

Paper Number: 3183

Holocene sedimentation in the Ångermanälven River estuary, the Baltic Sea – IODP Site M0062

Kotilainen, A.T.¹, Hyttinen, O.², Kekäläinen, P.², Obrochta, S.³, Andrén, T.⁴, Ryabchuk, D.⁵, Snowball, I.⁶

¹Geological Survey of Finland (GTK), Marine Geology, Espoo, Finland (correspondence: aarno.kotilainen@gtk.fi)

²University of Helsinki, Department of Geosciences and Geography, Finland

³Akita University, Faculty of International Resource Science, Japan

⁴Södertörn University, School of Natural Sciences, Sweden

⁵A.P. Karpinsky Russian Research Geological Institute (VSEGEI), St. Petersburg, Russia

⁶Uppsala University, Department of Earth Sciences, Natural Resources and Sustainable Development, Sweden

Ångermanland, in the northern Baltic Sea area, was deglaciated around 10.4 ka ago. It has long been known [1] that varve deposition is an ongoing process in the Ångermanälven river system and estuary, and it has continued for several thousands of years. For the period AD 1901-1971 a correlation between maximum daily discharge and mean varve thickness has been found [2]. Thus varve thickness and sediment geochemistry may yield reconstructions of changes in the precipitation and the sedimentation processes in the estuary further back in time.

Two sites, M0061 and M0062, in the Ångermanälven River estuary were drilled during the IODP Expedition 347 “Baltic Sea Paleoenvironment” (M0061 and M0062) [3]. In this presentation we show results from the site M0062, which is located at latitude 62°57N longitude 17°48E and a water depth of 69 meters. The core recovery was ~ 36 m [3]. The sediment analyses included e.g. grain-size, LOI, XRF, total carbon and ICP-MS geochemical analysis. The preliminary age model for the cores is based on the ¹⁴C-, paleomagnetic- and OSL-dating, and Pb-content records.

The sediment sequence was divided into three lithological units. Unit 1 (35.9-16.17 mbsf) consists of from well-sorted (fine to medium) sand and silt, deposited in a glaciofluvial environment. Unit 2 (16.17-10.72 mbsf) consists of interlaminated silty clay-clay couplets, i.e. clastic varves, typical of a glaciolacustrine environment. Unit 3 (10.72 - 0 mbsf) consists of horizontal, planar, and parallel laminated silty clay. Couplets of light and dark laminae are 1-9mm thick, and are interpreted as varves. This unit was first deposited in a large lake, which soon turned into brackish marine basin [3]. Upwards coarsening median grain size in the topmost part of the unit suggests an overall increasing river input and/or basin shallowing due to land uplift which today amounts to circa 8 mm/year.

Variable sediment properties, indicated by changes in grain size and XRF data (Al/Si, Ti/Al, Fe/Ca ratios) suggest changes in the precipitation, river discharge and nutrient transport/input into the Baltic Sea Basin during the past ~ 10000 years.

This work is a part of the CISU project funded by the Academy of Finland and the Russian Foundation for Basic Research, and the Swedish Research Council (VR).

References:

[1] Cato, I. (1987). On the definitive connection of the Swedish Time Scale with the present. SGU

68, 1-55.

[2] Sander, M., Bengtsson, L., Holmquist, B., Wohlfarth, B., Cato, I. (2002). The relationship between annual varve thickness and maximum annual discharge (1909-1971). *Journal of Hydrology* 263, 23-35.

[3] Andrén, T. et al. (2015). *Proc. IODP, 347: College Station, TX (Integrated Ocean Drilling Program)*.

