



The precipitation of silica gels along seismogenic faults due to sudden fluid pressure drops: an example from the Zuccale low angle normal fault, Italy

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Based on experimental and some field-based studies several authors have proposed that silica gel (hydrated amorphous silica) layers are generated by frictional slip along seismogenic faults. The precise mechanism(s) of formation have remained somewhat enigmatic, but most studies invoke a mixture of frictional and chemical processes simultaneous with seismogenic slip. In this presentation we describe a new occurrence of ultrafine grained silica fault rocks that are hosted along a number of detachment faults developed within the Zuccale low angle normal fault on the island of Elba, Italy. Based on the geological and microstructural observations, including very detailed EBSD measurements, we propose an alternative mechanism of formation in which the gels precipitate rapidly from supersaturated pore fluids formed due to sudden drops in fluid pressure along faults during or immediately following episodes of seismogenic slip. This mechanism may have widespread application to other examples of fault-hosted silica gels. Furthermore, given the field appearance of these layers (see figure) and the recognition of ultrafine quartz crystallites in thin section, it is possible that similar examples in other natural fault zones may have been mistakenly identified as pseudotachylytes. The implications for fault weakening will also be discussed.