



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.

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

Wim Hoek^{1*}, Lineke Woelders², Keechy Akkerman^{1,3}, Tom van Hoof³, Rikke Møller-Just^{1,4}, Friederike Wagner-Cremer¹

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

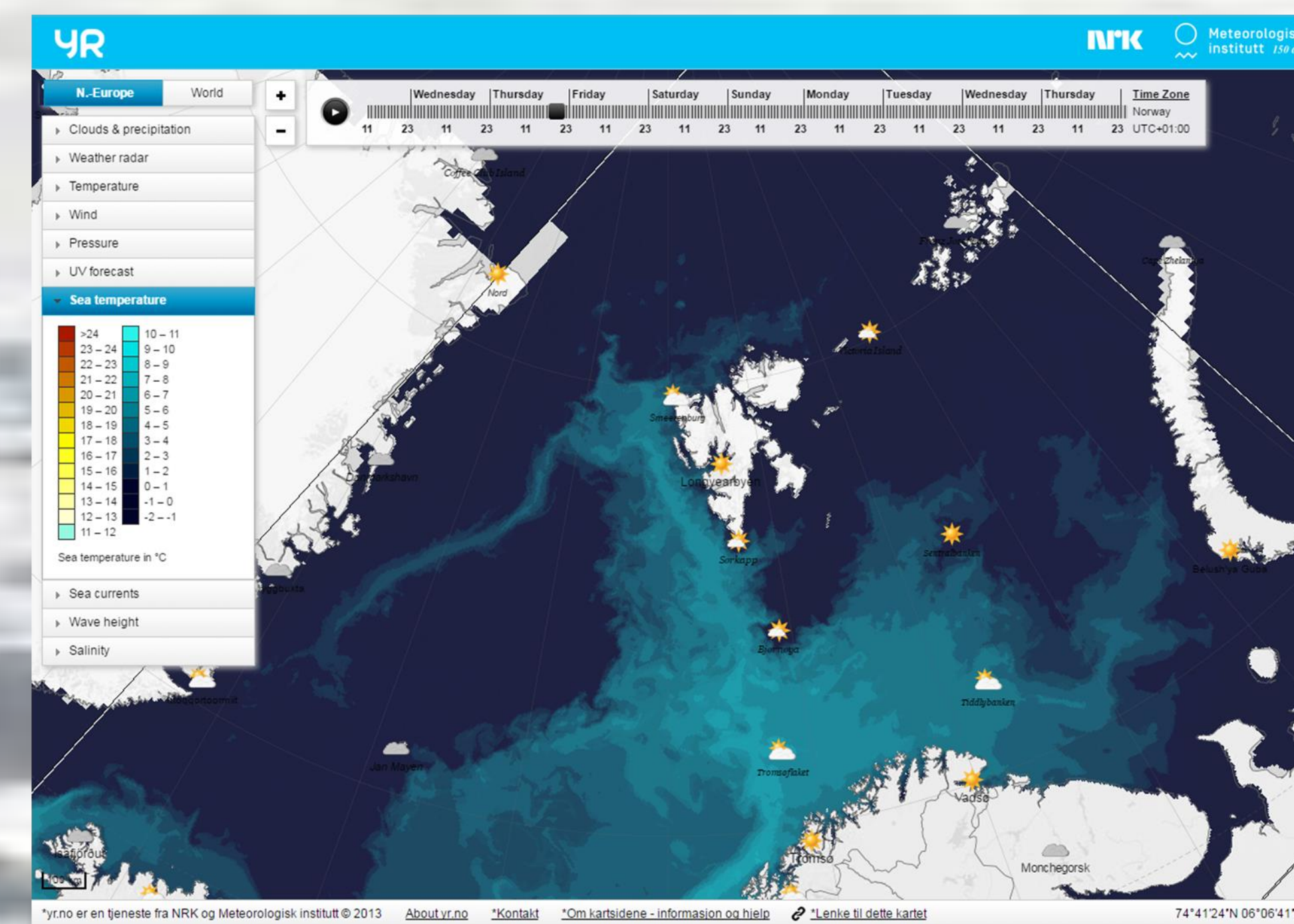


Fig.1: The Spitsbergen Current forms the Polar limb of the N-Atlantic circulation. The relative warm water results in a strong W-E temperature gradient over Svalbard, with average temperature differences over 5°C between Hornsund and N-Edgeøya (A & B in Fig.2 & 3). This area is particularly vulnerable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

