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Global ionospheric vertical drift studies

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Electrodynamic and dynamic processes mainly control low and equatorial latitude ionospheric electron density changes. The transportation of plasma to high altitudes where recombination rate is lower over the equatorial regions results in the formation of the equatorial ionization anomaly
characterized by enhancement of electron density at approximately 15 degrees latitude on both sides of the geomagnetic equator. Magnitudes of vertical ExB drifts influence the extent of development of ionospheric irregularities and hence useful to understand for communication and navigation applications. Despite the critical importance of vertical ExB drift (Lorenz force), long-term direct observations of low latitude electric field data remains scarce in a number of longitude sectors. As a result, a number of studies rely on Low Earth satellite data that are more appropriate for climatological studies. A useful complimentary data is daytime observations from ground-based magnetometers. Ground-based magnetometer data have advantage of being continuous with high temporal resolution and are available in a number of longitude sectors, thus increasing the probability of getting coincidental observations when the satellite is within the vicinity of the magnetometer location. It is established that the difference between horizontal components of the Earth's magnetic field observations (ΔH) from magnetometer locations at the equator and about 6- 9 degrees away from the equator is a proxy of EEJ, which has a linear relationship with vertical ExB drift. The framework of the current project involves performing climatological studies of vertical drifts observed by the Communications and Navigation Outage Forecasting System (C/NOFS) satellite and EEJ data with the ultimate aim of developing a global model of low latitude vertical drifts.

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