# A new Holocene ice core record from Academy of Sciences ice cap, Severnaya Zemlya?


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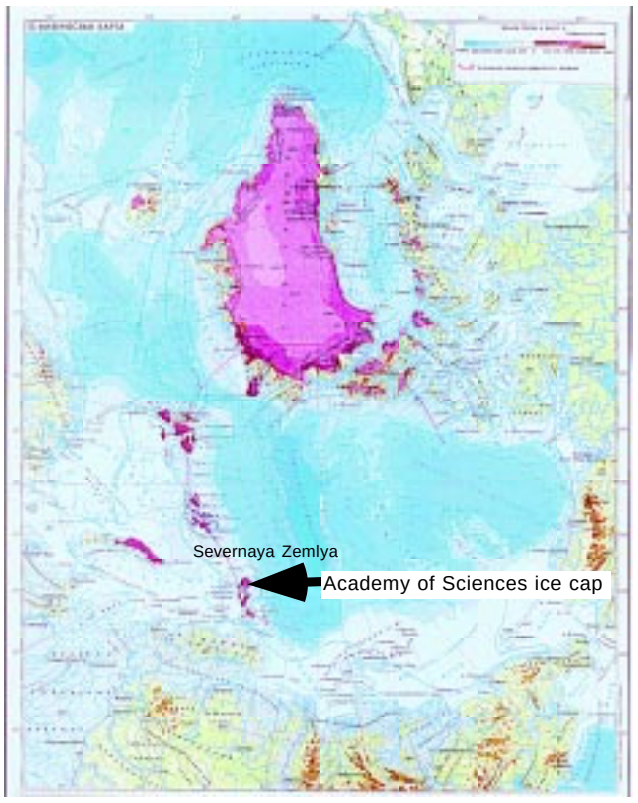
## Drilling site

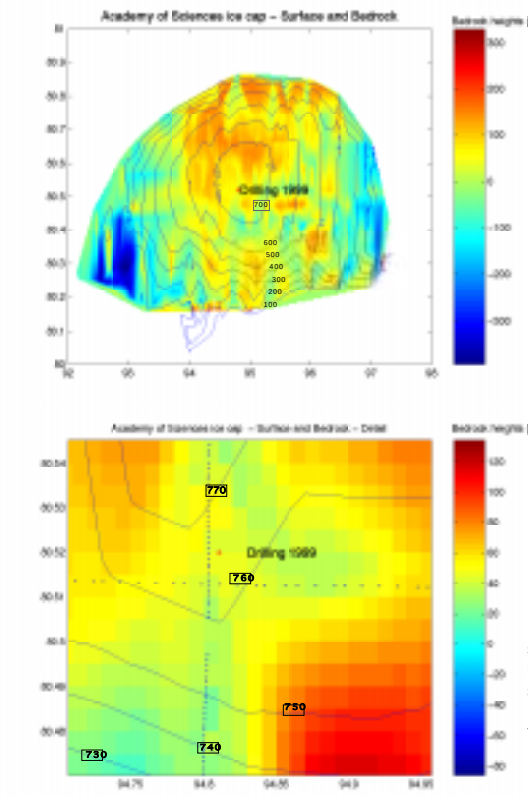



The possibility of using ice cores for past climatic reconstruction is well known from Greenland and Antarctica, but only one half of the Arctic region has ice caps.

The archipelago of Severnaya Zemlya is the most eastern Eurasian area covered by considerable ice caps. The Academy of Sciences ice cap (Komsomolets Island) was chosen for a new deep ice core drilling because it is the thickest and coldest one on Severnaya Zemlya. The island was continuously glaciated through the whole Holocene. Ice-core proxies from Academy of Sciencies ice cap represent the time period back to the Younger Dryas (KLEMENTEV ET.AL, 1991). The new core should be drilled to get past climate information with very high resolution.

