Seismo-ionospheric Electron Density Anomalies before the 12 May 2008 Mw7.9 Wenchuan Earthquake Observed by FORMOSAT-3/COSMIC

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The global ionospheric map (GIM) is used to observe variations in the total electron content (TEC) of the global positioning system (GPS) associated with 35 M≥6.0 earthquakes occurred in China during a 10-year period of 1 May 1998-30 April 2008. The statistical result indicates that the GPS TEC above the epicenter often pronouncedly decreases on day 3-5 before 17 M≥6.3 earthquakes. The GPS TEC of the GIM and electron density profiles probed by six micro satellites of FORMOSAT3/COSMIC (F3/C) are further employed to simultaneously observe seismo-ionospheric anomalies during an Mw7.9 earthquake near Wenchuan, China on 12 May 2008. It is found that GPS TEC above the forthcoming epicenter anomalously decreases in the afternoon period of day 6 to 4 and in the late evening period of day 3 before the earthquake, but enhances in the afternoon of day 3 before the earthquake. The spatial distributions of the anomalous and extreme reductions and enhancements indicate that the earthquake preparation area is about 1650km and 2850km from the epicenter in the latitudinal and longitudinal directions, respectively. The F3/C results further show that the ionospheric F2-peak electron density, NmF2, and height, hmF2, significantly decreases approximately 40% and descends about 50-80km, respectively, when the GPS TEC anomalously reduces.