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Variations of the electron density in the topside ionosphere during the earthquake on January 22, 2024 in Central Asia

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According to the US Geological Survey (https://earthquake.usgs.gov/earthquakes/) strong M7.0 earthquake occurred on January 22, 2024 at 18:09:04 (UTC), 128 km WNW of Aykol, China with coordinates of the epicenter 41.263°N, 78.659°E at the depth 13.0 km. In this study, observations from the Swarm satellites that provide in situ measurements of the local ionospheric parameters during the M7.0 China earthquake on January 22, 2024 are analyzed. Analysis of observations of plasma density perturbations along the trajectories of Swarm satellites over the area of earthquake, revealed the features, which are likely associated with the penetration of the seismogenic electric field into the ionosphere [1]. The EQ occurred during a prolonged period of geomagnetic quietness. Several hours after the main shock, the tandem of Swarm_C and Swarm_A satellites crossed the EQ area in the dark ionosphere and observed a small-scale irregularity of the plasma density. The satellite flying first measured higher values of Ne, while the second satellite, flying 12 s later and ~150 km to the east, detected a drop of about $1.5*10^4$ cm^{-3}. The anomaly started developing just over the epicenter a day before the EQ and maximized on the day of the main shock and aftershocks. We suppose that the observed irregularity is a signature of a seismogenic electric field penetrating the ionosphere. The magnitude and shape of the observed ionospheric irregularity appears to be consistent with the predictions of models representing the concept of lithosphere-atmosphere-ionosphere coupling in terms of electrodynamic processes [2].

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References

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