Short-term Variabilities of Wave-3 and 4 Structures in the Low-latitude Ionosphere

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In this study, the day-to-day variabilities of wavenumber-3 and 4 longitudinal structures in the ionosphere after the launch of FORMOSAT-7/COSMIC-2 (F7/C2) in July 2019 is investigated using the Global Ionosphere Specification (GIS). The GIS is based on implementation of assimilating 1500-1800 F7/C2 radio occultations (ROs) per day, in conjunction with ground-based global positioning system (GPS) TEC measurements with international reference ionosphere providing background electron density information. The most prominent components of wavenumber-3 and 4, the eastward propagating nonmigrating diurnal tide with zonal wavenumber 3 (DE3), diurnal eastward propagating nonmigrating tide with zonal wavenumber 2 (DE2), and stationary planetary wave 3 and 4 are examined. The results reveal that wave-3 and 4 tidal amplitudes change of 2-4 TECu (represent ~15-25% in background TEC value) regularly occur on very short timescales (~1–2 days) at the equatorial ionosphere anomaly (EIA) crests, it could be considered as the modulation of the E region dynamo. The strong asymmetries of wavenumber 4 occur around the maxium amplitude of the whole period in October, which implies the in-situ effects due largely to meridional neutral winds. Further, to investigate their relationship to the tidal wind field of this hypothesis, these results are compared to the Whole Atmosphere Community Climate Model (WACCM) using the Data Assimilation Research Testbed (DART).

Keywords: longitudinal structure in ionosphere, wavenumber-3 and 4, short-term variabilities of tides

