

Ionospheric Effects of a Solar Eclipse of March 20, 2015 on Oblique Sounding Paths in the Eurasian Longitudinal Sector

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Abstract

© 2016, Springer Science+Business Media New York. The results of measuring HF signals on oblique chirp sounding paths in the Eurasian region during a solar eclipse of March 20, 2015 and the neighboring days are presented. The solar eclipse took place against the background of a strong magnetic storm. It was established that during the solar eclipse on oblique sounding paths of different length and orientation the decrease in the maximum observable frequency for the F mode (MOF-F) and the lowest observable frequency for the F mode (LOF-F) was 8–14% and 22–33%, respectively. During the eclipse, the signal amplitude increased by 3–5 dB. On the Lovozero—Nizhny Novgorod path in the maximum phase of the solar eclipse, the electron density decrease in the ionospheric E and F2 layers at the midpoint of the path reached 37% and 22%, respectively. According to the MOF and LOF variation measurements for various modes, the group delay time of radio signals, and the results of spectral analysis, it was found that in the eclipse there were wave disturbances with a period of 25 to 50 min. However, quasi-periodic variations of MOF-F and LOF-F having a period of 50 to 80 min but which started before the eclipse were detected on some paths. Probably, in these cases, the variations were a result of the superposition of disturbances from two sources, namely, the magnetic storm and the solar eclipse.

<http://dx.doi.org/10.1007/s11141-016-9711-9>
