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Anomalies of electron density and velocity in the ionosphere before large earthquake: Comparison between DEMETER observations and SAMI3 simulations

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In this study, we use DEMETER satellite data to analyze the ionospheric plasma density (N_e) and velocity perpendicular to the magnetic field line (V_{\perp}) before large earthquakes. The observations of density and velocity anomalies before the 2010 Chile earthquake, 2009 Kermadec Islands earthquake and 2009 Samoa Islands earthquake are studied. The percentage density variation ($\Delta N_e/N_e$) and perpendicular velocity (V_{\perp}) are positively correlated. The slope between the percentage density variation and perpendicular velocity increases with geomagnetic latitude. The results from observations and from the model simulation are compared. The slope obtained from SAMI3 simulation with an imposed eastward electric field (E) is generally higher than those obtained from DEMETER. The slope of the density variation and perpendicular velocity increases with increasing imposed electric field. On the other hand, the slope generally increases with geomagnetic latitude with the same imposed electric field.