

Seismic analysis using the auditory sense – Playing the sounds of the Earth

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Classifying a seismic event registered by a seismic network as a local earthquake, a local explosion or a more distant earthquake or explosion is an important part of the work of a seismic analyst. Normally preliminary event classification is done after the application of signal filter(s) by visually studying the seismograms and various computed spectrograms. In this work an alternative sense, the sense of hearing, is applied in seismic analysis.

The key issue is that seismic signal must be modified in order to make it audible. Frequencies used in seismic analysis typically range from tens of hertz down to few tenths of a hertz. This is considerably different from the normal hearing range of a person which ranges roughly from 20 Hz to 20 kHz. Several different methods of transferring the seismic signal to audible range and their applicability to auditory analysis are evaluated. High dynamic range of seismic data is also taken into account and different methods of signal amplification are discussed.

Usefulness of hearing in seismic analysis is assessed by studying whether listening to suitably modified seismic signal can provide information about the seismic source or quality of seismic data similar to visual inspection. This is done by utilizing subjective experiences of seismic analysts familiar with analysing seismic data using visual tools. Providing an easy-to-use tool to convert a seismic event/signal into audio is also a goal. Finally, some alternative applications for “auditory seismology” are also reviewed.