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Break of slope in earthquake size distribution and creep rate along the San Andreas Fault system

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Crustal faults accommodate slip either by a succession of earthquakes or continuous slip, and in most instances, both these seismic and aseismic processes coexist. Recorded seismicity and geodetic measurements are therefore two complementary data sets that together document ongoing deformation along active tectonic structures. Here we study the influence of stable sliding on earthquake statistics.
We show that creep along the San Andreas Fault is responsible for a break of slope in the earthquake size distribution. This slope increases with an increasing creep rate for larger magnitude ranges, whereas it shows no systematic dependence on creep rate for smaller magnitude ranges. This is interpreted as a deficit of large events under conditions of faster creep where seismic ruptures are less likely to propagate. These results suggest that the earthquake size distribution does not only depend on the level of stress but also on the type of deformation.