Geophysical Research Abstracts
Vol. 20, EGU2018-12515, 2018
EGU General Assembly 2018

A micromorphological assessment of Lateglacial Swedish clay varves from Svinstadsjön, Östergötland – understanding proglacial lake processes and refining a site varve chronology.

Rachel Devine (1), Alison MacLeod (2), Adrian Palmer (1), and Stefan Wastegård (3)

(1) Department of Geography, Royal Holloway, University of London, Egham, UK (Rachel.Devine.2013@live.rhul.ac.uk), (2) Department of Geography and Environmental Science, The University of Reading, Reading, UK, (3) Department of Physical Geography, University of Stockholm, Stockholm, Sweden

During the last deglaciation (c.16 – 10 ka BP) the combination of glacially-forced global sea level changes and regional isostatic movements resulted in the isolation of the Baltic from the north-eastern Atlantic. This led to the formation of an ice-contact proglacial lake, the Baltic Ice Lake, which was ice-dammed by the Fennoscandian Ice Sheet during the Lateglacial Interstadial and Stadial periods. Critically, the Baltic Ice Lake acted as a depocentre for the deposition of annually laminated (varved) glacial sediments. These deposits are exposed in many locations across Scandinavia including the current Baltic coast and within the Baltic Sea. The pioneering work of De Geer (1884) identified annual cycles in the sedimentation pattern, and through the construction of overlapping varve-thickness diagrams he established the Swedish Varve Chronology or Swedish Timescale (STS). The STS was the first model of ice retreat across Sweden and has since been revised and updated to extend to the present day. There are, however, sections of the 13, 257 year-long STS where varves are missing, in particular 700-900 years are missing either during the Younger Dryas - Pre-Boreal period (12.9-11.35 ka BP) or the early Holocene. One explanation for the missing years within the STS is a lack of precision in macroscale varve counts, which are the traditional means of developing local site chronologies.

The approach here is to combine macroscale counts, μ-XRF analysis, and thin section micromorphology on a 9 m Younger Dryas age varve record from Svinstadsjön, Östergötland. Thin section analysis has enabled the identification of three distinct varve microfacies, which differ in structure, texture and thickness. Melt season characteristics vary from complex microfacies that are typically >10 mm thickness with multiple sediment inputs, to simple single-layered melt seasons in the thinner, <1 mm thickness, varves. When combined with the varve thickness data these relationships probably reflect proximity to the ice margin. It is also noticeable within the record that there were periods of increased ice-rafted debris deposition.

Varve count data shows differences between varve counting methods due to two key reasons: 1) more varves are present when counted under thin section due to the presence of thin (<1 mm) varves characterised by subtle differences in grain size and colour between seasonal layers that are not observed at the macroscale, 2) deformation structures are identified in both proximal and distal varves at the microscale, probably reflecting periods of local slope instability. Revised counts of the varves are ongoing using micro-scale sediment analysis, with the potential to revise the current estimate of the number of years in the Lateglacial part of the STS.