Session 14

The link between fluids and fault slip: The state-of-the-art in observations, experiments, and models

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Fluids are a key factor that control the friction laws governing fault slip, nucleation, and the dynamics of earthquake rupture. Fluid pressure can reduce the normal stress on faults and promote reactivation, while fluid pressure gradients can explain seismicity migration, earthquake clustering and fault segmentation. Recent work also postulates that fluids play an active role in driving aseismic slip and associated seismic signals, such as tectonic tremor at the down-dip edge of the seismogenic zone, where fluid overpressure results from dehydration of hydrous minerals. Fluids are also linked to anthropogenic activity related to georesource exploitation and reservoir management that can cause earthquakes. Similarly, volcanic earthquakes are commonly modeled as turbulent flow of magmatic fluids extruded at shallow depths and coupled to geological structures, such as the walls of crack-like structures.

The goal of this session is to provide an overview of the current knowledge of the relation between fluids and earthquakes by inviting contributions related to a range of environments – tectonic, anthropogenic, volcanic, etc. – with the aim of understanding the role of fluids in generating seismic signals and deformation. We particularly welcome contributions reporting not only observations, but also work from laboratory experiments reproducing earthquake nucleation and propagation, as well as numerical and mathematical models.