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Multiple deformed layers in Weichselian lacustrine sediments at Baltmuiža, western Latvia

Woźniak, Piotr Paweł^{1*}, Belzyt, Szymon², Pisarska-Jamroży, Małgorzata², Nartišs, Māris³,
Lamsters, Kristaps³, Woronko, Barbara⁴ and Bitinas, Albertas⁵

¹ Faculty of Oceanography and Geography, University of Gdańsk, Bażyńskiego 4, 80–309 Gdańsk, Poland

² Institute of Geology, Adam Mickiewicz University, B. Krygowskiego 12, 61–680 Poznań, Poland

³ Faculty of Geography and Earth Sciences, University of Latvia, Rainis Blvd. 19, 1576 Riga, Latvia

⁴ Faculty of Geology, Warsaw University, Żwirki i Wigury 93, 02–089 Warsaw, Poland

⁵ Nature Research Centre, Akademijos 2, LT-08412 Vilnius, Lithuania

* E-mail corresponding author: geopw@ug.edu.pl

The Baltmuiža site is located at the Baltic Sea bluff in the western Latvia, 6 km to NE from Pāvilosta town. Close to the site two faults in Lower Palaeozoic sediments are recognised, the closer one is deep-seated in the crystalline bedrock (Nikujins, 2017). The Quaternary sediments cover lies directly on Devonian rocks and has 70 m total thickness (Kalniņa et al., 2000). During the Late Weichselian the study area was completely covered by the ice sheet. At the end of glaciation, due to an additional, local ice-advance of so called Apriki glacial tongue, older sediments have underwent a heavy diapirization (Saks et al., 2012b). Late Weichselian deposits are underlain by sands and silty sands of the Jurkalne 3 Member with thickness up to 40 m (Kalniņa et al., 2000), which were deposited at the margin of an extensive freshwater basin (cf. Kalniņa et al., 2000 and Saks et al., 2012a), in MIS 3 according to OSL dating results (Saks et al., 2012a). These sediments are visible along a prominent part of the western Latvia coast. Layers with ‘trapped’, internal soft-sediment deformation structures (SSDS) occur in them at Baltmuiža (Belzyt et al., 2018). Five layers with SSDS, sandwiched in generally not deformed sediments, were recognized there. The deformed layers are commonly rich in load casts and pseudonodules, injection structures and fluid-escape structures. Almost all layers with SSDS have an eroded top boundary.

The recognised layers with SSDS seem not to be directly connected with commonly observed in the vicinity of the Baltmuiža site glaciotectionic deformations (large-scale diapirs, folds, reverse faults; e.g. Saks et al., 2012a, b). What is more, due to the basal ice sliding of Apriki glacial tongue (Saks et al., 2012b), small-scale Late Weichselian subglacial deformations are limited to a thin layer of the topmost part of the studied sediments. The SSDS developed metadepositionally, in multiple stages, most probably just after the deposition of lacustrine sediments during MIS 3. Furthermore, Late Weichselian glaciotectionic processes caused that the layers with SSDS are deflected from the original horizontal position. The most probable trigger mechanisms responsible for the origin of the studied layers with SSDS include: (1) the glacioisostatic rebound affecting the crustal faults instability, (2) a local, seismic event (tremor) of moderate magnitude, caused e.g. by glaciotectionic processes. Moreover, as a trigger that induced Late Weichselian modifications of previously developed SSDS cannot be excluded: (1) an ice loading at the final stage of glaciation, and (2) a local seismic event (tremor) of moderate magnitude caused e.g. by ice-blocks fall/collapse.

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