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**CASSM –The Development of a Subsurface
Experimental Methodology**

Abstract: The use of boreholes for geophysical measurements has allowed direct access to the subsurface with improved spatial resolution and limited complications from near-surface heterogeneity. Crosswell seismic acquisition, using two boreholes, has been a focus of research. By the late 20th century, crosswell seismic methods had reached a plateau following intensive R&D efforts of the 1980s and 1990s in both instrumentation and analysis/inversion methods. Time-lapse crosswell has great potential for monitoring subsurface processes, however, acquisition costs and repeatability issues limited the methods application. A new methodology, termed Continuous Active-Source Seismic Monitoring (CASSM), was developed in the early 2000's and proved successful at reaching new boundaries of precision measurement and temporal sampling for field-scale seismic data. CASSM utilizes permanent (or semi-permanent) crosswell instrumentation to achieve 'continuous' seismic measurements.

Over the course of 15+ years and multiple projects (with varying applications) the CASSM methodology has developed and proven successful at precision monitoring of time-varying subsurface processes.

In this presentation I shall review the development of CASSM, with a focus on application for stress monitoring of the San Andreas Fault, and summarize the current research status.

Speaker Bio:



Tom Daley is a retired staff scientist in the Energy Geosciences Division of Lawrence Berkeley National Laboratory. He has been with Berkeley Lab since 1987 and served as Geophysics Department Head for 3 years. He received a Bachelors degree in Geophysics(1980) and a Masters degree in Engineering Geoscience(1987), both from the University of California, Berkeley. He worked from 1980 to 1985 with Seismograph

Service Corporation performing borehole seismic surveys and managing a district office in Ventura, CA.

Tom's research work is focused on the acquisition and analysis of borehole seismic data from field scale experiments. Current research includes seismic monitoring using distributed acoustic sensing (DAS) on fiber optic cables and continuous active-source seismic monitoring (CASSM). Problems addressed include continuous travel time monitoring to detect stress changes, monitoring geologic storage of CO₂, characterization of subsurface fractures including geothermal and oil fields, high resolution imaging of shallow surface materials, imaging fracture flow zones in contaminated aquifers, and geophysical characterization of volcanic tuff flows for nuclear waste isolation at Yucca Mountain.

Tom has contributed to over 70 peer-reviewed publications, and has been a member of the Society of Exploration Geophysicists (SEG) since 1980, a member of the American Geophysical Union (AGU) since 1987, the European Association of Geoscientists and Engineers (EAGE) since 2013, and is currently on the SEG Research Committee, and is ex-chair of the SEG CO₂ research subcommittee.