



Findings of historical Icelandic (Askja AD 1875) tephras in varved lake records from Lake Tiefer See and Lake Czechowskie: a new potential for synchronizing the recent environmental history in NE Germany and N central Poland

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Identification of remnants of volcanic ashes (tephras) intercalated in lake sediments has become a crucial point for dating purposes and for synchronization of different sediment records. During the Late Glacial and the Holocene Northeastern Germany and Northern-central Poland were episodically impacted by ash clouds of larger eruptions from Icelandic volcanoes (e.g. Saksunarvatn, 10.2 cal ka BP, and Vedde Ash, 12.1 cal ka BP); the most recent ones in 2010 and 2011 occurred from rather low-scale eruptions from Eyjafjallajökull and Grimsvötn resulting in an interruption of air traffic and local deposition of fine grained ash. We have started an intense search for traces of these volcanic ashes (cryptotephras) and other historic Icelandic tephras in two annually laminated palaeoclimate records, Lake Tiefer See (NE Germany) and Lake Czechowskie (N central Poland), in order to verify the ^{14}C supported varve chronologies of these sequences. Lake Czechowskie and Lake Tiefer See are both located within the terminal moraine of the Pomeranian ice advance of the last glaciation and encompass continuous sediment records since the Late Glacial. First results of tephrochronological investigations revealed a cryptotephra finding of the rhyolitic Askja AD 1875 ash in both sequences. The Phreatoplinian Askja AD 1875 eruption is considered as the largest Icelandic eruption in history, comparable with the 1991-Pinatubo eruption. Due to strong westerly winds the Askja AD 1875 Tephra was distributed towards the east as evidenced by documentary records and occurrences in numerous peat bogs in Norway and Sweden. A tentative finding was reported from Grambower Moor in N Germany suggesting a subsequent southward moving ash cloud over Sweden (van den Bogaard and Schmincke, 2002). With the ultra-distal cryptotephra findings in Lake Tiefer See and Lake Czechowskie, ca. 2060 km and 2300 km SE of the Icelandic source, respectively, we can confirm the southward ash dispersal and provide an perspective of further findings in high-resolution palaeoclimate archives in this region. The Askja AD 1875 tephra in the Tiefer See and Czechowskie sequences is a crucial isochron for the synchronization of poorly laminated sediment sections in both records, and thus it is essential for the comparison of the multi-proxy data set in order to investigate regional differences in lake responses to rapid climatic and environmental changes. The rather complex dispersal pattern of the historical Askja AD 1875 tephra furthermore points out that simple conical dispersal maps are not always valid and that future tephra investigations in palaeoclimate records should also include the systematic search for rather non-expected tephras.

This study is a contribution to the Virtual Institute of Integrated Climate and Landscape Evolution Analysis –ICLEA– of the Helmholtz Association and the Helmholtz Association climate initiative REKLIM topic 8 “Rapid climate change derived from proxy data“.

References: Van den Bogaard, C., Schmincke, H.-U., 2002. Linking the North Atlantic to central Europe: a high resolution Holocene tephrochronological record from northern Germany. *Journal of Quaternary Science* 17, 3-20.