



Intra- and Inter-annual Variations of the Ionospheric WN4 Structure and the Causative DE3 Tide

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It is suggested that the longitudinal wavenumber-4 (WN4) structure in the ionospheric F-region is caused by the non-migrating tidal mode DE3 (diurnal eastward wavenumber-3) in the upper atmosphere at the ionospheric E-region altitudes. In order to investigate the relationships existing in these two kind waves, we first deduce the WN4 structure from the latitudinally integration of total electron content (ITEC), which is retrieved from the JPL GIMs. Meanwhile, we use the upper atmospheric observation of SEBER and TIDI on board the TIMED satellite to obtain the temperature (T), the zonal and meridional wind (U, V) components of DE3 tide. It is found that both the intra- and inter-annual variations WN4 is much similar to the T and U components of DE3, while it is quite different to the V component. The intra-annual variation of WN4 and DE3-T/U is mainly acted as that both waves present chiefly in two periods of a year, they appear in later spring with moderate strength, and become very strong in summer and autumn seasons. In contrast, both waves are very weak or tend to vanish during winter. The inter-annual variation of WN4/DE3 waves are represented as the quasi-biennial oscillation (QBO). Both them are stronger during the eastward QBO wind phase than during the westward wind phase. The similar intra- and inter-annual variations of the WN4 and DE3-T/U waves provide a signify evidence that the ionospheric longitudinal WN4 structure is excite by the upper atmospheric non-migration tide DE3.