**Ice covers are shown in pink colour in the map on the left.**

**Map:**
World Atlas of snow and ice Resources,
Russian Academy of Sciences, Moscow 1997, p.55



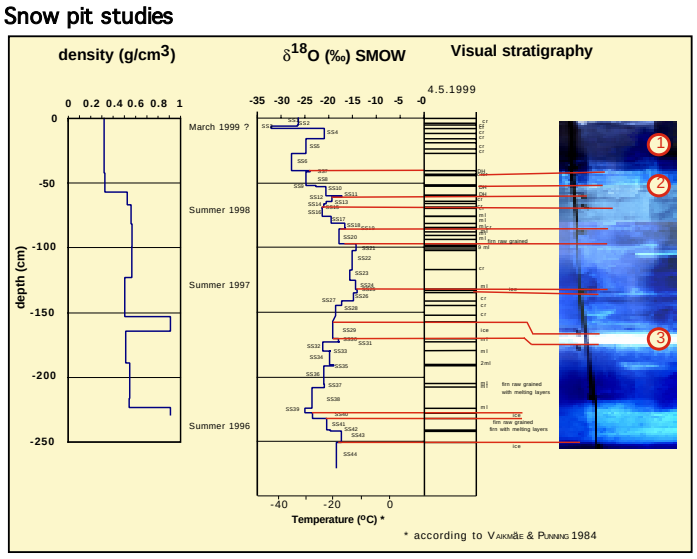

In 1997 J.A. DOWDESWELL carried out a programme of airborne radio-echo sounding (100 MHz) of the ice caps on Severnaya Zemlya. His database was used to find a suitable drilling site on Academy of Sciences ice cap with flat subglacial topography and low ice flow velocity.

The drilling place chosen has the coordinates 80.52N 94.81 E.

**Database:**
Ice thickness: DOWDESWELL, 1999
Surface topography: map GUGK, 1991

## First results

### Snow pit studies




The Glacier is characterized by large melting events in summer producing infiltration layers. Snow of the winter 1998/99 is accumulated in the upper 60 cm (**layer 1**). It is a homogeneous density. Its $^{18}O$ values have a large dynamic range of nearly 15‰ probably caused by single events of precipitation. Depth hoar is well known from Central Greenland characterizing the late summer. It occurred on Academy of Sciences ice cap in 1998 (**layer 2**).
In deeper horizons mixing of infiltrating summer melting water with firn is smoothing the isotope signal. Ice lenses and layers occur in an inhomogeneous pattern. Ice layers of more than 10 cm could be observed (**layer 3**).

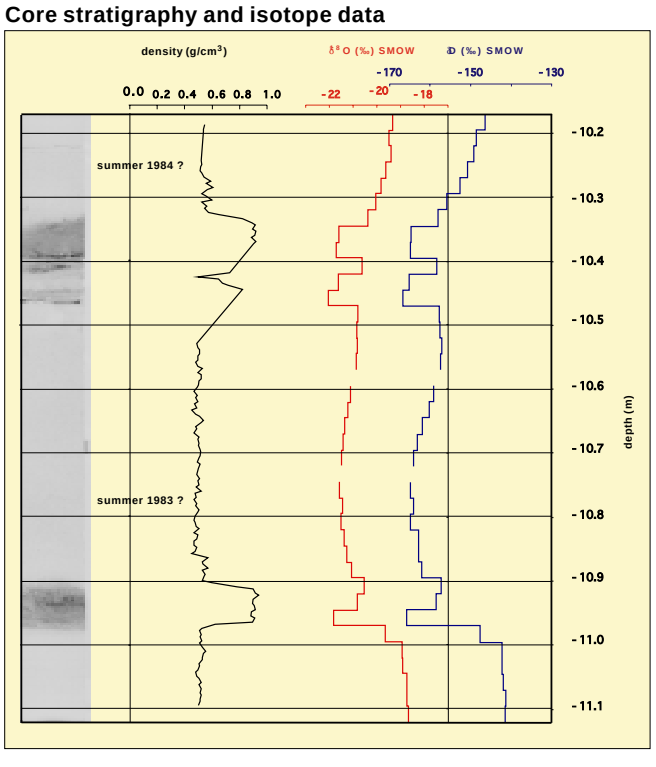
## Field activities

Tower with the KEMS-112 drill on Academy of Sciences ice cap

The drilling was started in May 1999 as a joint project of the Alfred Wegener Institute (Germany), the Arctic and Antarctic Research Institute, and the Miining Institute (Russia, St. Petersburg both). Camp and tower were errected and the first 54 m of core were drilled using the KEMS-112 electromecanical ice core drill, the same type used at Vostok Station, Antarctica.

