

Global ionosphere map constructed by using total electron content from ground-based GNSS receiver and FORMOSAT-3/COSMIC GPS occultation experiment

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Effects of rapidly changing ionospheric weathers are critical in high accuracy positioning, navigation, and communication applications. A system used to construct the global total electron content (TEC) distribution for monitoring the ionospheric weather in near real time is needed in the modern society. Here we build the TEC map named Taiwan Ionosphere Group for Education and Research (TIGER) Global Ionospheric Map (GIM) from observations of ground-based GNSS receivers and space-based FORMOSAT-3/COSMIC (F3/C) GPS radio occultation observations using the spherical harmonic expansion and Kalman filter update formula. The TIGER GIM (TGIM) will be published in near real time of 4-hour delay with a spatial resolution of 2.5° in latitude and 5° in longitude and a high temporal resolution of every 5 min. The F3/C TEC results in an improvement on the GIM of about 15.5% especially over the ocean areas. The TGIM highly correlates with the GIMs published by other international organizations. Therefore, the routinely published TGIM in near real time is not only for the communication, positioning, and navigation applications, but also for monitoring and scientific study of ionospheric weathers, such as magnetic storms and seismo-ionospheric anomalies.

Keywords: Global Ionospheric Map, Total Electron Content, FORMOSAT-3/COSMIC, Ionospheric weather, GNSS