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Magnetic field anomalies from seismo-ionospheric effects of 2011 Tohoku earthquake

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Anomalous magnetic variations were observed by ground magnetometers in East Asia area after the 2011 Tohoku earthquake. Some earlier reports showed the seismo-magnetic variations have obvious amplitude around the epicenter, we emphasis here that the variations can still be notable at stations 2000 to 4000 km away from epicenter and we define it as teleseismic magnetic disturbances (TMDs). TMDs appear about 8 min later after the arrival of seismic Rayleigh waves at teleseismic distances, and propagate at a horizontal velocity of 3.9 km/s. The wave-like TMDs last for no longer than 10 minutes, and have a main period of 2.1-3.3 min. TMDs are not generated by direct eects of processes in focal area crust or tsunami waves, instead, their properties consist with the Rayleigh wave model of seismo-ionospheric disturbances. Hence we conclude that the TMDs are the magnetic manifestation of seismotraveling ionospheric disturbances (STIDs), generated by the interaction between the ionosphere and atmosphere through acoustic waves launched by travelling Rayleigh waves.

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