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Morphological characteristics and coupling mechanism of the ionospheric disturbance caused by Super Typhoon Sarika in 2016

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Abstract The temporal and spatial morphological characteristics of the ionospheric disturbance excited by Super Typhoon Sarika (ST-Sarika) in 2016 are investigated using Tomography Sounding Data observed by Digisonde-4D portable sounder installed on FuKe Station (FKS) of Meridian Space Weather Monitoring Project of China. The results show that the significant ionospheric disturbances are found and correlated to ST-Sarika. The electrons in E and F1 layer decreased and even disappeared during the period from UTC 00:00 to 03:00 in forenoon of 17 Oct 2016, the 1st day before ST-Sarika landed on Hainan Province. But the electron density in E and F1 layer increased in the afternoon of ST-Sarika landfall day and the next day. As the ascending and descending airflows of ST-Sarika alternately passed above FKS, the anomalies of profile electron density in F2 layer periodically appeared at 4 hours interval. When the strongest ascending airflow of ST-Sarika eyewall was above FKS UT 12:00 (Sundown) of 18 Oct, the extent of electron density profile anomaly in F2 layer was the largest with the maximum of 0.8×10^6 e/cm³ and the electron in the F2 layer above 350 km altitude disappeared. Additionally, the ionosphere vertical drift above FKS was mainly downwards and its mean daily velocity reached the maximum of 6.8 m/s on 18 Oct, but the ionosphere vertical drift velocity suddenly increased to 70 m/s and last for a few minutes before typhoon center arrived above FKS. Based on these temporal and spatial morphological characteristics of the ionospheric disturbances, the coupling mechanism was explained by the combined action of turbulent layer movement, photochemical reaction, neutral wind, electric field, and gravity waves from the interaction between ST-Sarika airflow and the varied topography.

Key points:

- The electrons in E and F1 layer decreased and even disappeared in forenoon of the 1st day before ST-Sarika landed on Hainan Province. But the electron density in E and F1 layer

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