Longitudinal Variability of the Low Latitude Ionosphere and Scintillation Activity

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Longitudinal variability of the post-sunset low latitude ionosphere is provided by Tiny Ionospheric Photometers (TIP) on the Constellation Observing System for Meteorology, Ionosphere, and Climate (COSMIC) satellites. The TIP sensor is a compact, nadir directed, narrow-band, ultraviolet photometer operating at the 135.6 nm wavelength. This emission is produced by radiative recombination of O^+ ions and electrons. At night, the strength of the emission is proportional to the square of the peak electron density, Nmax. TIP measures the horizontal structure of the ionosphere with 15-30 km resolution and high sensitivity, providing detailed observations of the post-sunset equatorial anomaly even during solar minimum conditions. It has previously been demonstrated by Whalen (JGR, 2004), that the maximum value of the pre-reversal enhancement in vertical ExB drift is linearly related to the value of Nmax at the crest of the equatorial anomaly at 2000 LT. A linear relationship has also been established between the TIP 135.6 nm radiances at the crest of the equatorial anomaly at 2000 LT and the pre-reversal enhancement in vertical ExB drift velocities at 1900 LT in the Peruvian longitude sector. This relationship is independent of the magnitude of the daytime vertical ExB drift velocities. Based on this relationship and TIP 135.6 nm observations, a longitude variation in the pre-reversal enhancement in ExB drift reveals a 4-cell pattern that is attributed to non-migrating tides which arise from tropospheric weather patterns in the tropics. The longitudinal pattern of the pre-reversal enhancement suggests that certain longitudes are more favored than others for the subsequent development of scintillation activity. The strength of this relationship is investigated using scintillation observations from the SCINDA network of ground-based VHF and UHF receivers. A strong relationship implies a connection between tropospheric weather and the occurrence of scintillation activity.