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Anatomy of a 30 Ma old earthquake from an exhumed fault (Gole Larghe Fault, Adamello, Italy)

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Pseudotachylytes (solidified friction-induced melts) decorate some exhumed ancient faults and remain, up to now, the only fault rocks recognized as the unambiguous signature of seismic slip. It follows that pseudotachylyte-bearing fault networks might retain a wealth of information on seismic faulting and earthquake mechanics.

In this contribution, we will show that in the case of large exposures of pseudotachylyte-bearing faults (as is the case of the 30 Myr old Gole Larghe Fault exhumed from a depth of $\sim$ 10 km and cutting the Adamello tonalites, Italian Alps), we might constrain most of the earthquake source parameters by linking field studies with microstructural observations, high-velocity rock friction experiments, modeling of the shear heating and melt flow, and dynamic rupture models.

In particular, it has been possible to estimate the rupture directivity, the slip weakening distance, the fault dynamic shear resistance, the traction evolution with slip and the ratio between surface energy and frictional heat.

We conclude that the structural analysis of an exhumed fault may allow the reconstruction of the earthquake mechanics and the seismic energy budget at a given point of the fault.