

The Glarus overthrust (Switzerland): evidence for significant syn-overthrusting ductile shear within the hanging wall complex

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It is widely believed that the Glarus nappe complex in the Helvetic Alps in Switzerland is thrust as an essentially *rigid* block over the - also essentially rigid - infra-Helvetic footwall block. At the thrust contact, more than 40 km displacement is thought to be localized in a 25-200 cm thin limestone layer (the famous Lochseiten limestone). Martin Burkhard (Neuchâtel University, Switzerland) recently proposed, however, that the Glarus nappe complex might have behaved much less rigid than commonly thought, and has taken up substantial amounts of syn-overthrusting simple shear. We present microscopical and field evidence in support of this idea.

The hanging wall rocks (mostly Permian "Verrucano") show a well developed linear fabric (mineral lineation and elongated clasts) in a roughly 700 to 1000 m wide zone above the thrust contact. The lineation is parallel to the northwards directed thrust direction. Pre-thrusting (Calanda phase) fold axes are progressively sheared into parallelism with this lineation in an approximately 200 m wide zone above the contact. Bedding and foliation are entirely parallel in the lowermost 50 m, indicating that (post Calanda) simple shear strain is increasing towards the thrust-zone. Shear-bands indicate northwards thrusting. Microstructures within the nappe also show a strong spatial relationship with the Glarus thrust. Intracrystalline deformation of quartz grains gets more intense towards the thrust-zone. The important syn-overthrust microstructures within the hanging wall are dissolution seams (stylolites), pressure shadows, subgrains, undulose extinction, growth of new grains along grain boundaries and intragranular microcracks and deformation lamellae. The microstructures indicate that grain size reduction took place and pressure solution creep was an important deformation mechanism during overthrusting.

The foot wall rocks show almost no evidence of syn-overthrusting ductile shear. Only in the uppermost meter (or even less) the pre-thrusting (Calanda phase) foliation is bended northwards locally.

The strain distribution within the hanging and foot wall is not in accordance with the model of a rigid block being thrust over a rigid substratum.