First Report on Coseismic Ionospheric Disturbances Following the Deep-Focus Earthquake (Mw 6.6) in Tarauacá, Acre, Brazil: Ground Uplift and TEC Analysis

Authors

[1] Adebayo, O. M.; [1] Kherani E. A.; [1] Pimenta A. A.

Affiliation

[1] National Institute for Space Research, São José dos Campos – Brazil

Abstract

On January 20, 2024, a deep-focus earthquake of magnitude 6.6 struck near Tarauacá, Brazil, at a depth of 607.0 km. While no surface damage was reported, this event marked a significant seismic occurrence in a region known for deep earthquakes associated with the subducted Nazca Plate. Using Global Navigation Satellite System (GNSS) Total Electron Content (TEC) data from the Brazilian Network for Continuous Monitoring of GNSS Systems (RBMC) and seismic data from the IRIS network, we analyzed the earthquake's impact on both ground surface (in form of uplift) and ionosphere (in form of disturbances). The results show clear ionoquakes characterized by distinct "N-type" wave patterns in TEC data, originating from infrasonic-acoustic waves launched from the earthquake's crustal displacement. The ionoquakes arrived in the ionosphere 8.3 minutes from the mainshock onset and traveled with the net propagation speed of 550 m/s to 743 m/s. This is the first report on coseismic ionospheric disturbances, or ionoquakes, following an earthquake in the Brazilian sector. The spectral analysis shows a maximum TEC amplitude in the frequency range 14 mHz – 16 mHz which suggest that the ionoquakes are signatures of high-frequency infrasonic-acoustic waves dynamics.