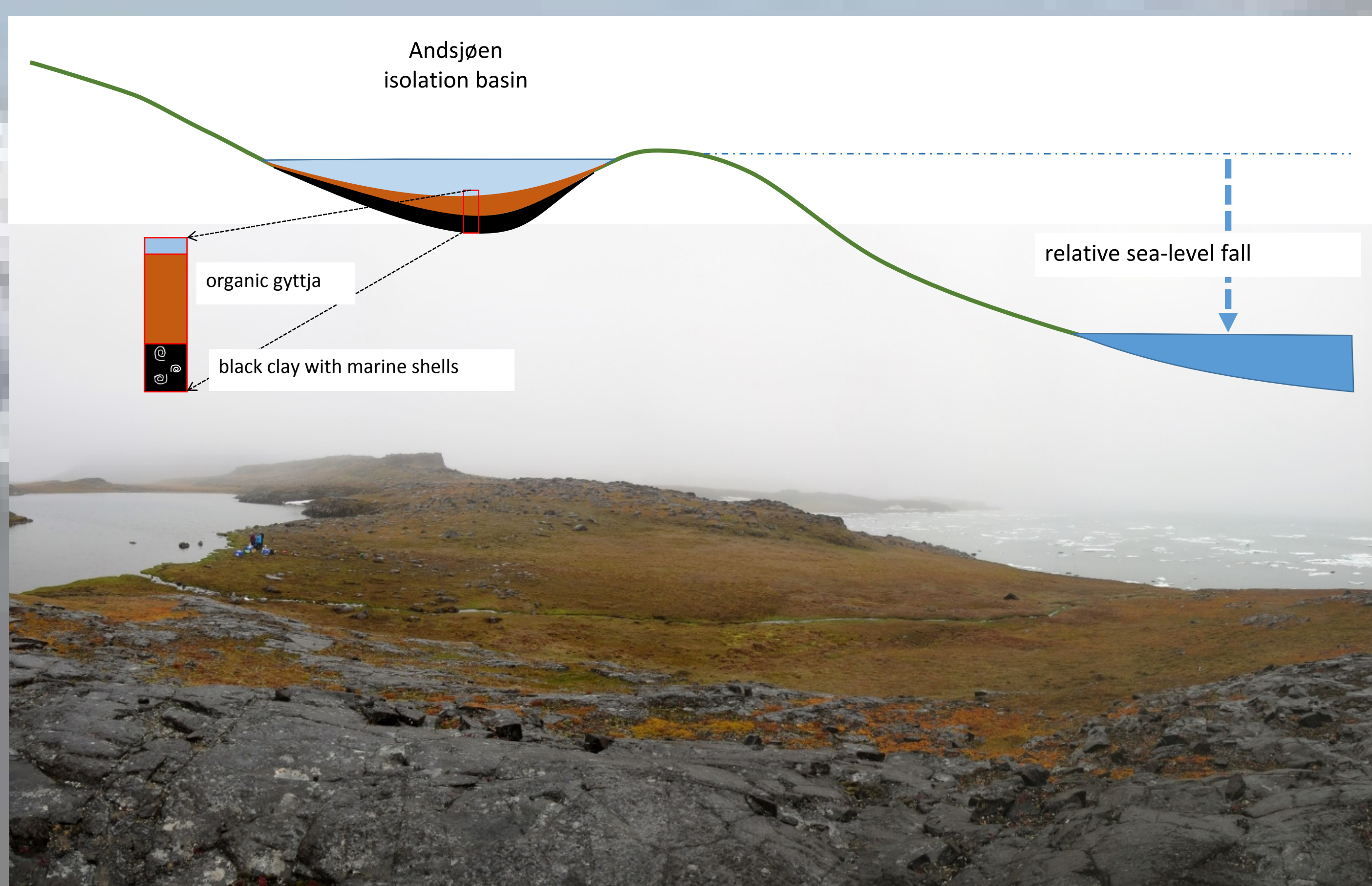


Fig.4: The lake Andsjøen at Sundneset (S-Barentsøya) at +15m asl has been formed in intrusive dolorites and became disconnected from the sea due to isostatic uplift since deglaciation. Based on a relative sea-level reconstruction using <sup>14</sup>C-dated driftwood in coastal terraces in this region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

