Geophysical Research Abstracts
Vol. 16, EGU2014-4170, 2014
EGU General Assembly 2014


# Reflection seismic imaging in the volcanic area of the geothermal field Wayang Windu, Indonesia

Ulrich Polom (1), Wiyono Wiyono (1), Bambang Pramono (2), and CharLotte M. Krawczyk (1)

(1) Leibniz Institute for Applied Geophysics (LIAG), Hannover, Germany (ulrich.polom@liag-hannover.de), (2) Star Energy Geothermal Indonesia, Jakarta, Indonesia

Reflection seismic exploration in volcanic areas is still a scientific challenge and requires major efforts to develop imaging workflows capable of an economic utilization, e.g., for geothermal exploration. The SESaR (Seismic Exploration and Safety Risk study for decentral geothermal plants in Indonesia) project therefore tackles still not well resolved issues concerning wave propagation or energy absorption in areas covered by pyroclastic sediments using both active P-wave and S-wave seismics. Site-specific exploration procedures were tested in different tectonic and lithological regimes to compare imaging conditions.

Based on the results of a small-scale, active seismic pre-site survey in the area of the Wayang Windu geothermal field in November 2012, an additional medium-scale active seismic experiment using P-waves was carried out in August 2013. The latter experiment was designed to investigate local changes of seismic subsurface response, to expand the knowledge about capabilities of the vibroseis method for seismic surveying in regions covered by pyroclastic material, and to achieve higher depth penetration. Thus, for the first time in the Wayang Windu geothermal area, a powerful, hydraulically driven seismic mini-vibrator device of 27 kN peak force (LIAG's mini-vibrator MHV2.7) was used as seismic source instead of the weaker hammer blow applied in former field surveys.

Aiming at acquiring parameter test and production data southeast of the Wayang Windu geothermal power plant, a 48-channel GEODE recording instrument of the Badan Geologi was used in a high-resolution configuration, with receiver group intervals of 5 m and source intervals of 10 m. Thereby, the LIAG field crew, Star Energy, GFZ Potsdam, and ITB Bandung acquired a nearly 600 m long profile.
In general, we observe the successful applicability of the vibroseis method for such a difficult seismic acquisition environment. Taking into account the local conditions at Wayang Windu, the method is superior to the common seismic explosive source techniques, both with respect to production rate as well as resolution and data quality. Source signal frequencies of 20-80 Hz are most efficient for the attempted depth penetration, even though influenced by the dry subsurface conditions during the experiment. Depth penetration ranges between 0.5-1 km.

Based on these new experimental data, processing workflows can be tested the first time for adapted imaging strategies. This will not only allow to focus on larger exploration depths covering the geothermal reservoir at the Wayang Windu power plant site itself, but also opens the possibility to transfer the lessons learned to other sites.