A total 50 samples from the ONG2 and 70 samples from the ONG5 with interval from 3 to 5 cm were analyzed for pollen and 42 pollen, spores, and non-pollen-palynomorph taxa were identified in the studied samples.

According to detailed palynological investigation bottom sediments of ONG5 core started to form during Allerød interstadial warming period. Tundra landscapes with *Betula nana,* possibly shrub *Alnus* as well as herbs were dominated on surrounding area in that time. The area occupied by periglacial vegetation communities with dominating *Artemisia*, Cyperaceae and Chenopodiaceae and participation of *Ephedra* increased during Younger Dryas period. Amelioration of climatic conditions in the beginning of the Holocene contributed to the reduction of territories occupied by vegetation of open habitats. However, the shrub and dwarf forms of *Betula* still dominated in the vegetation cover. This interval is attributed with the Preboreal period of the Holocene. The sharp changes in composition of pollen spectra were fixed above upper boundary of Preboreal. Probably, it is connected with hiatus in sedimentation. The rate of sedimentation sharp decreased at the same time. The uppermost 60 cm of sediments contain pollen and spores of the end of the Atlantic, Subboreal and Subatlantic period. End of the Atlantic period is characterized by the development of spruce and pine forests with the participation of *Alnus*, an admixture of *Ulmus* and *Quercus*. Participation of broadleaved species decreased, spruce and pine forests with *Betula* and *Alnus* were widespread during Subboreal time. Pine forests with *Betula*, *Picea* and *Alnus* participation are main feature of Subatlantic period as well as appearance of *Secale* and anthrophorous herbs at the end of the period.

The ONG-2 core is represented by sediments formed during the end of the Atlantic, Subboreal and Subatlantic periods according to pollen stratigraphy. Spore-pollen spectra received to allow more detailed reconstructed vegetation cover changes during the second part of the Holocene.

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BEENCHIME SALAATINSKY CRATER IN NORTHERN YAKUTIA - ORIGIN AND ENVIRONMENTAL DYNAMICS IN THE 8-KM CIRCULAR STRUCTURE

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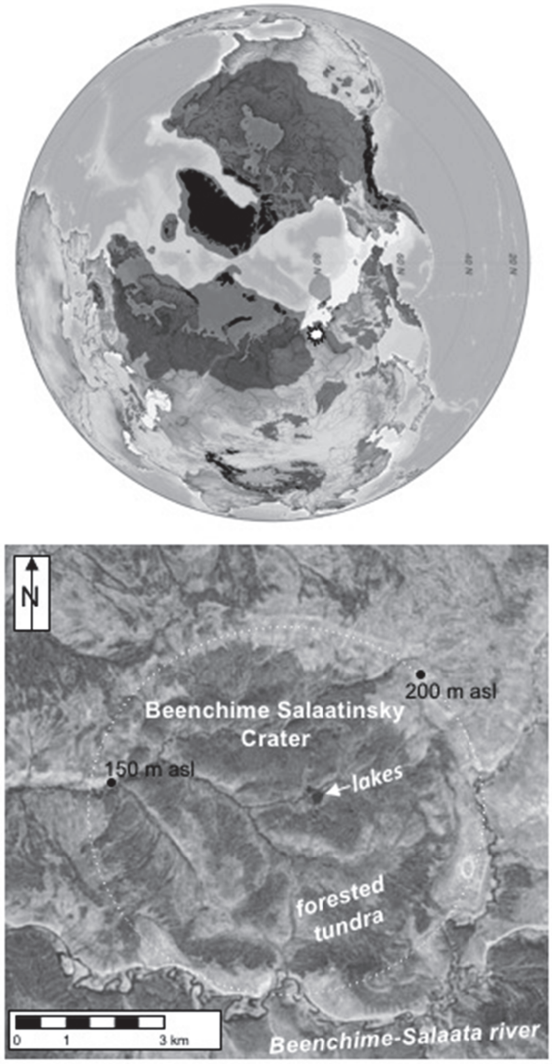
Short-term scientific goals of our study are to reveal the origin of the crater (impact crater or volcanic crater) and the late Quaternary environmental history in the area. Beenchime Salaatinsky Crater (BSC) is a potentially multi-million-year-old ring structure that has a diameter of 8 km and is located west of the Olenyok River in northern Yakutia (Figure 1A). The altitude difference in the crater is around 60 m (140 m to 208 m above sea level) with forest tundra (i.e. larches) and shrubs and grass covering much of the area. The basin structure consists of three geomorphic levels: a lower level at 140-150 m asl. with polygonal frozen ground, partly boggy and filled with water in the meadows and with a drainage pattern that is seasonally active; a medium level at 150-165 m asl. has slopes and erosive remains of ancient fluvial terraces; the upper level at 165-208 m asl. consists of bedrock forming the crater rim. It includes a polygonal pattern from periglacial frost cracking in the weathered bedrock (Figure 1B).

