Holocene changes in vegetation and climate at the Khatanga region, northern Siberia
- derived from a lacustrine pollen record -

Introduction
The northern Siberian treeline is supposed to migrate further north, due to climatic changes in the taiga-taiga-ecosystem. But inhibiting or strengthening factors are still not adequately known [Boest et al., 2012], thus the changes of the treeline ecosystem are still not totally predictable.

Therefore a field campaign in 2011 and 2013 collected information about the actual arctic vegetation, which will be used to reconstruct the conditions of the late Holocene for the tundra-taiga-ecosystem.

Material & Methods

The lake was selected optically from helicopter (Fig. 1), due to its vegetation surrounding, representing an arctic taiga-ecosystem of tundra elements. The location of the core was chosen after a bathymetry via boat during the field work in summer 2011. A 90 cm long core (Fig. 2) was retrieved by an UWITECH gravity coring device and had been cut into two parts. The uppermost 27 cm of the core were subsamples into 0.5 cm thin slices already in the field (Fig. 3). 14C dating was performed afterwards. The samples were treated following standard procedures for pollen preparation [Faegri & Iversen, 1989; Bleg, 2004; Moore, Weiss, & Collinson, 1991]. Statistics were processed using the R-software (Team R, 2011) developing an RDA (Regularized Discriminant Analysis; Lescle, Ossenberg, & Thierberg, 2011; Fig. 4).

Results

The diagram (Fig. 5) shows the development of the vegetation within the last 2100 years. The composition of the taxa changes slightly over time. An increasing trend of Larix becomes visible within the last 70 years. A decrease of the Cyperaceae seems simultaneous thus a change to drier conditions can be assumed. The pollen diagram (Fig. 5) reveals clearly visible that the increase of Larix in the recent years is accompanied by a decrease of Cyperaceae in the same period. The trend of Larix increase is supported by the RDA analysis, which shows, that Larix significantly increases over the last 70 years. Further, the species Picea and Larix migrate towards the treeline. The correlation of Larix and Cyperaceae is significant within the RDA analysis, indicating that Larix and Cyperaceae are influenced by the same factors, which are most likely to be climatic changes.

Conclusions

- The vegetation changed from a Larix influenced taiga with shrub elements (Betula & Alnus) to a vegetation with less Taiga elements and more herbs like Brassicaeae or Cyperaceae.
- Afterwards Larix increased, thus at least taiga became abundant again.
- Changes within the ecosystem of the arctic treeline are present and visible within the last 300 years. They probably underlay climatic conditions, whereas the vegetation shifts due to changes of these conditions.
- Larix, as the dominant element of the landscape, is actually present within the treeline area and had been there since three centuries, in different amounts.

Outlook

Further analyses will use genetic methods to give insight into migrational processes of Larix trees within the treeline area. These and advanced vegetation data will help to understand, reconstruct and simulate the changes of this arctic ecosystem more and more.

Additional information will be provided by the talk of Laura Esp (Analysing arctic-boreal treeline changes using ancient sedimentary DNA) and the posters of Kathleen Stoof-Liebschering (Accessing the ancient sedimentary DNA archive to analyse species’ histories and past biodiversity), and Stefan Kruse (LARIX - An individual-based model for simulating vegetation dynamics at the arctic tree line in Siberia).