ANSIR NATIONAL RESEARCH FACILITY FOR EARTH SOUNDING

ANNUAL SUMMARY – 2009-2010

Component Reports:

(1) Portable Seismic Instruments
– The Australian National University

(2) Reflection Seismic
– Geoscience Australia

(3) Electromagnetics
– University of Adelaide

ANSIR: Portable Seismic Instruments - The Australian National University, 2009 - 2010

Instrumentation

- 106 ANU solid state short period recorders
- 125 Lennartz LE-3Dlite 3-component 1Hz seismometers
- 40 Mark Products L4C vertical component 1 Hz seismometers
- 47 Mark Products L-28-3D 3-component 4.5 Hz seismometers
- 22 Wilmore IIIA/IIIC vertical component 1-Hz seismometers (nearly obsolete)
- 41 Earth Data PR6-24 portable recorders (10 of which are 6 channel)
- 34 Guralp CMG-3ESP seismometers (about 8 of which are 30s, the remaining are 60s).
- 18 Guralp GMG-40T seismometers (all 30s corner period)
- 5 Streckeisen STS2 seismometers (120s corner period)
- 2 Nanometrics Trillium seismometers (40s corner period)
- 4 Reftek 72A-02 three channel recorders (nearly obsolete)

Access for Researchers

Access for instrumentation is through application to ANSIR for equipment. This system has worked successfully for the past decade. The user base over the past five years includes:

- The Australian National University (ANU)
- Geoscience Australia
- Monash University
- The University of Tasmania
- The University of Western Australia

Project Facilitation

- Dr. Nick Rawlinson (ANU) deployed 45 ANU short period instruments (coupled with LE-3Dlites) in northwest NSW as part of the EAL1 deployement. Instruments were installed from April 2009 until May 2010 at a 50 km spacing.
- Dr. Nick Rawlinson (ANU) deployed 53 ANU short period instruments (coupled with LE-3Dlites) in northern NSW as part of the EAL2 deployement. Instruments were installed in May 2010 and will be in place until early 2011.
- Dr. Sara Pozgay & Prof. Brian Kennett (ANU) currently have 25 broad band instruments along a north-south transect through central Australia (between Adelaide and Tennant Creek). The instruments have been in place for 2 years, and will be retrieved before the end of the year.
- Dr. Sara Pozgay & Prof. Brian Kennett (ANU) currently have 5 broad band instruments deployed in southeast NSW and eastern Victoria. The seismometers used in this case are Streckeisen STS2s.
- Dr. Anya Reading (UTAS) and Dr. Nick Rawlinson (ANU) deployed 15 LE-3Dlites in central Tasmania as part of a geothermal experiment from October 2009 until January 2010. These instruments were coupled to Orion data loggers that were formerly part of the ANSIR pool.

- *AuScope Support – passive seismic transects*:
  - Dr. Michelle Salmon & Prof. Brian Kennett(ANU) deployed 35 ANU short period instruments (coupled with LE-3Dlites) across the Curnamona craton in South Australia. Instruments were deployed in March 2009, and retrieved in November 2009.
  - Dr. Herb McQueen & Prof. Brian Kennett (ANU) deployed 30 ANU short period instruments (coupled with LE-3Dlites) near Mt. Isa in May 2009. The instruments will moved to an adjacent location in September 2010.

Current Status

- 25 Earth data loggers in central Australia, plus 25 Guralp CMG-3ESPs.
- 5 Earth data loggers in southeast NSW/eastern Victoria, plus 5 Streckeisen STS2s.
- 53 ANU short period recorders in northern NSW plus 53 LE-3Dlite seismometers
- 30 ANU short period recorders in Queensland plus 30 LE-3Dlite seismometers
- 15 LE-3Dlite seismometers are still in Tasmania

ANSIR: Reflection Seismic Component - Geoscience Australia 2009-2010

Capability

- Deep Crustal Reflection Seismic acquisition & processing, coordinated and undertaken by Geoscience Australia.