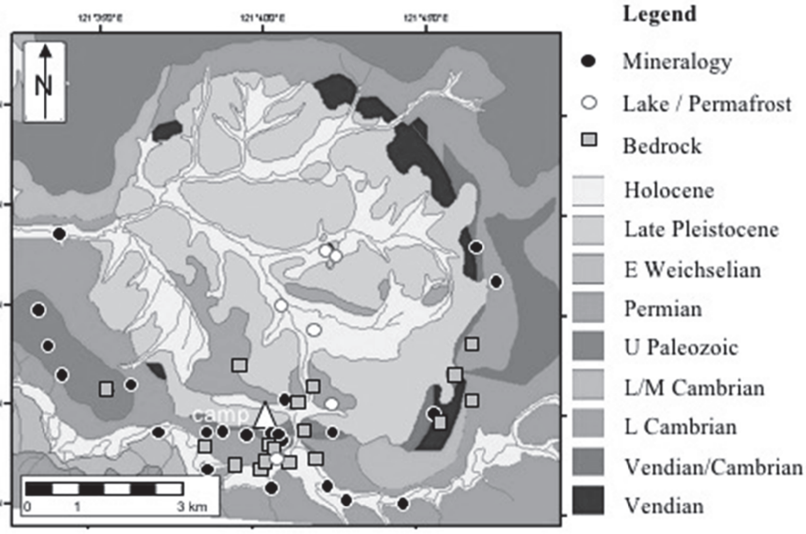
A



B

Figure 1: **A**) Beenchime Salaastinsky Crater is exposed in northern Yakutia, in the uplands west of the Lena river (see star). The crater escaped major Pleistocene glaciations (shaded areas, H. Grobe, 2008, redrawn from Ehlers and Gibbard, 2007, Niessen et al., 2013).
B) The crater is named for its neighboring river. Drainage in the low relief terrain exits to the west. Periglacial weathering takes place in the crater rim dolostones. The basin center holds a group of small lakes [WorldView-2 imagery 2013].
C) Paleozoic sediment rocks form the crater rim, the crater inside and outside (based on Mikhailov, 1978, Masaitis, 1999, modified).

C



Following earlier geomorphological surveys, it is assumed that the basin is the result of a Mesozoic volcanic explosion similar to Kimberlite Pipes elsewhere in Yakutia (Pinchuk et al., 1971, Khain, 1985). Alternatively, a meteorite impact is blamed, because suevitic breccias have been identified (Mikhailov et al., 1979, Masaitis, 1999). According to geomorphological age estimates, the crater is between 65 and 40±20 Ma old (Moon et al., 2001; Grieve, 1987, Earth Impact Database, 2018).

In a pilot study during summer 2016 we sampled several landforms of the basin interior (a peat plateau, ancient river terraces, a modern lake depression) and geologic formations (Paleozoic bedrock and modern river sediments) (Figure 1C). In the central part of BSC the biggest of three lakes, 300 m in diameter, has been studied using 50 MHz ground penetrating radar profiles and short cores. At four sites of the lower and medium levels soil pits were dug into the ground and short cores of about 1 m extended the sediment records into the underlying permafrost. Placer examinations are in progress to identify the precious metal and heavy mineral fractions from fluvial samples. Several fractions obtained by sieving are under inspection (i.e. 2-1, 1-0.5, 0.5-0.25, and 0.25-0.16 mm).

Thin section studies on various bedrock samples from outcrops are analyzed using polarized light microscopy that allows identifying possible shock metamorphic effects. In fact, shocked quartz with PDFs (planar deformation features) was found in a sample taken from a Permian sandstone outcropping in the crater interior. The crystallographic orientations were measured using a U-stage microscope. Some other samples of the crater rim are only slightly shocked.

We sum up our results in a preliminary scenario, which suggests a Paleozoic meteoritic impact event, a Mesozoic overburdening of the area and a subsequent erosion in the course of the Olenyok Uplift. Finally, we propose late Quaternary landscape dynamics based on sediment dating using AMS ^{14}C and sediment properties in the crater; fluvial sediment transport is documented for the MIS 3 and MIS 1 periods whereas mid to late Holocene lake sediments indicate increasing aridity in the area with lake level lowering during the past ca. 2000 years.

Our long-term scientific goals are to identify, if the site is a suitable target for deep drilling efforts. It would allow studying the depth and depositional history of the basin filling and would aid reconstructing the crater origin. Optionally, boreholes and cores can serve to study the permafrost temperature field and an extreme habitat of microbial life.

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