Lower ionosphere monitoring by the South America VLF Network (SAVNET): C region occurrence and atmospheric temperature variability.

AUTORES:
Perin, F., Raulin, J., Rivero, H., Kaufmann, P., Rodriguez, R., Clilverd, M., Samanes, J., Fernandez, G.

RESUMEN:

Daily profiles of phase measurements as observed on fixed VLF paths generally show a transient phase advance, followed by a phase delay, for about 90 min after sunrise hours. This is indicative of a reflecting ionospheric C region developing along the terminator line at an altitude below the normal D region. The suggested occurrence of a C region is consistent with rocket measurements made in the 1960s, showing a maximum of the electron density between 64 and 68 km, and by radio sounding in the 1980s. In order to correctly describe the properties of the phase effect associated with the presence of a C region, it is important to understand the subionospheric propagation characteristics of the VLF paths. In this paper, we analyze the variations presented by the temporal properties of the VLF narrowband phase effect and determined a parameter associated with the appearance of the C region at sunrise hours observed by receivers from the South America VLF Network. Periodic patterns emerge from the parameter curves. Two distinct temporal behavior regimes can be identified: one exhibiting slow variations between March and October, and another one exhibiting faster variations between October and March. Solar illumination conditions and the geometrical configuration of the VLF paths relative to the sunrise terminator partly explain the slow variation regime. During periods of faster variations, we have observed good association with atmospheric temperature variability found in the measurements of the Thermosphere Ionosphere Mesosphere Energetics and Dynamics and Sounding of the Atmosphere using Broadband Emission Radiometry satellite instrument, which we assume to be related to the winter anomaly atmospheric phenomenon. However, when comparing the parameter time series with temperature curves, no direct one-to-one correspondence was found for transient events.

Key words:
Ionosphere; Solar monitoring; Upper and lower atmosphere interaction; VLF technique.