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Longitudinal Variability of Thermospheric Temperature

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A topic of great current interest in atmospheric dynamics is the developing recognition of the influence of the diurnal eastward-propagating non-migrating tide of wavenumber 3 (DE3) on the thermosphere. Longitudinal variations of F-region ionospheric electron density show a zonal wavenumber 4 pattern, expected for satellite observations at a fixed local time with respect to a rotating Earth. WINDII observations of airglow O(1S) volume emission rate (VER), excited by photoelectron impact on atomic oxygen at 250 km were interpreted as neutral density observations; they have shown the wavenumber 4 to be a common density perturbation in the equatorial thermosphere. The analysis has been extended further by examining thermospheric neutral temperatures at 245 km height derived from the observed daytime O(1S)VERs and the atomic oxygen density scale heights centred at this altitude. The observations examined have shown a distinct wave-4 signature at 20°S-40°S for the period from September to April with a more pronounced increase during fall equinox. Another enhancement of the wave 4 amplitude is observed during January. At the same time the quasi 2-day wave was observed in the MLT region in Rayleigh scattering temperatures and up to 180 km in O(1S) airglow and wind observations. The thermospheric temperatures at 245 km are further analysed for quasi 2-day wave signatures in attempt to determine the source of the observed thermospheric temperature wave-4 perturbations and their coupling with the neutral atmosphere below.