



Velocity inversion of earthquake data in the southwest of Western Australia

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The southwest of Western Australia contains one of the biggest pieces of Archaean crust in the world, the Yilgarn Craton. Southwest of the Yilgarn Craton contains an area of intra-plate seismicity referred to as the South West Seismic Zone (SWSZ). Meckering (M 6.9, 1968) and Cadoux (M 6.4, 1979) earthquakes occurred in the SWSZ causing large surface faulting and resulting in extensive damage to buildings and infrastructure. Earthquakes are frequent, but rarely big in magnitude. A 3D velocity inversion technique has been utilised to analyse the 3341 seismic events that occurred between 1985 and 2003 in the southwest of Western Australia in this area. These events have been recorded at permanent as well as temporary Geoscience Australia stations. The overall database of over 6000 events was reduced to include only P-phase arrivals and stations located in the southwest of WA. The initial flat, two-layer model for the algorithm has linear velocity gradient within each layer and discontinuities at 20 km, representing the upper/lower crust boundary, and at 34 km, representing a lower crust/ Moho boundary.

The results of the inversion show that a High Velocity Zone (HVZ) is present within the southwest of WA. The HVZ is oriented in the south-south-easterly direction in the northwest of the Yilgarn block and stretches for approximately 400 km. It is observed underneath the Jimperding Metamorphic Belt, a boundary between the Boddington and Lake Grace terranes. This boundary is thought to be the catalyst for the seismic activity observed in the area.