Shallow Level Passive Seismic at GSWA; surveys and storage

Ruth Murdie¹ Andreas Scheib ²

¹Geological Survey of Western Australia
²AJS Geoscience Consulting, Edinburgh
Tromino at GSWA

Timeline

• Purchase of single—station system Tromino May 2012
• First trial at Mulga Rock in October 2012
• Extension of coverage at Mulga Rock in 2013
• Eucla Basin survey in 2013 and expanded in 2014
• Boorabbin Sand Resource Survey in 2014
Methodology

Measures seismic noise in 3 components
Takes the spectral ratio of horizontal and vertical components H/V
Seismic noise is a function of amplitude, but spectral ratio is dependent upon subsoil structure
Used for simple double layer stratigraphy – i.e. depth to bedrock.

\[ f_z = \frac{V_{s1}}{4h_1} \]
Estimates

2 unknowns - Vs and h

- Obtain h from drill hole logs if available
- Or estimate from power law regression from known drill depths nearby
- Or estimate Vs from tabled values (affected by compaction, consolidation, cementation, pore volume, pressure, moisture content etc)
- Or estimate Vs through experimental determination on core samples
  - but Vs measured at 0.5Mhz
  - may not be comparable to those estimated from the recorded H/V
  - anisotropy not considered
  - derived Vs liable to be higher than those estimated by H/V
Mulga Rock

South Gunbarrel Basin

Site of anomalous Au in transported regolith

89 Tromino sites acquired

41 coincident with drill holes (only 11 holes penetrate basement)
Upper layer of soil removed to provide level base and firm contact
3 long spikes on the bottom driven into the ground
Unit levelled
20 mins acquisition
128Hz sampling frequency
Plastic bucket placed over Tromino to reduce wind effects
Data processed with Grilla software
Mulga Rock

1425 Kakarook Corner

RC11

AC1036

RC340
Mulga Rock – main traverse
Eucla Basin

- GSWA just completed a drilling program
- Good basement contrast
- Good access along the Transline
- Deep crustal seismic line shot recently
- Passive seismic would enhance information on cover thickness
- 42 sounding made at 10-20km intervals
- 7 drill sites
Eucla Basin

[Graph showing depth of basement (m, asl) against longitude (West to East) with various geological features and drillhole markers indicated.]
Eucla Basin

[Diagram of Eucla Basin showing depth of basement and various zones such as Rodone Shear Zone, Haig, and Mondrabilla Shear Zone.]

AFO
N.Foreland and Fraser Zone

Gravity high
H/V low?

Western edge of the Eucla Basin

Government of Western Australia  Department of Mines and Petroleum
Eucla Basin - 3D
Archiving

GSWA archives Tromino data and makes it available as appropriate
Compulsory submission for exploration companies
Welcomed submission from other sources
Stored as ascii as raw data files
Searchable through Geoview
Conclusions

Initial surveys have given verifiable depths to basement estimates
Depth of cover have ranged from 5m to > 700m
Rapid acquisition
Data modelling uncomplicated
Do need some sort of depth/velocity control

GSWA archives shallow passive