Title: Effect of Zonal Wind Shears on low-latitude Westward Currents associated with Equatorial Electrojets

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Abstract:

The highly varying neutral winds in the E-region ionosphere tends to push the plasma through the Earth's magnetic field which sets up electric fields and ionospheric currents. Most times, the strongest daytime magnetic signal is due to the eastward equatorial electrojet (EEJ) at the magnetic equator. The westward currents seen at the flanks of dip equator are often called as Equatorial Electrojet (EEJ) return currents or sidebands. Both the EEJ and the westward currents are highly variable in strength and depend on the neutral wind in the E- and lower F-region where ionospheric conductivities are large. We still lack a full understanding of how changes in the neutral wind modify the low-latitude current system.

The present study focuses on understanding the effect of local zonal winds at E to lower-F region altitudes on the intensity of these currents. The zonal wind measurements taken by the MIGHTI instrument onboard the ICON satellite and the latitudinal profile of EEJ currents given by the Swarm satellites are utilized for this study. The vertical gradient in zonal wind velocity at the altitudes where Pedersen conductivity dominates plays a major role in increasing or decreasing the westward current intensity. We further used the MIGHTI winds along with the equatorial electric field estimated by the Swarm observations in the Richmond's (1973) EEJ model to understand the effect of zonal winds at different altitudes. The dependence of the westward current on the vertical gradient in the zonal wind for different solar cycle conditions will also be presented.

References-

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[2] Fambitakoye, O., Mayaud, P. N., & Richmond, A. D. (1976). Equatorial electrojet and regular daily variation SR—III. Comparison of observations with a physical model. Journal of Atmospheric and Terrestrial Physics, 38(2), 113–121. https://doi.org/10.1016/0021-9169(76)90118-5