



Delay-fired seismic refraction survey in the southwest of Western Australia

K. A. Galybin, M. Dentith

School Of Earth And Geographical Sciences, The University of Western Australia, Australia
(galybk01@student.uwa.edu.au / Fax: +61 8 64881178 / Phone: +61 8 64881873 /
mdentith@segs.uwa.edu.au / Fax: +61 8 6488 1037 / Phone: +61 8 64882676)

A seismic refraction survey using delay-fired sources, mostly commercial quarries, has been carried out in the southwest of Western Australia. Three-component data have been recorded along a north-south traverse over a number of deployments and subsequently compiled and picked using polarisation, semblance and fractal dimension techniques. The profile stretches from Collie, 150km south of Perth to Moora, 150 km north of Perth and is located on the western margin of the Yilgarn Craton, one of the major Archaean entities in the world. Most data are records of four source locations providing good seismic ray coverage along the traverse. Travel-time data were modelled using the RAYINVR algorithm (Zelt and Smith, 1992). The resulting crustal velocity profile shows significant variation in crustal structure along the traverse, including a High-Velocity Zone (HVZ) in the lower crust.

Analysis of data indicates that the crust in southwest of Western Australia consists of two layers; the upper crust thins from 22 km in the north to 19 km in the south and has P-wave velocities in the 5.85 – 6.35 km/s range. The lower crust thins out from 22 km thickness to 16 km to the north and has P-wave velocities in the 6.75 – 7.05 km/s range. The whole of the crust thins out from 41 km thickness in the south to the 38 km thickness in the north. The mantle is found to have a velocity of 8.25 km/s.

Forward modelling indicates presence of the HVZ, which is thought to have P-wave velocities in the 7.8 – 8.1 km/s range, at depths of approximately 25 km. This feature is very significant, as it coincides with Jimperding Metamorphic Belt (JMB), a boundary between the Boddington and Lake Grace terranes. JMB is tentatively linked to the origin on the intra-plate seismicity in the region and detection of the HVZ on a north-

south traverse supports a genetic link between the two and a possible scenario for explanation of the causes of earthquakes in the region.