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Modelling the impact of telluric currents on earthquake activity

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In several studies performed in recent years (e.g. Duma, Ruzhin, 2003; Duma, 2005; Lipovics, 2005; Duma, Freund, Kessel, 2006) it turned out that the induced electric currents in the Earth's lithosphere play an important role in earthquake activity: so called Lorentz forces and mechanic torques are generated, which act on the lithosphere and add stress to an active seismic rupture zone. Many examples of regional earthquake activity indicate this very close relation between the variations of the 'telluric' currents, which can easily be monitored by geomagnetic observatories, and the temporal variations of seismic activity. This applies to the earthquake frequency with respect to the time of day, in the seasonal range as well as in the long term (years, decades). Since such an interaction is rather astonishing and has rarely been considered in scientific studies, there is a strong need of a sound interpretation of this mechanism, the 'Magneto-Seismic Effect MSE'. The presentation deals with details of the electromagnetic model, the involved energy, and the model's capability to fit the observed seismic performance of several strong earthquake regions in the three time domains: diurnal, seasonal, long term. This is demonstrated for seismoactive regions in Asia (Japan, Taiwan, China, Sumatra), in the USA (California) and in Europe (Italy, Austria, Greece), even for earthquake activity with event magnitudes M greater 6. The results confirm the validity of the model and the important role of this geodynamic and electromagnetic process on strong earthquake activity, i.e. acting as a powerful trigger mechanism. Since the process is a systematic one, this makes possible predictions of seismic activity which deserve special attention for improved earthquake hazard assessments, earthquake awareness and preventive measures.