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The constitutive behavior of active faults, constraints from observations and dynamic modeling

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Geophysical data have documented the high spatial and temporal variability of fault slip modes. In the seismogenic depth range, slip rate on faults span a continuum ranging from mm/yr to m/s . Yet, the physics of the processes that control these behaviors remains poorly understood. This severely limits our ability to assess the potential size, magnitude and recurrence of earthquakes on active faults. The research approach undertaken tends to cut across traditional disciplinary bounds and promote multidisciplinary studies using field observations, geodetic measurements, laboratory experiments as well as numerical studies to better understand the evolution of fault zone properties and associated processes occurring during fault slip. We will discuss the importance of taking into account the main fault plane and the surrounding medium as a continuously evolving coupled system to highlight what controls seismic and aseismic slip and better assess seismic hazard.