

FORMOSAT-7/COSMIC-2 observing seismo-ionospheric precursors of the 14 November 2019 M7.1 Indonesia Earthquake

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FORMOSAT-7/COSMIC-2 (F7/C2), with the mission orbit of 550 km altitude, 24-deg inclination, and a period of 97 minutes, was launched on 25 June 2019. Tri-GNSS Radio occultation System (TGRS), Ion Velocity Meter (IVM), and RF beacon onboard F7/C2 six small satellites allow scientists to observe the plasma structure and dynamics in the mid-latitude, low-latitude, and equatorial ionosphere in detail. F7/C2 TGRS sounds ionospheric RO (radio occultation) electron density profiles, while F7/C2 IVM probes the ion density, ion temperature, and ion velocity at the satellite altitude. The F7/C2 electron density profiles and the ion density, ion temperature, and ion velocity, as well as the global ionospheric map (GIM) of the total electron content (TEC) derived from global ground-based GPS receivers are used to detect seismo-ionospheric precursors (SIPs) of the 14 November 2019 M7.1 Indonesia Earthquake. The GIM TEC and F7/C2 RO NmF2 significantly increase specifically over the epicenter on 25-26 October, which indicates SIPs of the 14 November 2019 M7.1 Indonesia Earthquake being detected. The F7/C2 RO electron density profiles upward motions suggest that the eastward electric fields have been enhanced during the SIP days of the 2019 M7.1 Indonesia earthquake. The seismo-generated electric fields of the 2019 M7.1 Indonesia earthquake are 0.34-0.64 mV/m eastward. The results demonstrate that F7/C2 can be employed to detect SIPs in the ionospheric plasma, which shall shed some light on earthquake prediction/forecast.

Keywords: FORMOSAT-7/COSMIC-2, radio occultation, seismo-ionospheric precursor