Experimental Amplitude Characterization of Pc3 and Pc5 Pulsations at the Brazilian Equatorial Region

Silva, G. B. D. D.; **Alves, L. R.**; **Padilha, A. L.**

Daytime equatorial electrojet currents (EEJ) are known to amplify geomagnetic variations on the ground in the equatorial region, with the possible exception of Pc3 pulsations for which there are reports of both amplification and damping in the pulsation amplitude near the magnetic equator. To clarify the EEJ effects on ground continuous pulsations (Pc) in the Brazilian equatorial region, we statistically analyzed the amplitude structure of Pc3 (10 - 45 s) and Pc5 (150 - 600 s) pulsations recorded preferably during quiet days at multiple equatorial to low latitude stations (L = 1.00 - 1.12) nearly aligned along the 10° magnetic meridian. It was observed that diurnal Pc5s were amplified at all stations of the equatorial region, but mainly at those closest to the dip equator (latitudes less than 2°), whereas diurnal Pc3s were preferentially damped at equatorial stations, especially at one station under the dip equator. We interpret these differences as associated with different mechanisms of pulsation generation and transmission, and to the increase of Cowling conductivity in the diurnal equatorial ionosphere. Daytime Pc5s are transmitted horizontally in the TM0 mode from polar latitudes and amplified in the equatorial region by the higher ionospheric conductivity. On the other hand, daytime Pc3s are preferably upstream waves generated by ion-cyclotron instability on the bow shock, which propagate as compressional waves along the equatorial plane of the magnetosphere and are damped by the high conductivity of the equatorial ionosphere before reaching the ground. Our data also show significant sunrise terminator effects in Pc3 pulsations at the stations closest to the dip equator. However, on contrary to reported at other longitudes, in the Brazilian equatorial region the sunrise effect increases the H-to-D (north-south to east-west) amplitude ratio. We suggest that these significant differences could be arising from the markedly different magnetic declination angles between the Brazilian sector and the regions of the other studies. In our case, the H-component amplification can be explained by enhancements of the zonal (eastward) electric field near the magnetic equator driven by F region neutral winds (the F region dynamo) shortly after sunrise.

Publication:
American Geophysical Union, Fall Meeting 2017, abstract #GP43B-0992

Pub Date:
December 2017

Bibcode:
2017AGUFMGP43B0992S

Keywords:
0694 Instruments and techniques; ELECTROMAGNETICS;
0699 General or miscellaneous; ELECTROMAGNETICS;
1594 Instruments and techniques;
GEOMAGNETISM AND PALEOMAGNETISM;
1599 General or miscellaneous;
GEOMAGNETISM AND PALEOMAGNETISM