Travel time seismic tomography on Reykjanes, SW Iceland

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We present updated tomographic results obtained using seismic data recorded around geothermal reservoirs located both on-land Reykjanes, SW-Iceland and offshore along Reykjanes Ridge. We gathered records from a network of 234 seismic stations (including 24 Ocean Bottom Seismometers) deployed between April 2014 and August 2015. In order to determine the orientation of the OBS stations, we used Rayleigh waves planar particle motions from large magnitude earthquakes. This method proved suitable using the on-land stations: orientations determined using this method with the orientations measured using a giro-compass agreed.

We focus on the 3D velocity images using local earthquakes to perform travel time tomography. The processing includes first arrival picking of P- and S- phases using an automatic detection and picking technique based on Akaike Information Criteria. We locate earthquakes by using a non-linear localization technique, as a priori information for deriving a 1D velocity model. We then computed 3D velocity model by joint inversion of each earthquake's location and velocity lateral anomalies with respect to the 1D model. Our models confirms previous models obtained in the area, with enhanced details. In a second step, we performed inversion of the Vp/Vs ratio. Results indicate a low Vp/Vs ratio anomaly at depth suggesting the absence of large magmatic body under Reykjanes, unlike results obtained at other geothermal field, sucha as Krafla and Hengill. We discuss implications of those results in the light of recent IDDP drilling in Reykjanes.