Geomagnetic and Ionospheric Disturbances During Moderate Seismic Events in South America

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Seismic-Triggered-Travelling-Ionospheric-Disturbances (SAIDs) can be generated by seismic activity. Earth displacement due to earthquakes causes effects on the atmosphere up to 300 km in height, including the ionosphere region, as a result of the coupling of the Lithosphere Atmosphere Ionosphere interfaces. In fact, in the atmosphere, effects are amplified by up to 4 orders of magnitude, because atmospheric density decreases exponentially. We use data from magnetometer and GPS stations located in the South America region. For the time series, spectral analysis techniques based on the Continuous Wavelet Transform (CWT) and Hilbert-Huang Transform (HHT) were used. For the moderate earthquake (Mw=6.3) using GPS receiver data, we detect the Travelling Ionospheric Disturbances that are associated with an acoustic wave with a velocity of 0.8 km/s and with slower (0.3 and 0.2 km/s) velocities that may be associated with gravity waves. Favorable preconditioning offered by non-seismic MSTIDs contributes to the rise of the seismic detectable level. Using magnetometer networks, we detect SAIDs in the form of geomagnetic disturbances that have propagation velocities greater than the velocity of the primary and secondary waves recorded by seismographs, and due to the very high velocities, these disturbances may be associated mainly to the shear or oblique Alfvén waves.

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