

Numerical simulation on electrodynamics of the pre-earthquake ionospheric anomalies

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Over the last few decades, ionospheric observations indicate that the total electron content (TEC) often significantly decreases in afternoon on 3-5 days before the $M > 6.0$ earthquakes. It is generally considered that electric currents driven by stressed rock flow into ionosphere. We use NRL 3D ionosphere model, SAMI3 to simulate this phenomenon, and add external current terms into current continuity equation. The range of external current distribution is $120 \pm 20^\circ\text{E}$, $30 \pm 20^\circ\text{N}$, 85~170km, and the maximum current density is 500nA/m². Our simulation result indicates that the upward current on the bottom of ionosphere produces the maximum (minimum) variation of increasing (decreasing) ~30% (~10%) ΔTEC . The increasing ΔTEC is mainly located in west region of external current; however, the decreasing ΔTEC is mainly located on both sides of increasing region.

Keywords: earthquake precursor, ionospheric dynamics, total electron content