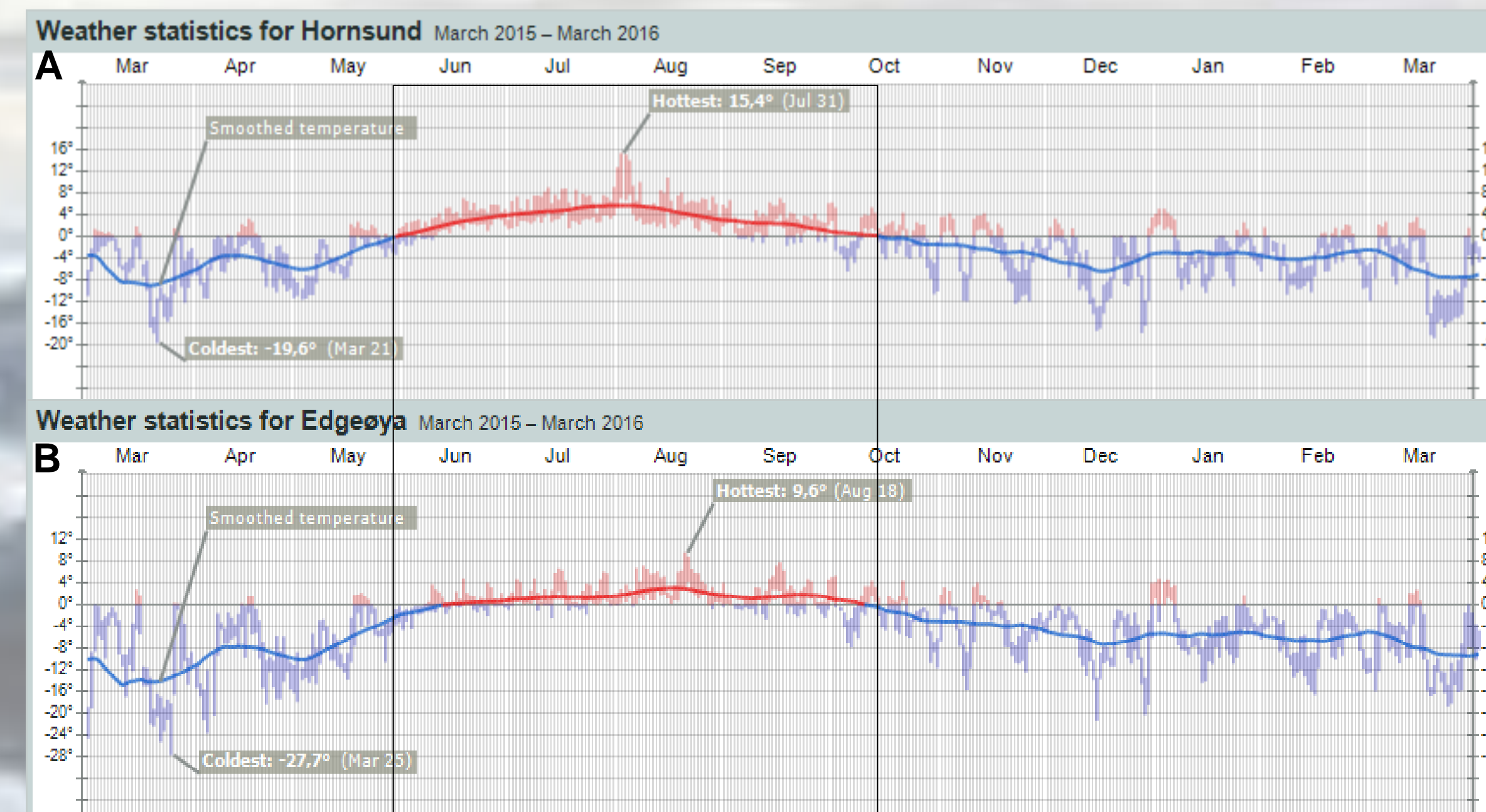


Fig.2: Temperature records over March 2015-March 2016 from the meteorological stations Hornsund (A) and N-Edgeøya (B). Note that not only the average values, but also T_{max} and T_{min} differ with several degrees, leading to a considerably shorter growing season on Edgeøya. Source: www.yr.no/place/Norway/Svalbard/

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.

