Geophysical Research Abstracts
Vol. 20, EGU2018-14685, 2018
EGU General Assembly 2018

Using U-Pb calcite dating to directly-date continental-scale faults

Catherine Mottram (1), Djordje Grujic (2), and Isabelle Coutand (2)
(1) University of Portsmouth, Portsmouth, UK (catherine.mottram@port.ac.uk), (2) Dalhousie University, Halifax, Canada

Continental collision causes the build-up of large amounts of stress in the buckling crust. The stress causes rocks to deform on a range of timescales; slowly, over millions of years in the ductile deep roots of mountain belts, and rapidly, over seconds during seismic events in the shallow brittle crust. These rapid, low temperature upper crustal processes are notoriously difficult to date as the minerals usually used to record geological time (such as zircon) typically do not crystallise or record any deformation under these conditions. Emerging techniques have recently been developed for directly-dating brittle structures using calcite, a mineral ubiquitous in many brittlely deformed rocks (i.e. Roberts and Walker, 2016, Geology; Nuriel et al., 2017, Geology). This has opened up a whole new realm of tectonic investigation in the upper crust.

This project aims to develop, and use the new calcite U-Pb dating technique to study how orogenic stress is spatially and temporally accommodated along two major seismically-active, continental-scale faults. The Main Himalayan Thrust, which is largely responsible for accommodating the on-going India-Asia collision, and the North Anatolian Fault, which forms a major transform plate boundary between Eurasia and Anatolia. We use structural geology, petrographical and microstructural tools to characterise fault-related calcite veins and slickenfibres. U-Pb dating of calcite is used to reconstruct the Pliocene-Pleistocene displacement history along these first-order structures. Reconstruction of the space-time distribution of major seismic events at geological timescales will help to inform earthquake hazard assessments in the region today.

Roberts and Walker, 2016, Geology, 44, p. 531; Nuriel et al., 2017, Geology, 45, p.587