Access for Researchers

Access for seismic contracting is through application to ANSIR for projects/equipment. The user base during this reporting period was:

- Geoscience Australia
- GeoScience Victoria
- AuScope
- Geological Survey of Western Australia (GSWA)

Project Facilitation

- **Auscope-funded Southern Delamerian Seismic Survey.** This survey consisted of two traverses; an east-west trending line (147km) that commenced west of Naracoorte in South Australia and ended near Horsham in Victoria, and a north-south trending line (51km) that crossed the main traverse just east of the SA/Vic border. The data from the east west line complements earlier ANSIR seismic surveys and will provide a continuous deep seismic transect from the western Lachlan Fold Belt to the eastern Delamerian Fold Belt. This survey was conducted in November to December 2009.

- **AuScope/GSWA funded Capricorn Seismic Survey.** This survey consisted of three lines totalling 579 km which crossed the Pilbara, over the Capricorn Ranges and onto the Yilgarn. Combined these lines provide a transect that aims to image the extent of Archean crust beneath the Capricorn Orogen and assist in identifying whether the Pilbara and Yilgarn Cratons are in direct contact or separated by one of more elements of Proterozoic crust. This survey was conducted in April to May 2010.

Current Status

Processing of the Southern Delamerian survey is almost complete. Processing of the Capricorn survey data is underway and is planned for completion in early 2011.

The current contractor panel for acquiring Deep Crustal Seismic will expire on the 30th June 2011. Geoscience Australia plans to refresh this panel through an open tender process to be conducted in early 2011 so as to ensure a continuation of this capability after June 2011.

ANSIR: Electromagnetics - University of Adelaide 2009-2010

Instrumentation
With the aid of AuScope Investment:

- 25 broadband MT instruments and 40 low-frequency MT instruments.

Access for Researchers
Access for instrumentation is through application to ANSIR for equipment. This is beginning to work well now that many of the hardware issues have been resolved and the instrumentation is reliable. The user base at present is:

- Geoscience Australia
- PIRSA
- Geological Survey of Western Australia
- The University of Adelaide
- The University of Western Australia
- Monash University (ANSIR proposal in preparation)

Project Facilitation

- Dr Kate Selway (University of Adelaide) took six sets of equipment to Antarctica for 5 months (Nov 2008-April 2009). Her group collected 33 sites across the Vestfold Hills Complex to investigate ancient plate boundaries;
- Professor Mike Dentith (University of Western Australia), in collaboration with the Geological Survey of Western Australia (GSWA), has recently taken eight instruments across the western Musgrave Domain and collected over 50 sites;
- Ms Tania Dhu and Dr Phil Heath (PIRSA) have used nine sets of equipment across the Flinders Ranges to investigate the deep basement structure connecting the Curnamona with the Gawler Cratons;
- The Earth Imaging group at Geoscience Australia (GA) have used ten or more instruments along GA's Onshore Energy Security Program seismic lines in South Australia, Northern Territory and Western Australia;
- Dr Stephan Thiel (University of Adelaide) is using twelve sets of equipment for monitoring of geothermal systems at Paralana, northern Flinders Ranges. The aim is to observe time changes in MT signals during hydrofracturing to measure changes in rock permeability at depth;
- Professor Graham Heinson and his group (University of Adelaide) are using MT for imaging groundwater systems at the Mound Springs (Great Artesian Basin) and in the Flinders Ranges to map and delineate water resources;
- The University of Adelaide group have collected over 30 new sites along the Auscope-funded Southern Delamerian line.

Current Status
All 25 broadband instruments are currently in the field. The locations are:

- GA and GSWA have 10 instruments that will be deployed over 70 days along the Youanmi seismic line. This will involve collection of over 150 sites of data over almost 700 km, which will be one of the largest new MT data sets in the world;
- Dr Kate Selway has 6 instruments in Central Australia on an ARC Discovery grant program to examine the petrophysical causes of electrical conductivity;
- Dr Stephan Thiel has 9 instrument at Paralana to undertake 3D and 4D monitoring of a geothermal program, funded by the University of Adelaide.