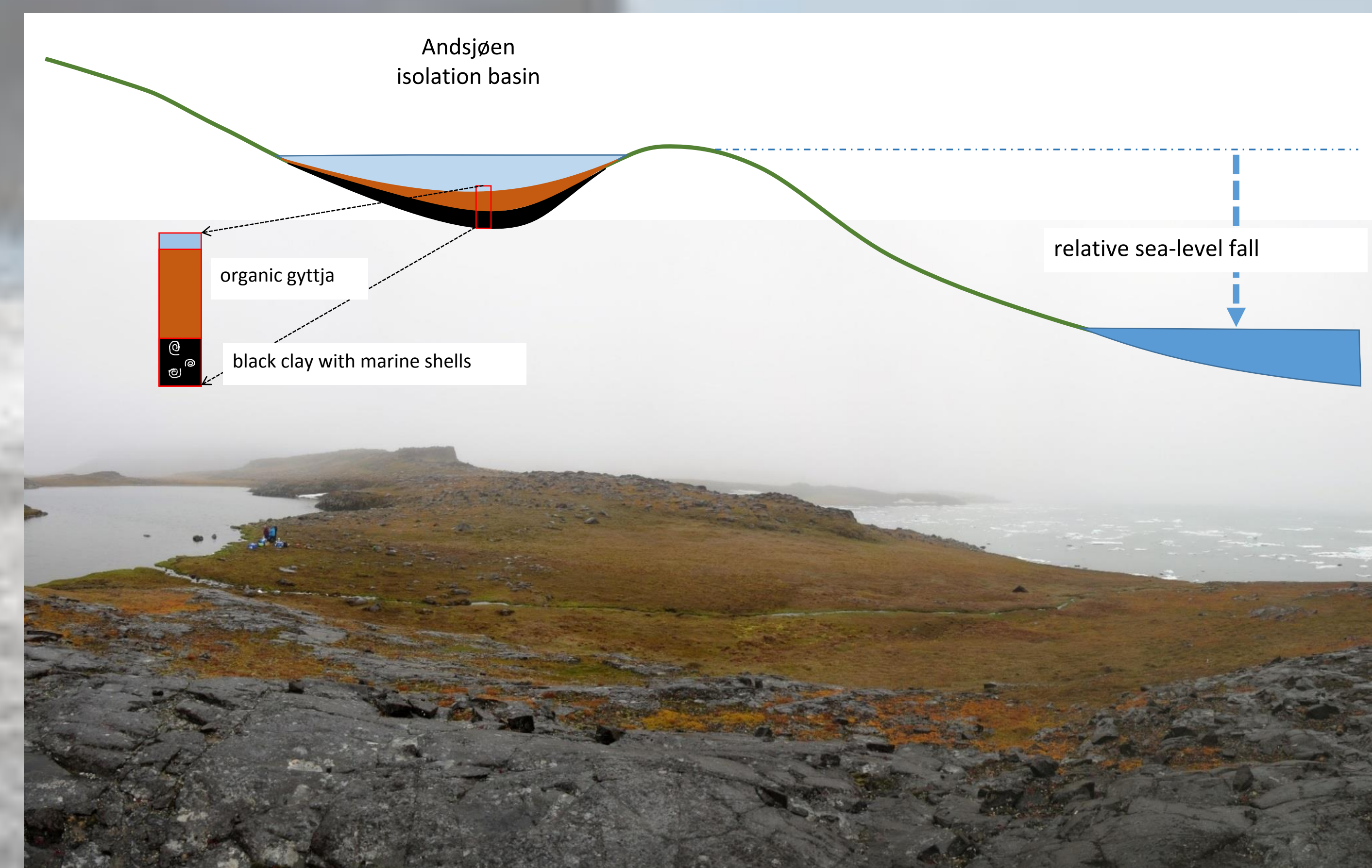
