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Uniwersytet Łódzki

Olga Reutt[1] • **Damian Moskalewicz**[2]
Piotr Paweł Woźniak[2]

[1] *University of Gdańsk, Faculty of Oceanography and Geography*
[2] *University of Gdańsk, Department of Geomorphology and Quaternary Geology*

E-mail: *olga.reutt@wp.eu; damian.moskalewicz@ug.edu.pl; piotr.wozniak@ug.edu.pl*

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Seeking indicators of tills weathering: how can we exploit geophysical and geochemical methods?

A detailed insight into weathering processes may delivernot only historical data, but it can also provide a better understanding of the long-term evolution of soils and contemporary landscapes in general. Geophysical and geochemical methods are widely applied in various geological settings and, in relation to weathering, they can help in identifying the range and intensity of this process, which ultimately supports any other sedimentological research and palaeogeographical reconstructions. However, as far as tills are concerned, there seems to be a large research gap, which eventually triggered our study project.

Our main research activities are: (1) major and trace elements content analysis using ICP-MS (Inductively Coupled Plasma – Mass Spectrometry) and XRF (X-Ray Fluorescence), (2) geophysical logging of till profiles with handheld gamma-ray spectrometry (GRS) which yields the concentrations of K, Th, U and total gamma-ray signal (GR), (3) correlation of weathering indices obtained by geochemical analyses with geophysical logging results.

Four study sites in the northern Poland are planned to conduct the research. All of them are located within the ice-sheet extent during LGM (the Last Glacial Maximum) and the exposed profiles feature at least one Weichselian (MIS 2) till layer with various susceptibility to weathering. The profile in Dmuchowo site consists of massive till with sandy interbedding in its lower part. There are visible signs of

weathering in the top part. In Gdynia Babie Doły site the till profile is protected by paralimnic sands and silts, and debris-flow diamicton, but its top bears signs of initial erosion. The till profile in Gdynia Orłowo site reveals intense weathering in the top part and lastly, the till profile in Polskie Gronowo site does not show any apparent signs of erosion and weathering with the upper part protected by glaciolacustrine silty--clayey deposits.