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The timescale of the aseismic to seismic deformation in a cooling pluton: ^{40}Ar-^{39}Ar ages of the solid-state deformation in the Adamello (Southern Italian Alps)

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The northern Adamello is crosscut by ductile shear zones and pseudotachylyte-bearing faults, both compatible with the same stress field, with ductile shear zones crosscut by brittle faults. These relations are coherent with the re-equilibration of the pluton-related thermal anomaly to temperatures typical of the base of the seismogenic continental crust (T = 250 – 300°). Our new ^{40}Ar-^{39}Ar ages help to constrain the absolute age and duration of each deformation phase.
Samples included wall-rock biotite, bulk ultramylonites and pseudotchylytes. Before stepwise heating ^{40}Ar-^{39}Ar measurements, samples were characterized by microstructural, geochemical and petrological analyses.

The wall-rock biotite is 33.4±0.1 Ma old, independently of grainsize. Mylonites feature complex age spectra between 28-31 Ma, including biotite and altered feldspar. Four pseudotachylyte matrices are clustered around 30-31.5 Ma, and two samples have 25-26 Ma ages.

Ductile shearing active 2 Ma after wall-rock emplacement indicates either low strain rates, or a long-lasting thermal anomaly, which might be due to high emplacement depth, and/or the progressive assemblage of adjacent plutons through small magma pulses. Seismogenic faulting overlaps with mylonitization around 31 Ma; younger pseudotachylyte ages may be due to late-stage reactivation.