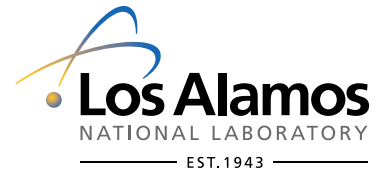


# 3D Seismic Imaging

*Noninvasive, High-Resolution, Underground Imaging and Characterization*



LANL scientists have pioneered the development of noninvasive, high-resolution seismic imaging. Our novel 3D seismic imaging algorithms reveal critical reservoir structures that cannot be detected by standard industry software. These novel imaging techniques have great potential for reliable monitoring of critical infrastructures such as earthen dams.

**Left:** C.J. Strike Dam, an earth dam of the hydraulic-fill type, is on the Snake River in Idaho and is 144 ft (44 m) high. David R. Frazier Photolibrary, Inc.

## Background

Active seismic reflection data contain information of underground structures and material properties. LANL has pioneered development of high-resolution 3D seismic reflection imaging methods based on wave theory. The algorithms can produce detailed images of underground geologic formations.

Our 3D subsurface images, produced using Gulf of Mexico seismic data for oil and gas exploration at depths up to 10 km, reveal critical reservoir features that could not be detected otherwise.

## Capabilities

Geophones can be placed in the water or on the earthen dam to collect time-lapse seismic data for monitoring structural integrity. Industrial collaborators will acquire and preprocess the data. LANL scientists will transform the data into 3D high-resolution images for geologic characterization.

## Future Applications

- Monitoring the integrity of critical infrastructures such as dams
- Characterizing changes in underground material properties
- Tracking CO<sub>2</sub> movement during geologic carbon sequestration
- Detecting and monitoring faults in geologic formations that are very difficult to image

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**Below** Using LANL's advanced imaging software, seismic reflection data (left) are transformed into a high-resolution image (right), revealing detailed subsurface geologic structures such as faults and oil/gas reservoirs that are not apparent using conventional techniques.