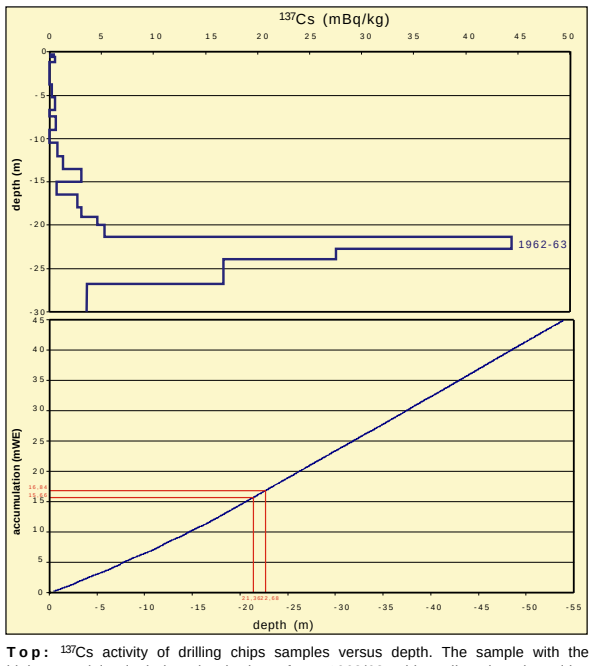
In 2000 drilling will be continued in hoping to reach bedrock.

### Core stratigraphy and isotope data



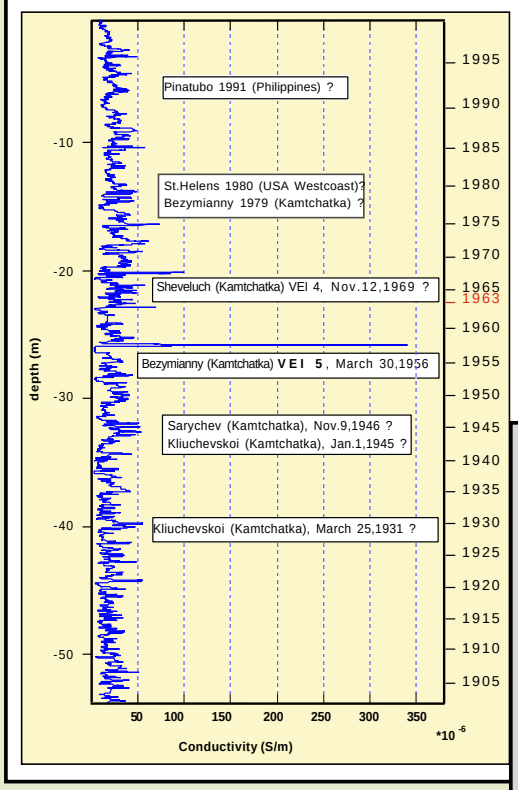

The example core sequence clearly shows layers of infiltration ice produced by refreezing melting water. These irregularities are apparent in the density and isotope profiles.

### Mean annual net mass balance




**Top:** $^{137}Cs$ activity of drilling chips samples versus depth. The sample with the highest activity includes the horizon from 1962/63 with radioactive deposition from nuclear tests in 1961/62.
**Below:** Accumulation versus depth calculated from gamma absorption density measurements of the ice core. The depth of the reference sample including the 1962/63 layer is corresponding with a total accumulation of 15.66 to 16.84 mWE giving a mean net mass balance of app. **45 cmWE/year**.

### Electrical conductivity and preliminary time scale




Electrical conductivity of the ice core was determined by help of the dielectric profiling method. The conductivity is depending on the amount of impurities in the ice, especially on acids from vulcano events. Historical vulcano eruptions were used for dating the Greenland ice cores.

The time scale given was calculated assuming a mean annual net mass balance of 45 cm WE, using the 1963 reference layer. This scale is indicating that the big event in electrical conductivity data in the depth of 25.8 m is caused by the eruption of Bezymianny in 1956, the largest volcano event in the time covered.


**References:**

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