

Ionospheric observations by Equatorial Atmosphere Radar during annular eclipse in December 2019

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The area of the Earth's atmosphere above an altitude of about 80 km is called the ionosphere, where molecules and atoms are partially ionized. Since the electron density varies depending on altitude, time, and location, radio waves passing through the ionosphere are delayed or refracted, which cause satellite communication failures and decrease GPS positioning accuracy. There is a need to accurately measure and predict the electron density distribution. It is known that a solar eclipse reduces the amount of sunlight when the moon passes in front of the sun in the daytime and affects the electron density distribution. In this study, during the annular solar eclipse near Southeast Asia on December 26, 2019, we observed the ionospheric E region with the Equatorial Atmosphere Radar (EAR) near the equator in West Sumatra, Indonesia, and analyzed the observation data. We also compared the results with ionosonde observations in Southeast Asia. Although clear 150-km echoes were observed with the EAR in the days before and after the eclipse, the 150-km echoes were not detected on the eclipse day. On the other hand, the E-region echoes showed significant variation in the distribution of echo power and Doppler velocity, which is thought to be affected by the solar eclipse.

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