Longitudinal Variability of Equatorial Electrodynamics and Scintillations

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Abstract: The longitudinal variability of equatorial electrodynamics or scintillations has not been thoroughly investigated due to the lack of ground-based instruments that track the temporal variation of scintillations and the driving electrodynamics at different longitudes. Thus, the study of the longitudinal variability of scintillations and the driving electrodynamics has been possible only using in situ observations. In this paper we present the longitudinal variability of the equatorial electrodynamics and scintillation activities using the combination of instruments onboard SWARM and C/NOFS satellites and ground-based radars, GPS receivers, and AMBER magnetometers network. Both ground- and space-based observations show stronger dayside and evening sector equatorial electrodynamics in the American and Asian sectors compared to the African sector. On the other hand, using the chain of ground-based GPS and radar observations, the African sector is found to be home for stronger and year-round active ionospheric bubbles/irregularities compared to the American and Asian sectors. This raises the question: if the evening sector equatorial electrodynamics (vertical drift), which is believed to be the main cause for the enhancement of Rayleigh–Taylor (RT) instability growth rate, is stronger in the American sector and weaker in the African sector – why are the occurrence and amplitude of equatorial irregularities stronger in the African sector?