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A glaciotectonic complex at the Vastyanskiy Kon' outcrop, NE European Russia: subglacial or proglacial deformations?

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The Vastyanskiy Kon' (VK) outcrop is the largest exposure of Quaternary sediments in the northeastern European part of the Russian Federation. The VK consists of Eemian to Weichselian marine and continental sediments that were deformed within a glaciotectonic complex of terminal moraine of the advancing Late Weichselian Kara Sea Ice Sheet. However, a few aspects of the stratigraphy and dynamic evolution of the VK glaciotectonic complex remain unresolved and ambiguous.

A particular debate concerns the structural position and age of the so-called "lower diamicton" (LD), a till-like unit, which generally occurs within the central part of the VK section. Two models on the development of the LD unit have been previously proposed. According to the first model, the LD is situated in its original stratigraphic position and reflects possible earlier Early/Middle Weichselian glaciation and is later deformed by Late Weichselian proglacial glaciotectonism. The second model suggests that the LD unit is a result of an injection of the overlying Late Weichselian lodgement till into underlying sandy units.

In our study, we performed a detailed tracing of stratigraphic units and structures utilizing classic surface mapping and 3D photogrammetric methods to access previously understudied parts of the VK. Our observations show that the architecture of the VK glaciotectonic complex represents an imbricate fan and partly support the model where the LD likely represents a till flow unit sourced from the overlying lodgement till under subglacial deformation mode. Finally, we conclude there is no evidence for postulated Early/Middle Weichselian glaciation in the study area.