

ANSIR

NATIONAL
RESEARCH
FACILITY FOR
EARTH SOUNDING

ANNUAL SUMMARY

2005 / 2006



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ANSIR Administration: Phone: +61 2 6125 4621 Fax: +61 2 6257 2737

ANSIR website: <http://rse.anu.edu.au/scismology/ANSIR/ansir.html>

ANSIR is a National Research Facility operated as a joint venture by The Australian National University and Geoscience Australia.

Up to June 2005 ANSIR operated as a Major National Research Facility under Contract to the Commonwealth of Australia. The owners have agreed to continue the National Facility with the same terms of access by merit until, at least, 30 June 2007. The new designation "National Research Facility for Earth Sounding" reflects expansion of activities beyond purely Seismic Imaging through, e.g., the enhancement of magnetotelluric work.

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THE ROLE OF ANSIR

ANSIR seeks to strengthen research and education in the Earth Sciences in Australia, and to provide a national focus and leadership through its work in Seismic Imaging and other aspects of Earth Sounding, which helps to foster collaboration between individual scientists, between institutions and across sectors.

ANSIR provides equipment and training for seismic imaging experiments. The staff of the facility provides help to researchers with the design and implementation of experiments and facilitate data processing and interpretation. The Director and Deputy Director maintain active research programs at ANU and GA and are thereby able to provide their experience to prospective applicants for use of the facility.

ANSIR has established a pool of equipment capable of imaging the Earth's interior at a variety of scales using different styles of seismic techniques. ANSIR's equipment is portable and can be moved to any part of the Australian Continent. Components of the equipment have been used overseas in international collaborative experiments. The ANSIR equipment can record energy from many types of sources, including earthquakes, explosions and truck-mounted vibrators; it can operate in a wide range of environments, including the remote hot and dusty conditions of the Australian outback, the humid tropics of the north and the freezing conditions of Antarctica.

The resources of ANSIR are available to all researchers. The scientific merit of the proposed research is the main criterion used to determine priority for access, but researchers have to be able to cover the operating costs for their projects.

- ANSIR coordinates all activities from ANU (as Financial Agent), support of reflection profiling is provided primarily from Geoscience Australia.
- ANSIR has supported scientific research through regional reflection profiles, mine-scale investigations, and several projects using the portable equipment in Australia.
- ANSIR at Geoscience Australia maintains legacy seismic reflection and refraction data acquired over the last 50 years by GA and its predecessors. As custodian of these data sets ANSIR supplies these to researchers, government agencies and companies on request.

ANSIR Activities in 2005/2006

Portable Instrument Deployments

- A cooperative experiment between ANU, UWA and GA, supported by ARC linkage funds has seen 8 portable broad-band instruments installed mostly along the coast of northwestern Australia to improve monitoring of seismicity
- A further 20 instruments were deployed in May 2006 from the Pilbara across the Capricorn Orogen into the northern Yilgarn Craton, and from Marble Bar into the Rudall Paterson province. The combined set of data will be used for structural studies of the crust and upper mantle.
- 40 short period instruments were deployed in the EVA project covering Eastern Victoria from October 2005 – May 2006 for delay-time tomographic studies. This deployment links with earlier work in the MALT project from Monash and Adelaide Universities and the entire data set is being processed to produce a unified tomographic model.
- 25 short period instruments were used in the NT / WA Tanami regional seismic survey project to collect wide-angle seismic reflection experiment to record the signals from the vibroseis sources used for the reflection profiling.
- ANSIR undertook its first magnetotelluric survey in eastern Goldfields region of the Yilgarn Craton, collaborating with Adelaide University and the pmd*CRC to record a magnetotelluric profile coincident with the 1991 deep seismic reflection traverse across Kalgoorlie. The magneto-telluric profile was ~ 95 km long, running east west through the Mt Pleasant – Panglo Au region, one of the regions main gold corridors as well as crossing the Ida Fault and Ockerberry Shear, two terrane boundaries and the Bardoc Shear – a major mid crustal structure that appears to have played an important role in gold distribution.

