Geophysical Research Abstracts
Vol. 20, EGU2018-18544, 2018
EGU General Assembly 2018

The preglacial and postglacial sediment record of Lake Ladoga, NW Russia – first results from a multi-proxy study on a 23 m sediment record

Volker Wennrich (1), Raphael Gromig (1), Martin Melles (1), Bernd Wagner (1), Sebastian Krastel (2), Elodie Lebas (2), Andrei A. Andreev (1,3), Grigory Fedorov (4,5), Janna Just (6), Larisa A. Savelieva (5), Lyudmila Shumilovskikh (7), Dmitry A. Subetto (8,9)

(1) University of Cologne, Institute of Geology and Mineralogy, Cologne, Germany (volker.wennrich@uni-koeln.de), (2) Institute of Geosciences, University of Kiel, Kiel, Germany, (3) Institute of Geology and Petroleum Technologies, Kazan Federal University, Kazan, Russia, (4) Arctic and Antarctic Research Institute, St. Petersburg, Russia, (5) St. Petersburg State University, St. Petersburg, Russia, (6) Department of Geosciences, University Bremen, Bremen, Germany, (7) Department of Palynology and Climate Dynamics, Georg-August University, Göttingen, Germany, (8) Northern Water Problems Institute, Karelian Research Centre, Russian Academy of Sciences, Petrozavodsk, Russia, (9) Herzen State Pedagogical University of Russia, St. Petersburg, Russia

The joint German-Russian project ′PLOT - Paleolimnological Transect′ aims to recover lake sediment sequences along a more than 6000 km long longitudinal transect across the Eurasian Arctic in order to investigate and reconstruct the Late Quaternary climatic and environmental history. As part of a pilot study, in summer 2013 an intensive seismic and coring campaign was performed at Lake Ladoga close to the city of St. Petersburg, marking the westernmost end of the transect. Ladoga is Europe′s largest lake, both by size and volume. Coring followed an intensive shallow and deep seismic survey in late August/early September 2013, using an Innomar sediment echosounder and a Mini-GI-Gun with a 32-channel seismic streamer, respectively. The results of the seismic survey indicate prominent unconformities that separate widespread Lateglacial and Holocene sediment successions from preglacial sediments preserved in isolated depressions underneath. The ca. 23-m long sediment core Co1309 was recovered from such a depression in the northwestern part of Lake Ladoga and has penetrated the unconformity and further into the preglacial sediments. The core was investigated by a multi-parameter approach using XRF-scanning, magnetic susceptibility measurements, as well as pollen, grain-size, and bio-geochemical analyses. The age-depth model is based on radiocarbon, OSL, varve counting and paleomagnetic ages as well as tephrochronology.

Based on both palynological results and the OSL ages, the base of the record is assigned to late MIS 5e (Eemian). The respective sediments consist of well sorted reddish sands, which exhibit dinoflagellates suggesting at least brackish conditions, likely due to a gateway of a precursor Baltic Sea to the White Sea via Lake Ladoga. The upper 13 m of a sediment core (Co1309) for the first time reflect the post-glacial history of the Ladoga Lake basin continuously and with high temporal resolution. The Lateglacial deglaciation sequence consists of greyish varved clays with sporadically intercalated sand layers, showing a successively decreasing thickness upwards. Age control in this core interval was established by combining radiocarbon dating with varve chronology, with the latter being anchored to the Vedde ash, which was identified as a cryptotephra. The age-depth model reveals the onset of glacial varve sedimentation at 14.172 $\pm$ 57 cal ka BP, when Lake Ladoga was part of the Baltic Ice Lake (BIL). Linear extrapolation of published retreat rates of the Scandinavian ice sheet reveals a formation age of the Luga moraine to the south of Lake Ladoga of 14.7 – 16.1 cal ka BP, much older then so far assumed. The varve sedimentation is covering the Bølling/Allerød interstadial and the Younger Dryas (YD) stadial. It terminates contemporaneously with the drainage of the BIL. The Holocene sequence consists of brownish diatomaceous silty clay with minor proportions of sand. Based on geochemical data, the Holocene can be divided into three periods: a transition zone until 10.3 cal ka BP, a period of increased clastic input until ca. 8.2 cal ka BP, potentially due to a lower lake level, and a period of relatively stable sedimentation until the present time.