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Coupled interaction of earthquake nucleation with deep gases and seismo-EMs

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The source mechanisms of seismo-electromagnetic (seismo-EM) phenomena remain open questions. In order to address this problem, a new fault model taking into account a coupled interaction of earthquake nucleation with deep Earth gases is introduced based on data mining analysis of earthquake lightning (EQL): a type of seismo-EM phenomenon; i.e., coupled interaction causes a negatively electrified gas-flow as the gases pass through fractured asperities due to an exoelectron attachment reaction. The gas-pressure impressed current, which could be expressed as a function of the earthquake parameters,

$\log I = 0.5M + \log\{\mathrm{xi}\}D_c$,

where M is magnitude, $\{\mathrm{xi}\}$ is a measure of electric-coupling intensity of asperity-cracks with deep gas flow at depth D_c,. The current is transient, but the electric activity repeatedly occur along successive crack paths until a network of cracks is fully developed over the asperity zone. The frequency is expressed as $f=1/\{\mathrm{Delta}\}t$: the interaction period of electrified gas flow $\{\mathrm{Delta}\}t = \{kappa\}l_c/v$, where $\{kappa\}l_c$ is a measure of electrified gas displacement.

As shown in Fig.1, the current is sufficient to explain the seismic electromagnetic signal (SES) intensity observed at the ground level. A possible explanation for lithosphere-ionosphere EM coupling is as follows. The current generates a transient electric dipole at a focal zone, which induces the telluric current system having lower frequencies of less than 0.02 Hz. Changes in the telluric current within the conducting Earth' s surface; sea water, may affect ionospheric EM disturbances, which are observable as sporadic E and GPS-TEC anomalies, as often observed before strong earthquakes.

Keywords: seismo-EMs, earthquake nucleation, deep Earth gases, exo-electron, SES, GPS-TEC

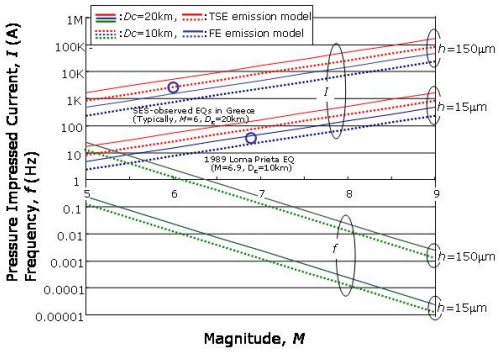

Fig.1 *I* and *f* as a function of *M*