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The spatial distribution of microfabric around gravel grains: indicator of till formation processes

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Till micromorphology studies in thin sections is an established tool in the field of glacial geology. Often the thin sections are inspected only visually with help of mineralogical microscope. This can lead to subjective interpretation of observed structures. More objective method used in till micromorphology is measurement of apparent microfabric, usually seen as preferred orientation of elongated sand grains. In theses studies only small fraction of elongated sand grains often confined to small area of thin section usually are measured.
We present a method for automated measurement of almost all elongated sand grains across the full area of the thin section. Apparently elongated sand grains are measured using simple image analysis tools, the data are processed in a way similar to regular till fabric data and visualised as a grid of rose diagrams. The method allows to draw statistical information about spatial variation of microfabric preferred orientation and fabric strength with resolution as fine as 1 mm.
Late Weichselian tills from several sites in Western Latvia were studied and large variations in fabric strength and spatial distribution were observed in macroscopically similar till units. The observed types of microfabric spatial distributions include strong, monomodal and uniform distribution; weak and highly variable in small distances distribution; consistently bimodal distribution and domain-like pattern of preferred sand grain orientation.
We suggest that the method can be readily used to identify the basic deformation and sedimentation processes active during the final stages of till formation. It is understood that the microfabric orientation will be significant affected by nearby large particles. The till is highly heterogonous sediment and the source of microfabric perturbations observed in thin section might lie outside the section plane. Therefore we suggest that microfabric distribution around visible sources of perturbation – gravel grains cut by the thinsection plane – have to be examined. In particular processes such as lodgement, simple-shear with rotating or non-rotating gravel grains, pure shear (vertical compaction, e.g. melt out) and sedimentation in a still water environment can be easily identifiable by this approach.
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