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ABSTRACT BOOK

MOVING PLATES AND MELTING ICECAPS
Processes and Forcing Factors in Geology





Synorogenic vein kinematics at the northwestern margin of the High-Ardenne slate belt (Redu-Daverdisse, Belgium)

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Fluid flow related to tectonic inversions has extensively been studied in the High-Ardenne slate belt (Germany, Belgium, France), as evidenced by the widespread occurrence of quartz veins. Veining linked to the main Variscan orogenic stage is far less abundant and strictly related to localized folding and faulting.

In the northwestern part of the High-Ardenne slate belt (Redu-Daverisse, Belgium) several (early- to) synorogenic quartz vein types were recognized during a structural mapping in the well-exposed Lesse river valley. Assessing the kinematics of the different vein types in the Lower-Devonian Saint-Hubert Formation, fluid flow has been related to brittle-ductile deformation, with a strong component of simple shear. Local fluid flow was influenced by lithology, with veins concentrated within the competent metaquartzitic rocks or at their interfaces, but also by specific sedimentological characteristics (e.g. lenticular competent layers, point bars, trough cross-bedded bars). Veining has been produced by several kinematic processes, such as fold-related deformation (e.g. saddle reef, tension gashes in the fold hinges, bedding-parallel slickenfibres, stockwork veining), shear reactivation of cross-bedding and truncation surfaces in a trough cross-bedded bar (e.g. bedding-parallel veins and slickenfibres, conjugate discordant shear veins), faulting (e.g. chaotic fault-parallel veins) and folding along sedimentological or tectonic wedges (e.g. blocky quartz geodes).

Because of the localized nature of the quartz veins and lack of evidence for large-scale tapping via fault-fracture meshes, the quartz most likely originated from local dissolution of the host rock. It is inferred from (micro)structural analysis that several veins formed as open voids/fractures, resulting from structural deformation along wedges or as saddle reefs. The lack of collapse and the free polycrystal growth in the cavities, suggest the presence of high fluid pressures during the filling of the mechanically induced cavities. Other vein observations concur this statement. We therefore conclude that in compressional orogenic settings, high fluid pressures can be sustained without hydraulic fracturing because of the large differential stresses characterizing the compressional regime.