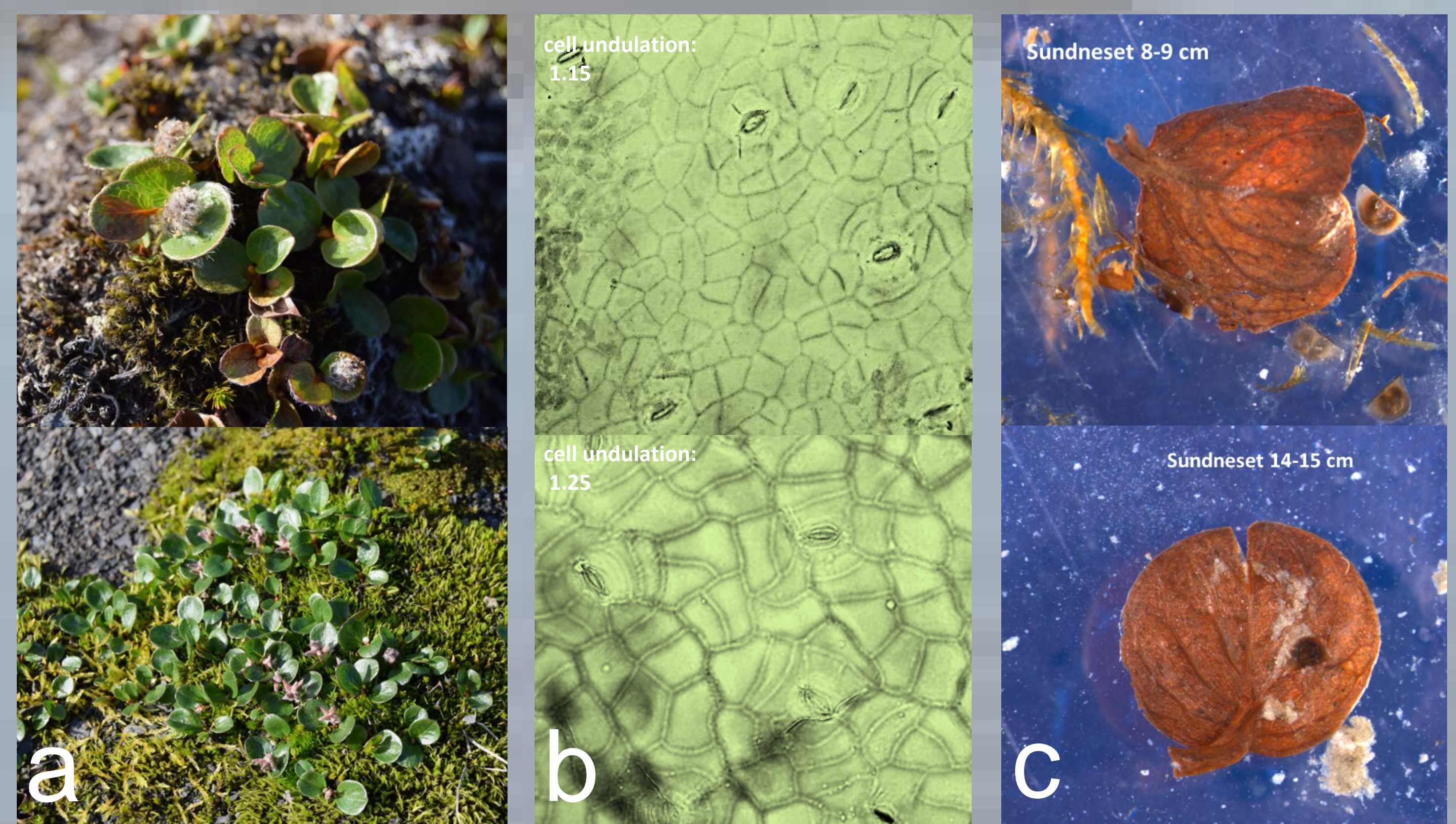


Fig.6 a: *Salix polaris* is the only "tree" species in E-Svalbard, only 5cm high.

b: Fluorescence 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 undulation, most likely linked to a difference in growing season.

c: fossil leaf material, which is abundantly present throughout the lake sediment core from Sundneset.

\* Birks et al. 2004: Recent environmental change and atmospheric contamination on Svalbard as recorded in lake sediments – synthesis and general conclusions. Journal of Paleolimnology 31, 531-546.

\* Bondevik et al. 1995: Postglacial sea-level history of Edgeøya and Barentsøya, eastern Svalbard. Polar Research 14(2), 153-180.

