Cavitation phenomena as a factor influencing the p-t conditions and mass loss processes within shear zones.

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Observation of thrust and shear zones in the Tatra Mts indicates that the presence of fluids plays a key role during shearing processes.

In the Tatra Mts., thrust-napping and shearing were multi-stage reactivated processes. Their cyclic character was determined by the increase and decrease in pore fluid pressure and resulted in gradual increase of geometrical complication of the shear zones. Due to lithological heterogeneity most of the thrust zones are non-planar in character which is inseparably connected with large-scale mass loss processes (Jurewicz et al. 2007). Displacement along the non-congruent walls of the shear zone could create pull-apart arrays.
A shear zone acted as a pathway of fluid migration. Fluids appearing within the thrust-fault fissure played the key role in tectonic transport and selective mass-loss processes (hydrotectonic phenomena). The source of fluids could be pores filled with meteoric water or they could originate from the dehydration of gypsum, occurring in the Anisian sediments of Rauhwacke character. During rapid movement, immediately after the moment of fault-wall displacement activation, the volume of the newly opened chambers alternately increased, causing temporary supra-pressurised fluids. The fluids migrating along the shear fissure acted as a meandering river: the rough and uneven surface of the wall-rocks disturbed fluid-flow causing escalation of erosion processes. In these conditions, when the pressure of flowing liquid rapidly fell below its vapor pressure, cavitation bubbles could originate and in the aftermath of this, cavitation erosion. The cavitation refers to the repeated cycles of growth and collapse of bubbles in a liquid due to vigorous local pressure fluctuations (Preece 1979). During spherical collapse of bubbles, the pressures and temperatures that are predicted to occur in the gas within the bubble, are very high. In the calculations of Fujikawa and Akamatsu (1980), the maximum temperature and pressure in the bubble center are the order of 6700°K and 848 bar respectively. Furthermore, these temperatures and pressures exist only for a fraction of a microsecond and after 2μs the interface temperature dropped to 300°K. Rocks within the shear zone and at the base of the nappes do not show any features that could indicate such high temperatures: there is no evidence of metamorphism in the wall-rocks. Nevertheless, there is high probability that in a closed system like a thrust zone mentioned above, cavitation phenomena were responsible for increase of temperature values and perturbation of pressure. It cannot be excluded that the feldspar found within shear zone hydrothermal in nature and crystallising at a temperature of ~350ºC(Jurewicz & Słaby 2004), in fact originated due to cavitation phenomena. Cavitation phenomena are underestimated as geological processes influencing the p-t conditions within shear zones and as an erosion mechanism. Undoubtedly this problem needs more investigations.

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