

Abstract

The seismic-reflection method, a powerful geophysical exploration technique that has been in widespread use in the petroleum industry for more than 60 years, has been used increasingly since 1980 in applications shallower than 30 m. The seismic-reflection method measures different parameters than other geophysical methods, and requires careful attention to avoid possible pitfalls in data collection, processing, and interpretation. Part of the key to avoiding the pitfalls is to understand the resolution limits of the technique, and to plan carefully shallow-reflection surveys around the geologic objective and the resolution limits. Careful planning is also necessary to make the method increasingly cost effective relative to test drilling and other geophysical methods. The selection of seismic recording equipment, energy source, and data-acquisition parameters is often critical to the success of a shallow-reflection project. By following known seismic reflections carefully throughout the data-processing phase misinterpretation of things that look like reflections but aren't is avoided. The shallow-reflection technique has recently been used in mapping bedrock beneath alluvium in the vicinity of hazardous waste sites, detecting abandoned coal mines, following the top of the saturated zone during a pump test in an alluvial aquifer, and in mapping shallow faults. As resolution improves and cost-effectiveness increases, other new applications will be added.