Wave-4 Structure of Electron Density and Temperature in the Topside Ionosphere

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Longitudinal structure of electron density (N_e) and temperature (T_e) observed by the Hinotori satellite and the DEMETER satellite was examined in this paper. Longitudinal structure of N_e and Te show a unit-correlation pattern during morning, which local maximums of N_e and local minimums of T_e appear around 90, 190, 250 and 330°E except during May-September. N_e and T_e observed by both satellites show a good agreement during morning from July to October nonetheless the solar activity difference. Meanwhile, longitudinal structure of Ne and Te display a positive correlation pattern during daytime in high solar activity. Fast Fourier transform analysis reveals that wave number 3 and 4 of N_e are pronounced during November-April and May-October, respectively, On the other hand, wave number 3 and 4 of T_e are pronounced during October-May and July-September, respectively. These results show that T_e in the topside ionosphere does not follow local N_e variation rather integrated N_e along the magnetic field line. Therefore longitudinal T_e variation display project longitudinal variation of lower ionosphere projected to the topside ionosphere. Discrepancies between N_e and T_e indicate the altitude difference of longitudinal wave structure.

Keywords: Electron temperature; electron density; topside ionosphere; wave-4 structure; DEMETER satellite; Hinotori satellite; equatorial ionosphere;