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Estimation of the Ionosphere and Plasmasphere Contribution to the GPS TEC under Quiet and Disturbed Conditions

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There are presented results of the comparative analysis of GPS TEC data and FORMOSAT-3/COSMIC radio occultation measurements during period of quiet and disturbed conditions. COSMIC-derived electron density profiles were integrated up to the height of 700 km (altitude of COSMIC satellites), the estimates of ionospheric electron content (IEC) on a global scale were retrieved with use of spherical harmonics expansion. Joint analysis of GPS TEC and COSMIC data allows us to extract and estimate electron content corresponded to the ionosphere (its bottom and topside parts) and the plasmasphere (h>700 km) for different conditions. In order to analyze seasonal behaviour of PEC contribution to GPS TEC at the different regions we selected several specific points with coordinates, corresponded to the approximate positions of different, mid-latitude and low-latitude, ionospheric sounding stations. For each specific points GPS TEC, COSMIC IEC and PEC estimates were analyzed. During solar minimum conditions percentage contribution of ECpl to GPS TEC indicates the clear dependence from the time and varies from a minimum of about 25-50% during day-time to the value of 50-75% at night-time. Contribution of both bottom-side and topside IEC has minimal values during winter season in compare with summer season (for both day- and night-time). Several case-studies of geomagnetic storms were analyzed in order to estimate changes and redistribution of electron content between ionosphere and plasmasphere. The obtained results were compared with TEC, IEC and ECpl estimates retrieved by Standard Plasmasphere-Ionosphere Model that has the plasmasphere extension up to 20,000 km (GPS orbit).