A paleo-sismogenic Lepontine dome? New insights from pseudotachylytes-generating faults

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Sismotectonic and geological maps have long portrayed the late Oligocene-Recent geologic history of the Lepontine Dome (Central Alps, Switzerland) as tectonically quiescent. We present here newly found pseudotachylytes from the Penninic gneiss nappes of the Maggia Valley which prove that seismic faulting occur. The macro-structural observations of pseudotachylytes in the nappe interior point to a very late phase of brittle deformation. They crosscut the foliation at high angles, closely associated with cataclastic rocks.

The melt produced from feldspar with the lowest melting temperatures, rather than from a whole sale "eutectic" melting of the gneiss, explains large structural and geochemical heterogeneities. Generally, the dark aphanitic matrix is composed of a cryptocrystalline polymineralic aggregate, sometimes with acicular microlite of biotite, mainly distributed near "chilled" margins. Electron microscopy confirms that optically isotropic matrix of the studied pseudotachylytes consists at least in small parts of true glass. We have identified K-rich fresh glass (depleted in Na, Ca) in the interstices between relict feldspar within sub-mm size host rock clasts embedded in the "matrix". Typical quench products include potassic feldspar, biotite and magnetite. In many samples, original matrix glass of the host pseudotachylyte has been altered during postcrystallization processes and doesn't show any clear quenching textures. In one sample, a particular stoichiometric potassium aluminosilicate glass composition is interpreted as a product of supercooling of the melt. Dating by in situ high spatial resolution UV-laser ablation $^{40}Ar/^{39}Ar$ of these elements provide new and strong arguments to better constraint the timing of the late Alpine faulting. Our data present new clues to propose an Oligocene or younger time limited seismic activity in the Lepontine Dome.