

Magnetotelluric and SP monitoring of Fracture Processes

Dr Eva Schill

Dec 18, 2025 5:30 PM

265 McCone Hall

UC Berkeley Campus

Abstract: Magnetotelluric (MT) and self-potential (SP) monitoring are used to track hydraulic stimulation in Enhanced Geothermal Systems or EGS. Fluid flow during fracturing redistributes electrical charge carriers causing changes in resistivity and natural electric fields. MT and SP responses have been documented during staged stimulation. In general, resistivity decreases during injection, while SP increases during injection and often continues rising into shut-in.

SP signals arise from electrochemical, electrothermal, and electrokinetic coupling, with electrokinetic effects linked to fluid flow in fractures. The magnitude and polarity of SP-pressure correlations depend on salinity, temperature, and fracture complexity. SP increases during shut-in coincide with the released seismic energy

To examine fracture-network effects, SP was monitored during two in-situ hydraulic fracturing experiments at Äspö HRL, Sweden. The HF2 (constant flow) experiment generated pronounced SP increases and strong AE during fracture propagation, followed by SP decreases and AE bursts during secondary fracture development. HF3 (stepwise pressurization with shut-ins) produced smaller SP and AE signals, indicating more distributed fracture growth. SP monitoring during the GOLD stimulation in Utah (Aug–Sept 2025) shows high-frequency amplitude variations that decrease at the onset of zipper-mode hydraulic fracturing and recover after operations cease.



Dr. Schil is a geologist and geophysicist and deals with geothermal issues from exploration to reservoir behavior. She combines various geological and geophysical methods to understand the structure of the subsurface. In combination with hydromechanical experiments, Dr. Schill is developing new monitoring methods that go beyond the monitoring of induced seismicity and shed light on reservoir processes. She is also working on new technologies to mitigate induced seismicity.