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A 115 year high-resolution ice core record from Severnaya Zemlya, Central Russian Arctic

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Ice cores are one of the best archives for climate and environmental changes. A new 724 m deep ice core was drilled on Akademii Nauk ice cap (Severnaya Zemlya) between 1999 and 2001 to gain high resolution proxy data from the Central Russian Arctic. Akademii Nauk ice cap is affected by summerly melting and infiltration processes, resulting in alteration of the original isotopic and chemical signals.

For the first time high resolution measurements of stable water isotopes (δ^{18}O, δD), density, electrical conductivity and major ions were carried out on an ice core from the Central Russian Arctic. Here we present these data from the uppermost 57 m. Dating this section by counting annual isotopic cycles and identifying volcanic horizons yielded an age of about 115 years in nearly annual resolution.

The following results indicate that our ice core is one of the best climate and environmental archives of the Eurasian Arctic.

Despite modifications through infiltrated melt water the δ^{18}O values reflect Arctic surface air temperature variations. We found some strong correlations between the isotope data and meteorological data from the Eurasian (Sub-) Arctic, especially from the western part (e.g. from Vardø/Northern Norway), indicating a strong Atlantic influence on the Central Russian Arctic climate.

The δ^{18}O values show pronounced temperature changes since the end of the Little Ice Age with a strong temperature increase after 1900 to an absolute temperature maximum in the 1930ies. This increase is also visible in the melt layer content, whereas the δ^{18}O deduced temperature increase since 1980 is not. This indicates that this warming take place especially in the non-summer seasons.

The Deuterium excess signal shows similarities with both the Northern Hemisphere temperature and the Kara Sea sea ice extent anomalies. Also the δ^{18}O data show similarities with the latter.

The anthropogenic influence on the Central Russian Arctic is visible in the increased levels of both sulphate and nitrate, with highest concentration from the 1960ies to the 1980ies. The sea salt aerosols reflected by sodium and chloride shows decreasing trends in the 20^{th} century.