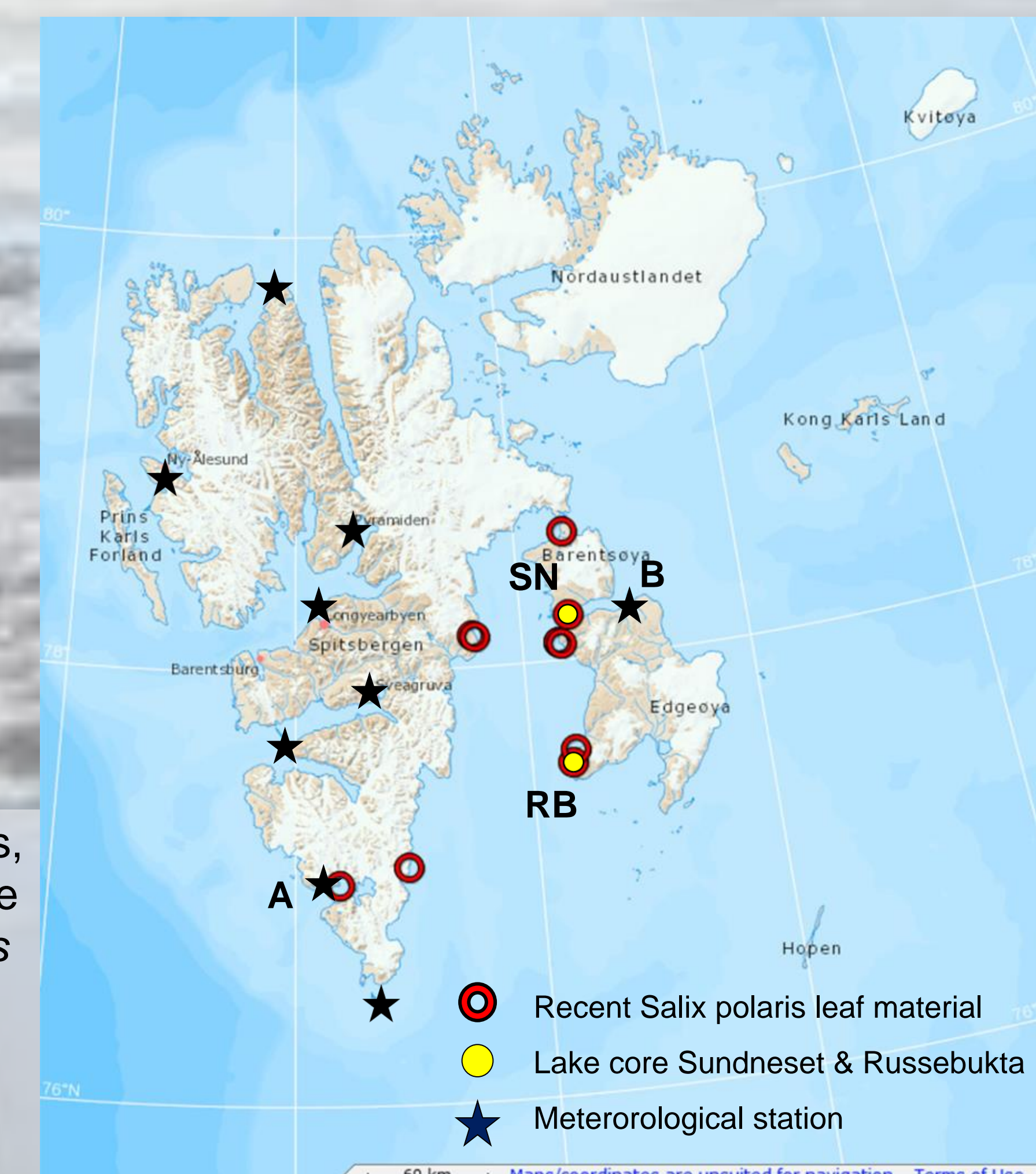


