Direct imaging of faults using reverse-time migration of microseismic data

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Detecting faults/factures is crucial for geologic hazard mitigation and industrial reservoir monitoring. Faults/fractures are often indirectly inferred by microseismic event locations. However, sparsely distributed micreoseismic events and their location uncertainty lead to inaccurate fault/fracture delineation. We develop a novel method to image faults/fractures directly using reverse-time migration of microseismic data and moment-tensor sources. We validate the method using microseismic data acquired using a borehole geophone string at the Aneth CO_2-Enhanced Oil Recovery (EOR) field. We first locate microseismic events and invert for their moment tensors. We then use these information to perform reverse-time migration, and obtain high-resolution images of faults/fractures around microseismic events. The fault/fracture geometries are consistent with the microseismic event locations and focal mechanisms.