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Investigation of reactions of the lower ionosphere to remote strong earthquakes using records of radio noise and partially-reflected signals

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In the paper on the basis of the experimental data obtained by the partial-reflection technique for more than 180 earthquakes, there are studied radio-noise variations within $f = 2-4$ MHz and characteristics of disturbances generated or amplified in the ionospheric D-region over these events. Our investigations were carried out for the earthquakes having $E > 10^{11}$ J, which occurred over land and under water at different R- ranges from the observation site for the earthquake depth being $h = 1-100$ km. Duration of the continuous observation series was $> 1-10$ hr.

It has been found that for the earthquakes having $E > 10^{12}$ J at a moment of the seismic shock and 2-4 min later, there are observed a sharp increase (several times) in radio-noise amplitudes (A) at $f = 2-4$ MHz with the probability $p = 30-77$ % (for different conditions); for those having $E < 10^{12}$ J there is $p < 10$ %. For the earthquakes over land, p is 1.5-4 times larger than that for the earthquakes under water.

After the earthquakes on the height-time dependences of the radio-noise amplitudes and partially-reflected signals having different time delays, one may observe quasi-harmonic changes with $p = 65-70$ % and $p = 40$ % for the events over land and under water, respectively. On the basis of analyzing the experimental data bank, a number of disturbances were recorded in the lower ionosphere; their duration, periods and apparent velocities (V) of their transfer in the lower ionosphere ($V \sim 0.5-100$ km/sec) being determined. The disturbances with $V = 0.5-4$; $\sim 10-20$ and ~ 100 km/sec were the most frequently recorded ones. There was made up a classification of possible types of the disturbances generated or amplified in the lower ionosphere after the earthquakes, a scheme of their transfer over global distances being considered.