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Afternoon counter electrojet longitudinal and seasonal variability in the South American sector

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One important feature of the geomagnetic variations near the magnetic equator, along which the equatorial electrojet (EEJ) flows at E-region heights, is the occurrence of counter electrojet (CEJ) events. A CEJ event results from the reversed flow of the eastward EEJ, which usually lasts for a few hours. The westward currents during CEJ events cause depressions in the horizontal (H) component of the geomagnetic field near the magnetic equator. The effect of the EEJ/CEJ can be isolated from other large-scale magnetic variations caused by Sq and magnetospheric currents by using a pair of stations located several 100 km apart in the same longitude and taking the difference of H measured at the two stations.

Here, we present an analysis of the longitudinal and seasonal dependence of the occurrence rate of CEJ events for the South American sector in the period from 2008 to 2017. We used geomagnetic data from the pair Huancayo (HUA, at the geomagnetic equator) and Piura (PIU) for the Peruvian sector, and the pair Tatuoca (TTB, presently at the geomagnetic equator, for which we present new digital data) and Kourou (KOU) for the Brazilian sector. It is interesting to note that TTB is placed in a region with very strong secular variation, leading to a significant movement of the magnetic equator.

It is found that the seasonal dependencies of afternoon CEJ occurrence rates are different between the Peruvian and Brazilian sectors. CEJ events are most frequent during the Northern-Hemisphere summer in the Brazilian sector and during the Northern-Hemisphere winter in the Peruvian sector. An analysis of space-borne observations of the ExB drift shows similar results. We will discuss possible mechanisms for the longitudinal difference in the occurrence of CEJ events.