Fig.4: The lake Andsjøen at Sundneset (S-Barentsøya) at +15m asl has been formed in intrusive dolorites and became disconnected from the sea due to isostatic uplift since deglaciation. Based on a relative sea-level reconstruction using ^{14}C -dated driftwood in coastal terraces in this region (Bondevik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

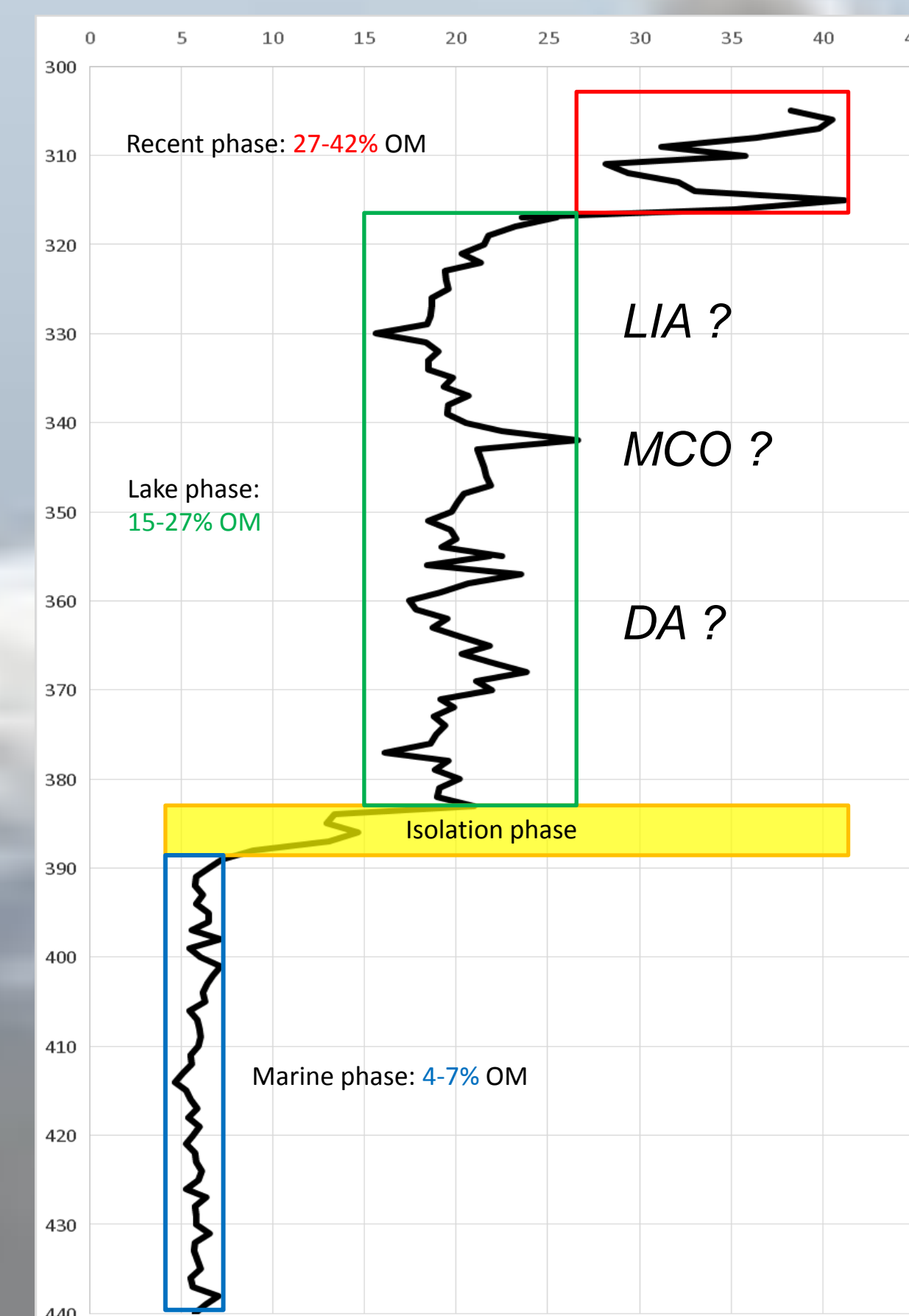


Fig.5: Loss-on-ignition (LOI) record from the core at Sundneset. The core had been taken in the deepest part of the lake with a water depth of 300 cm. The upper part of the organic lake deposits shows higher values of organic matter, related to an increase of *Pediastrum* algae as evidenced by the first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

