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Geomagnetic monitoring in context with earthquake activity

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There is strong indication that electric currents flowing in the Earth's lithosphere, i.e. telluric currents, interact with earthquake activity in many of the major seismic zones of the world (Duma, 1996; Duma and Vilardo, 1998; Duma and Ruzhin, 2002). As case studies have shown, continuous regional magnetic recordings in seismically active regions in Europe, Asia and America provide a base to verify this effect, since the variations of the telluric current field are well reflected in the geomagnetic data. Several examples are presented, referring mainly to the seismically active regions of Sumatra, Taiwan and California, based on data of geomagnetic observatories that surround these earthquake zones. In addition, we introduce the methodology of data processing, with the required software, to compute the crucial parameter that best reflects the coupling between lithospheric currents and seismic activity: the horizontal gradient of the current intensity generating a mechanical moment which acts on the rupture zone. The forces ('Lorentz' forces) arise from the interaction between the electric current and the Earth's main magnetic field. The observational methodology is demonstrated in three time domains: diurnal, seasonal and long-term magnetic variations, where the diurnal and seasonal variations have an external origin in the Earth's ionosphere, while the long-term variations are part of the dynamo process. Suggestions are presented regarding the optimal distribution of monitoring sites in an earthquake region and the instrumental requirements. If the method presented here is further refined, it may serve to identify phases of increasing or decreasing earthquake activity,

even of strong events with magnitude M6 and more, in any particular earthquake zone.