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Ionospheric response of the acoustic and gravity waves generated by Earthquakes and Tsunami: Linear analysis and numerical simulation

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Acoustic and gravity waves generated by earthquakes and tsunamis are known to produce the identifiable neutral wind fluctuations in the atmosphere and electron density fluctuations in the ionosphere. With GPS networks and low orbiting altimetry satellites, electron density perturbations were detected in the ionosphere following the recent giant Sumatra earthquake. These perturbations occupy a wide frequency domain covering both acoustic and gravity waves. In this report, we study the linear and nonlinear response of the ionosphere to the acoustic and gravity waves induced by the Tsunami. To study the linear response, the first-order perturbation analysis is performed using closed set of hydro-magnetic equations. In response to the fluctuating neutral wind induced by the acoustic and gravity waves, the perturbed electric field and electronic density amplitudes are derived from the linear analysis. To study the nonlinear response, these equations are solved numerically. The standard IRI, NRLMSIS and SAMI models are used to obtain the atmospheric and ionospheric input parameters for both linear and nonlinear analyses. The results are dicussed in the context of recent earthquakes.