SHALLOW ACTIVE-SOURCE SEISMIC TOMOGRAPHIC MODELING IN 2-D AND 3-D OF OLD FAITHFUL GEYSER IN THE UPPER GEYSER BASIN OF YELLOWSTONE NATIONAL PARK.

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The Upper Geyser Basin of Yellowstone National Park consists of active geysers which erupt hydrothermal water from a subsurface reservoir, the most famous of which is Old Faithful. To model the Old Faithful hydrothermal system, we process 2-D and 3-D active-source seismic data recorded in November 2016. Our 3-D array consists of 521 receiver and 343 shot locations while our 2-D line trends SW-NE, centered on the Old Faithful Geyser orifice, with 39 receiver and 39 shot locations. Both 2-D and 3-D arrays have a station spacing of ~25m. The source in this experiment was a 12lb sledgehammer striking a metal plate, with a stack of ~5 hammer strikes per shot location. Our receivers are 3-component, 5-Hz Magseis Fairfield Z-Land Nodal seismometers. We pick refracted first arrivals along generated 2-D lines throughout the 3-D array and combine all first picked arrivals into a single 3-D model. We invert the arrivals to create a velocity model and tomographic profiles. We aim to visualize changes in lithology around Old Faithful geyser and its subsurface plumbing system allowing us to visualize the main reservoir feeding the eruptive cycles. Preliminary results from the 2-D profile show slight differences from previous studies, with the P-wave refraction images allowing for more detailed interpretation. Creating tomographic profiles and models will contribute to scientific understanding of the main hydrothermal reservoir beneath Old Faithful Geyser by allowing us to visualize in 2-D and 3-D the geometry and structure of the reservoir feeding the geyser.