VARIATIONS IN CHIRP SIGNAL CHARACTERISTICS DURING X-RAY SOLAR FLARES: EXPERIMENT AND MODELING

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In this work we analyze chirp signal characteristics obtained over three oblique-incidence sounding (OIS) paths located in the Siberian and Far Eastern regions of the Russian Federation during periods of M and X class solar flares. The lowest observed frequencies (LOF) have been evaluated using interactive processing of OIS ionograms. We analyze OIS data obtained in 2014–2016. LOF values characterize signal absorption over the paths. LOF variations for the disturbed days were compared with LOF values for the quiet days. Compared to quiet days, LOFs showed a sharp increase during the studied X-ray solar fluxes over all paths. In the moment of maximum of X-ray fluxes, disappearance of reflections from lower layers of ionosphere has been observed, chirp signals propagated due to reflections from F2-layer. Amplitude of chirp signal has decreased also. Our study demonstrated that during solar flares, radio wave absorption increased sharply, frequency range decreased. We performed modeling of chirp signal characteristics on the basis of complex algorithm, which includes two modules: the ionosphere and plasmasphere global model and the radio wave propagation model for the X1.3 class solar flare on 25.04.2014. The results of the modeling are in good agreement with the experimental data.

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