Nojima and MTL fault zone gouge dating, Japan

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Recent studies have highlighted the potential for determining the absolute timing of near-surface deformation and brittle fault histories using isotopic dating techniques [1, 2]. Displacement on the fault planes often results in the development of fault gouge composed of rock fragments and authigenic illite. The understanding of these processes and the timing and extent of clay-rich fault gouge formation is important for: (1) hydrocarbon exploration as faults may act as either a conduit or a seal for fluids and/or hydrocarbons; (2) CO_2 geo-sequestration issues, (3) civil engineering in the evaluation of earthquake hazards and (4) ascertaining the suitability of sites for nuclear waste storage.

Unspiked and conventional K-Ar data of authigenic illite from gouge zones developed in outcrop and core samples will be presented. The samples originate from gouge zones in the Nojima fault zone on Awaji island and the Median Tectonic Line (MTL) near Nagano, Japan. 13 unspiked and 31 coventional K-Ar data of authigenic illite clay minerals separated from unique and well developed gouge zones have been analyzed. Samples from Nojima Fault and the MTL zone are characterized by protoliths of high-grade metamorphic or magmatic rocks allowing therefore a clear distinction with newly-grown illite. All dated sample fractions were extensively characterized by XRD, SEM and TEM. K-Ar ages of 44 illite separates have a total age range of 63.37 ± 1.30 Ma (Early Paleocene – Danian) to 9.30 ± 0.21 Ma (Late Miocene – Tortonian) for the MTL samples. K-Ar dating results are consistent with well-defined field constraints and consitent with ZFTA ages from adjacent localities. The illite age data provide absolute time constraints on the youngest, retrograde, neotectonic movements. The K-Ar data support a recent model that the Nojima fault zone was initiated 55 Ma ago based on ZFTA data [3].

References

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