Global view of the nighttime low-latitude ionosphere by the IMAGE/FUV 135.6 nm observations

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The FUV Spectrographic Imager (FUV/SI) onboard the IMAGE satellite takes images at two wavelengths (121.8 nm: SI-12 and 135.6 nm: SI-13). The SI-13 measures 135.6-nm emissions from the upper atmosphere with a narrow spectral resolution of 8.0 nm. During nighttime, the 135.6-nm airglow is a good measure of ionospheric O+ ion density integrated along the view path. Because the latitude of the satellite apogee drifts toward the equator, the FUV/SI viewed the low latitude region at night in early 2002. The SI-13 images clearly show the intertropical FUV arcs corresponding to the equatorial anomaly (EA) in the ionosphere. The two-minute cadence of the instrument provides a unique data set of the nighttime low-latitude ionosphere. We compare the IMAGE observations of the OI 135.6 nm nightglow with the model emission intensities calculated by using the SAMI2 ionosphere model. The comparison shows that although both the FUV observation and the model give comparable emission intensities at the EA peak, the two differ in terms of their latitudinal and local time dependences. Because FUV global images reveal the very variable nature of the low-latitude ionosphere, further data analysis can confirm the local time, longitude, and latitudinal dependences observationally. Large-scale (~1000 km) longitudinal wavy structures are often seen in OI 135.6-nm images. These structures drift eastward with a phase velocity of 100 - 200 m/s. The structure may be due to the plasma density perturbations generated by acoustic gravity waves through amplification by the spatial resonance and the Rayleigh-Taylor instability. This is a very common structure seen in the pre-midnight sector of FUV/SI images regardless of longitude.