One of the significant current tasks in seismology is the improvement of automated processing of seismic records on a time scale approaching real time. The use of the wavelet transform allows one to simultaneously run any necessary filtering and easily detect a different phase of the input signal that are not visible on the original seismograms, especially in case of strong noise. The entire process of filtering and analysis can be represented as three-dimensional graphic images, which greatly simplifies interpretation of the seismograms. Since this method does not require large computational effort there is a possibility of its realization in the form of real-time algorithms. Specific requirements are presented for registration and processing of poor and strong noisy seismic signals. These signals can be received from mobile stations or seismic stations installed in the "wrong" places, such as the territory of industrial plants or settlements (it simplifies and reduces the cost of installation and operation, but significantly impairs the quality of the seismic signals due to high noise levels). In this case pre-filtering is indispensable. Unfortunately, widely used methods for filtration such as the STA/LTA, LPF, HPF, etc. do not lead to satisfactory results.

The wavelet representation (db4) the original signal.

The original process (red) and that with noise eliminated (black).

The original signal with identified low frequency component (green).

Signal with removed low frequency component.

The wavelet representation (db4) the original signal.

3D-Scalogram.

The wavelet representation (db4) signal with removed low frequency component.

The standard method for noise suppression is the elimination of noise components from the spectrum of the signal. In application to wavelet decomposition this can be realized in a straightforward manner by removing the detailing coefficients of high frequency levels.

During debugging algorithm we tested different types of wavelets: Haar, Daubechies, "Mexican hat" and others. The use of any of them almost had no effect on the final result of the filtering. Finally the algorithm has been improved: as the input sequence are processed sequentially subtraction current measure with the previous. In this case, the low-frequency component disappears automatically and therefore wavelet algorithm lost the edge effects. The essence of the algorithm is not changed, but the processing time is significantly reduced.

CONCLUSION

On the basis of given example of seismic signal low-pass filtering using wavelet transform technology is shown that this technology can be successfully used for automated processing and analysis in seismology. Necessary to note that the advantages of this method are relatively small the computational computer time (in comparison with the technology based on the Fourier transform), so it take advantage to use widespread computing systems. Also it essentially allows to realize adaptive noise reduction systems, depending on signal and noise characteristics. And taking into account the characteristics of used wavelets in the time and frequency domain can be detected in the analyzed signals certain properties and features that are not visible on the original seismograms, especially in the presence of strong noise.