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Magnetic fabric of basal carbonatic cataclasite: Revealing the direction of thin-skinned nappe-stacking in the Inner Western Carpathians by AMS analyses

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The anisotropy of magnetic susceptibility (AMS) has been recognized as a sensitive indicator of rock fabric and is employed in the field of structural geology. Faults are often characterized by fault breccia, rocks with clast-in-matrix textures. A noteworthy feature of the breccia is the presence of a fabric defined by the preferred orientation of clasts and grains in the matrix. However, this fabric is often not visible in thin sections but can be detected by AMS analyses. We want to test if the magnetic fabric of tectonic breccia can help to determine the transport direction.

The sample area is the Cretaceous thin-skinned nappe-system of the Inner Western Carpathians. This Alpine-type orogenic belt is built up by large-scale, few km thick nappes without connection to their root areas. These thin rock slices thrust over large distances without sign of mayor deformation within the nappe slice. All the deformation took place along highly strained, narrow shear zones lubricated by hot fluids. These hydrostatically pressurized zones develop on the bases of the nappes, where basal tectonic breccia was formed. These polymict breccias have typical block-in-matrix texture and range from chaotic breccia to ultracataclasite in grain sice. All the rocks sampled are characterized by a very low susceptibility, some are even diamagnetic. Curie temperature analysis identified Ti-magnetite as major carrier of the magnetization in all the samples.

Area 1,2 and 3 (basal tectonic breccias from Tisovec, Puste Pole and Telgárt): the magnetic lineation is well defined within the footwall of the cataclasite: (Vepor basement and cover nappes) and plunging gently towards ENE. The whole nappe-pile was subject of ENE-WSW extension after the nappe-stacking. The stretching lineation observable is most probably related to this extensional event. However, the detected magnetic foliation within the investigated basal cataclasite is more diverse. I) part of the samples show horizontal magnetic foliation with NE-plunging magnetic lineation; it shows positive correlation with the structures measured in the footwall II) part of the samples show nice, flat-lying NE to ENE magnetic lineation with NE-SW trending vertical foliation. It can be related either to the same event, or the foliation and lineation is parallel to the Muran strike-slip fault, which is a major structural line related to the exhumation of the Vepor dome and (E)NE-directed transport of the cover Muran nappe. III) the largest part of the measured chataclasites shows sub-horizontal, or slightly SW-inclined magnetic foliation with NW to N plunging flat-lying magnetic lineation. This direction was not measured within the footwall. It may correspond to the supposed NW/N-SE/S oriented compressional stress field during primar nappe-stacking prior to the extensional event. Following this interpretation, the breccia was formed during nappe stacking and part of the magnetic fabric was not overprinted by the following extensional event.

This preliminary results show, that AMS-study of the basal tectonic breccia of thin-skinned nappes can be a powerful method in the future for detecting the hidden anisotropic fabric related to the tectonic movements, even if there are several tectonic events with different directions of movement.