

The correction of frequency responses of seismic sensors and the noise of corresponding measuring channels

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Abstract. The paper deals with seismic channels including a sensor, a pre-amplifier and a filter that corrects the frequency response of the sensor in the low frequency band. The benefit of such a correction is a wider bandwidth of the channel in the area of low frequencies. The drawback is a higher noise of the corrected channel. The results of numerical simulations and laboratory tests presented in the paper show that the frequency response of the geophone GS-20DX with the natural frequency of 10 Hz and the inertia mass of 11 g can be expanded down to the frequency of 1 Hz, and for a certain class of seismological problems this small geophone can replace the traditional seismometer SM-3 with the natural frequency of 0.5 Hz and the inertia mass of 1.2 kg. Applying analogous correction to the sensor SM-3 allows to expand its frequency response down to the frequency of 0.01 Hz, which, in its turn, means that in some cases the sensor SM-3 can be used instead of broad band seismometers STS-2 and REFTEK-151. The class of seismological problems that could be solved using the corrected channels is limited by the signal-to-noise ratio of the seismic waves being recorded. It should be not less than 3–5. Such seismic signals are usually produced by regional earthquakes and excavating explosions at mining enterprises.

Keywords: seismometer, noise of measuring channel, correction of frequency response, frequency bandwidth.