Supplementary Information for

Thermally activated static friction explains earthquakes interactions

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This PDF file includes:

Figs. S1 to S4

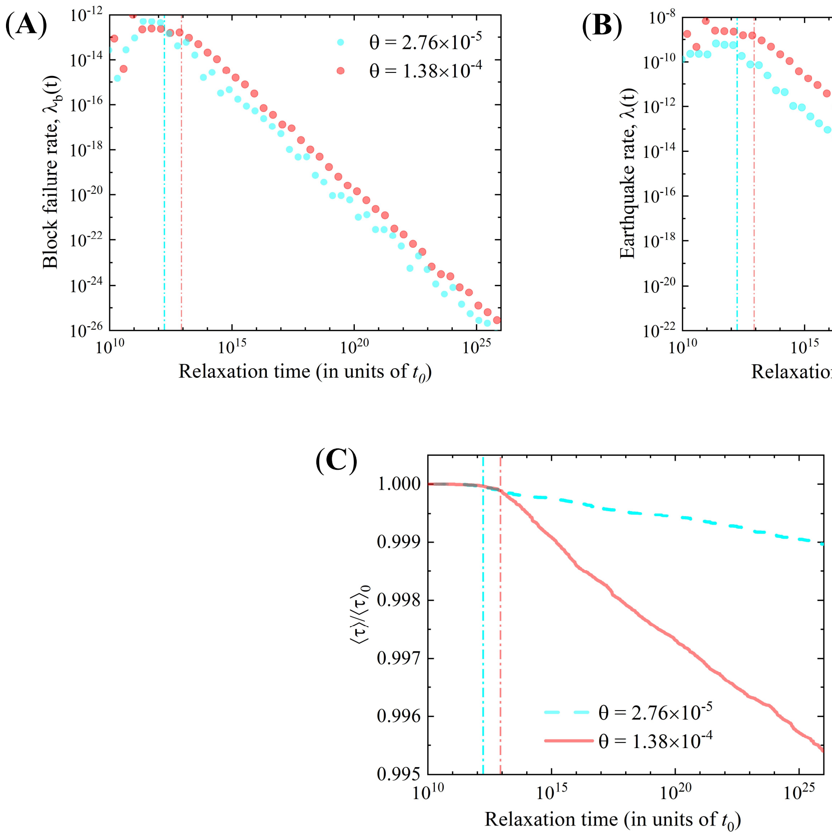

Fig. S1. Relaxation. (A) Block slipping rate $\lambda_b(t)$, (B) earthquake rate $\lambda(t)$, and (C) stress relaxation of the average shear stress $\langle\tau\rangle$ over the domain during relaxation tests performed at two different temperatures θ but a same dissipation d=4×10^{-5}, for which the sliding has been stopped. The value of $\langle\tau\rangle$ has been normalized by its value at sliding arrest, $\langle\tau\rangle_0$. The vertical dashed-dotted lines represent the value of the time constant $c = \frac{\theta}{|\dot{x}|}$, as predicted from the Fokker-Planck theoretical description (eq. (9)), for the two temperatures.

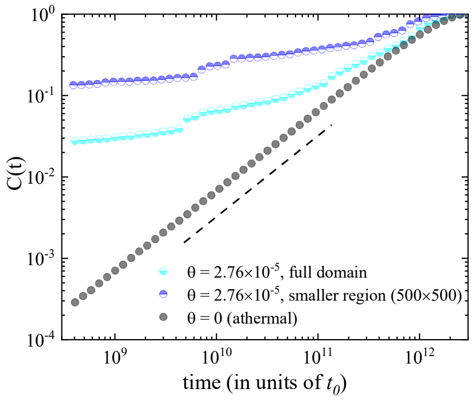

Fig. S2. Intermittency (time clustering) of earthquake activity. Intermittency of earthquake activity quantified from a correlation integral analysis of earthquake time series. $C(t)=2N_p/(N_e-1)N_e$, where N_p is the number of pairs of events which are separated in time by less than t, and N_e the number of successive events in the catalog. Cyan symbols: analysis performed for the events shown on Figure 3, over the full domain (2000×2000). Blue symbols: same as cyan symbols, but for earthquakes occurring over a smaller region (500×500). Gray symbols: for the events shown on Figure 1 for an athermal simulation. The black dashed line indicates a scaling $C(t)\sim t$ corresponding to an absence of intermittency (Poisson process), observed for the athermal model.

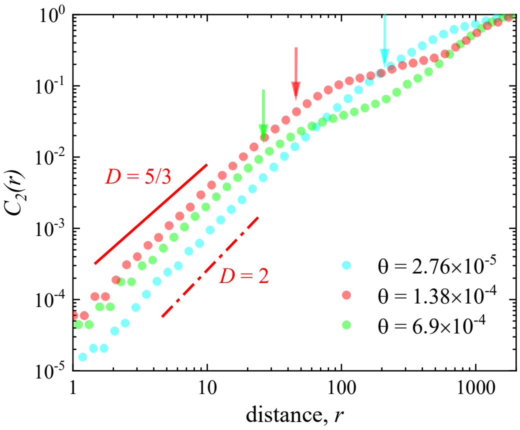

Fig. S3. Effect of temperature on spatial organization and correlation length. Correlation integral $C_2(r)=2N_p/(N_e-1)N_e$, where N_p is the number of pairs of events whose epicenter separation is less than r, and N_e the number of considered successive events, for a fixed time span $\Delta t=3\times10^{11}t_0$ and a same dissipation d=4×10^{-5}, but different temperatures θ. This shows that earthquake epicenters are organized following a fractal pattern up to a correlation length ξ (indicated by vertical arrows) that grows with decreasing temperature.

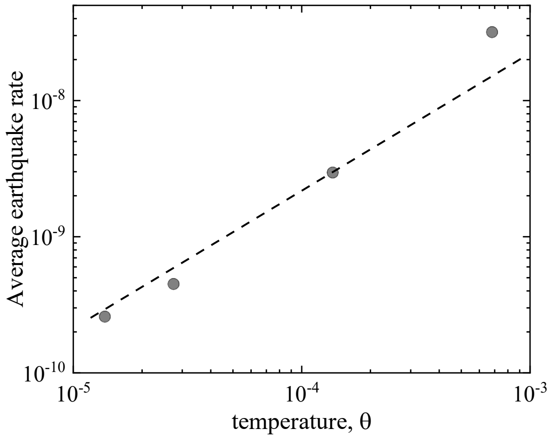

Fig. S4. Dependence of the average earthquake rate on temperature. Evolution of the average earthquake rate, i.e. including background activity as well as aftershocks, for simulations performed with the same dissipation d=4×10^{-5} but different temperatures θ. The dashed line indicates a proportional scaling, $\lambda \sim \theta$.