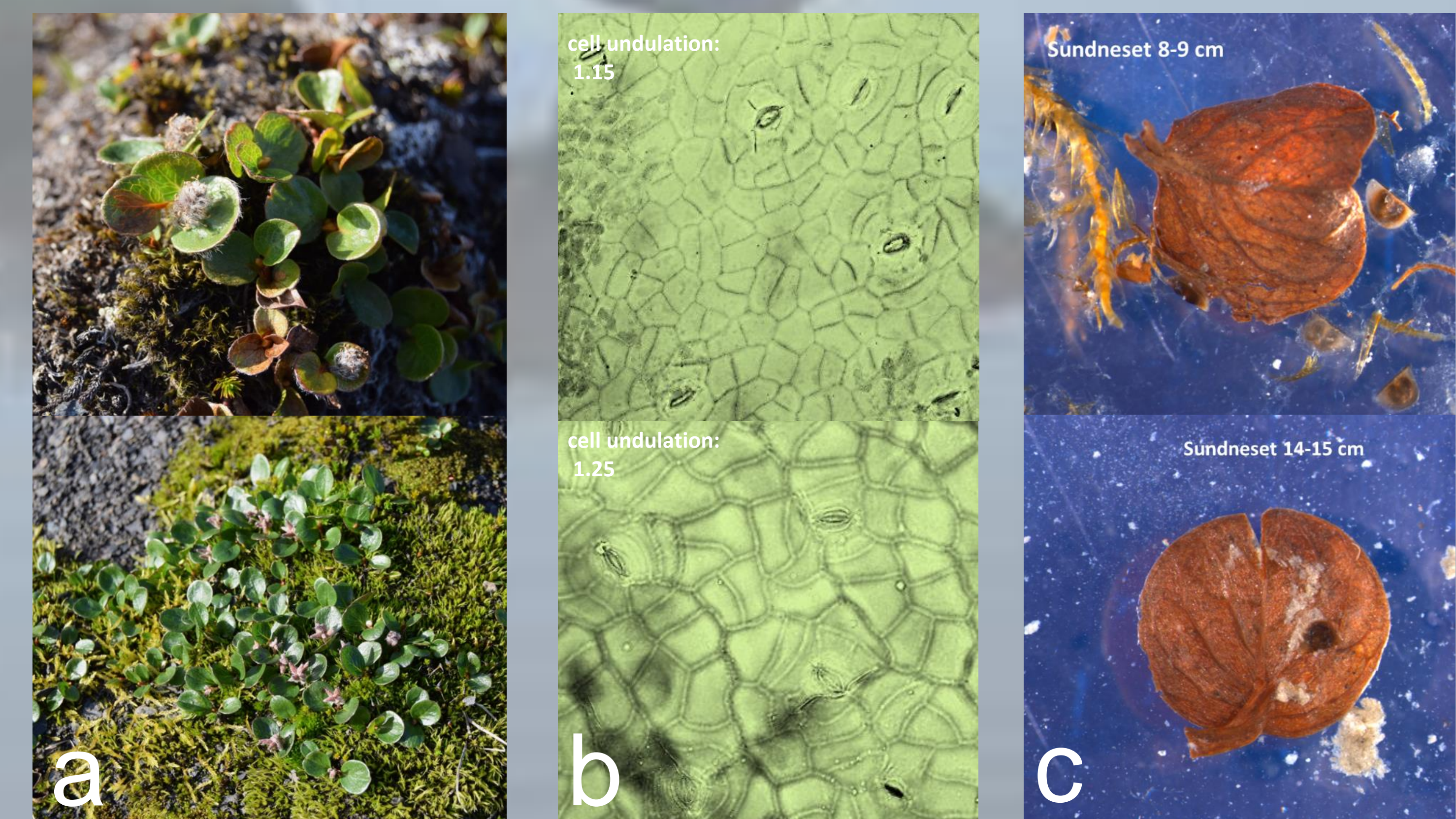


Fig.6 a: *Salix polaris* is the only "tree" species in E-Svalbard, only a few cm tall. b: Microscope images of the cuticle layer of collected *Salix polaris* leaves from N-Barentsøya (above) and S-Spitsbergen (below), showing a clear difference in cell size, most likely linked to a difference in growing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

