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Two way interactions between earthquake, ionosphere and geomagnetic field

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Anomalous magnetic variations were observed by ground magnetometers in East Asia area after the 2011 Tohoku earthquake. Observations show that the variations can be notable at stations 2000–4000 km away from epicenter, and we define it as teleseismic magnetic disturbances (TMDs). The common morphology and time sequence at different stations are analyzed and based on the results, a possible mechanism is suggested. The mechanism for TMDs, in brief, is that Rayleigh waves after quake arrive at teleseismic sites; atmospheric disturbances (in the form of subsonic wave) are caused locally and propagate upwards into the ionosphere overhead, and then variations of ionospheric electron density induced electric current influence the magnetic field disturbances beneath. The observed time sequence of phenomena indicates that this cause-effect chain is reasonable.