



## Excitation of San Andreas tremors by thermal instabilities below the seismogenic zone

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The relative motion of tectonic plates is accommodated at boundary faults through slow and fast ruptures that encompass a wide range of source properties. Near the Parkfield segment of the San Andreas fault, deep tremors and slow slip take place deeper than most seismicity, at temperature conditions typically associated with stable sliding, which should inhibit stick slip. However, laboratory experiments indicate that the strength of granitic gouge decreases with increasing temperature above 350°C, providing a possible mechanism for weakening if temperature is to vary dynamically. Here, we argue that recurring tremor and slip at these depths may arise due to shear heating and the temperature dependence of frictional resistance and contact healing. Assuming a lower thermal diffusivity in the fault zone than in the surrounding rocks, numerical simulations can explain the recurrence pattern of the mid-crustal tremors and their correlative slip distribution, predicting peak temperatures exceeding the solidus of wet granite during sliding. We conclude that shear heating associated with slow slip can be sufficient to generate pseudotachylyte injection veins in host rocks even when fault slip is domin.