The spatial-temporal total friction coefficient of the fault viewed from the perspective of seismo-electromagnetic theory

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Recently, it has been shown theoretically how the lithospheric stress changes could be linked with magnetic anomalies, frequencies, spatial distribution and the magnetic-moment magnitude relation using the electrification of microfractures in the semibrittle-plastic rock regime (Venegas-Aravena et al., 2019). However, this seismo-electromagnetic theory has not been connected with the fault's properties in order to be linked with the onset of the seismic rupture process itself. In this work we provide a simple theoretical approach to two of the key parameters for seismic ruptures which are the friction coefficient and the stress drop. We use sigmoidal functions to model the stress changes in the nonelastic regime within the lithosphere. We determine the temporal changes in frictional properties of faults. We also use a long-term friction coefficient approximation that depends on the fault dip angle and four additional parameters that weigh the first and second stress derivative, the spatial distribution of the nonconstant stress changes, and the stress drop. We found that the friction coefficient is not constant in time and evolves prior to and after the earthquake occurrence regardless of the (nonzero) weight used. When we use a dip angle close to 30?ˆ and the contribution of the second derivative is more significant than that of the first derivative, the friction coefficient increases prior to the earthquake. During the earthquake event the friction drops. Finally, the friction coefficient increases and decreases again after the earthquake occurrence. It is important to mention that, when there is no contribution of stress changes in the semibrittle-plastic regime, no changes are expected in the friction coefficient.