A SOLAR-TERRESTRIAL MAGNETIC EFFECT WITH SEISMIC IMPLICATIONS

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Several scientific publications report on changing earthquake frequency with respect to time of day and to seasons as well, which undoubtedly turn out from statistical studies for many earthquake regions. Papers devoted to this phenomenon are e.g. Conrad (1932), Shimshoni (1971), Duma & Vilardo (1998), Lipovics (2005), Schekotov et al.(2005), Duma & Freund (2008). Any natural effect on Earth which systematically appears at certain hours of the day or at a special season can solely be caused by a solar or lunar influence. Therefore this should apply also to the observed diurnal and seasonal cycles of seismic activity. Surprisingly, very few investigations were carried out on such a solar-terrestrial interaction, except studies which deal with a possible influence of tidal forces on the Earth's lithosphere. But these do not confirm tides as a general trigger for earthquakes. On the other hand, some reports indicate a relation between earthquake activity and sunspot numbers in the long term, e.g. Sytinskiy (1989). Intense studies in the past decade reveal that it is a large scale geomagnetic process which interferes with tectonic forces in many earthquake prone regions: the solar controlled electric currents in the Earth's ionosphere generate the diurnal and seasonal magnetic variations, which penetrate the Earth's lithosphere and cause induced 'telluric' currents there as well. At present there are two model candidates which show that quite strong mechanical forces result from this induction process. Since the above mentioned magnetic variations are safely recorded by all geomagnetic observatories on the globe, day by day, and for decades of their operation, the observatory data provide an excellent basis to study and to interpret the effect of magnetic impact on earthquake activity. Satellite measurements may provide gradient data of the regional geomagnetic field, which turned out to be of particular importance to compute the generated mechanical stress. Several examples are shown, demonstrating the relation between geomagnetic variations and seismicity in different regions. The magnetic and electromagnetic models are discussed, building on Lorentz forces and on the effect of magnetostriction.

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