



Characteristics of Ionospheric Scintillations in Chengdu, China

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Abstract The atmosphere was affected by ionospheric irregularity when wireless electromagnetic waves pass through the region. And the amplitude and phase fluctuate rapidly in a short period, which is called ionospheric scintillation. To better investigate space environment and communication, the study of ionospheric scintillation characteristics and its influence on electromagnetic communication has become increasingly important. Based on the observation data of GPS(Global Position System) /TEC(Total Electron Content) receiver placed in Chengdu (104.07°E, 30.67°N) from January 2018 to September 2020, the characteristics of ionospheric scintillation with time over Chengdu, China was analyzed statistically in this paper. Besides, a data processing program was developed for the received GPS/BDS(BeiDou Navigation Satellite System)/Galileo. The results show that the occurrence rate (OR) and intensity of ionospheric scintillation events have diurnal and seasonal variations over Chengdu, China. There is higher in spring and autumn, and they reach their maximum at the spring and autumn equinoxes. In addition, ionospheric scintillation events almost always occur at night. And ionospheric scintillation events occur rarely during the day, occasionally in the afternoon. However, the occurrence of ionospheric scintillation events is related to the elevation angles. It is shown that medium scintillation and strong scintillation events are mainly concentrated in the elevation angle of about 150°-210° due to the characteristics of the ionospheric irregularity. The overall occurrence rate of ionospheric scintillations over Chengdu declined generally during 2018-2020 due to solar and geomagnetic activity decreased. Furthermore, earthquakes occur relatively frequently in Chengdu, China, and it is found that the ionospheric scintillation intensity increases when earthquakes occur. The characteristics of ionospheric scintillation during earthquakes can be further studied in the future. This paper provides a reference for the construction of a scintillation prediction model in middle latitudes.

Keywords ionospheric irregularity; ionosphere scintillation; solar activity; geomagnetic activity; earthquake

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