Reflection Profiling

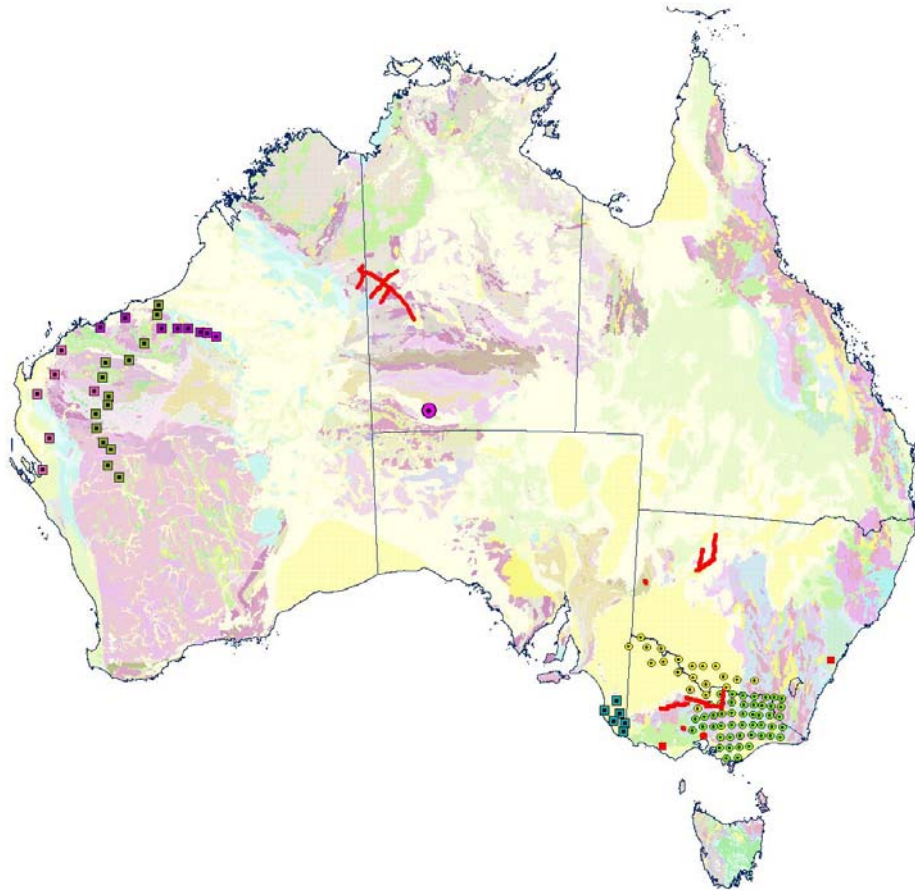
- The Tanami Seismic joint research project (Survey L171) was completed in WA and the NT at the commencement of the review period. This was a collaborative activity between Geoscience Australia, the Northern Territory Geological Survey, the Geological Survey of Western Australia, Tanami Gold NL and Newmont Mining Pty Ltd. In total 720 km of 60 fold deep seismic reflection profiling was undertaken making it the largest mineral province seismic survey ever undertaken in Australia.
- A 10 km medium resolution (120 fold) reflection profile was undertaken by ANSIR in conjunction with Newmont Mining (Survey L172) through the Callie gold deposit in the Tanami, NT.
- 300 km of deep seismic reflection 60 and 120 fold data was acquired in Thomson / Lachlan Orogens (Survey L173) in NSW for the *pmd**CRC, NSW DPI-Petroleum, NSW DPI-Minerals and Geoscience Australia.
- A medium resolution seismic reflection survey in the Stephens Creek Shear Zone in NSW consisting of 12 km of 60 & 120 fold data coincident with part of the 1996 AGSO dynamite regional seismic line (Survey L174).

- In the Sydney Basin a Coal Bed Methane high resolution seismic survey was undertaken using the ANSIR minivib source and the Curtin University seismic acquisition system was undertaken on behalf of Sydney Gas Pty Ltd (Survey L175).
- A high resolution coal seam imaging experiment was undertaken at Appin, NSW over two periods using both a Hemi60 vibrator and the minivib sources interfaced with the BHP Billiton Illawarra Coal seismic acquisition system (Survey L176).
- Two investigations were undertaken in the Otway Basin around the Naylor Gas well for CO2 sequestration studies with reflection profiling and downhole logging in conjunction with the CO2CRC, Curtin University and Schlumberger (Survey L177).
- A follow experiment to the L169 2004 Cadell Fault (Echuca) seismic survey was undertaken by GEMD at GA as a small scale high resolution investigation to further image neotectonic faulting using ANSIR geophones.
- A medium resolution seismic survey was undertaken in Ballarat West using both the large vibrators and a short segment of minivib line along a 10 km transect for Ballarat Goldfields Pty Ltd. (Survey L179).
- A transect across Central Victoria was completed which acquired 380 km of deep seismic regional profiling for the pmd*CRC, Geoscience Victoria, Geoscience Australia, Perseverance Mining, Leviathan Resources and Ballarat Goldfields (Survey L178)
- The year in review resulted in a record number of line km and surveys undertaken in the 50 years that BMR / AGSO / GA and ANSIR have been acquiring deep seismic regional data. In addition the year saw a number of ANSIR legacy datasets requested and the release of data from the 2003/2004 Curnamona seismic survey (L163).

2005/2006 Experiments and beyond

Figure 1 shows the range of experiments carried out in the 2005/2006 using both the portable and reflection equipment. Some equipment was also in use in Antarctica in the Lambert Graben area. Table 1 shows the work program for experiments undertaken over this period whilst Table 2 shows the proposed work program for 2006/2007.

Figure 1. ANSIR Experiments undertaken in 2005/2006



Key:

- Broad-band instrument
- Short-Period instrument
- ▬ Reflection profile
- ★ Refraction profile – with shot
- Marsupial mole study

Table 1: ANSIR experiments undertaken in 2005/2006

Proponent	Institution	Location	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Reading, Kennett 02-00T	ANU, RSES	Antarctica	A4	A4	A4	A4	A4	A4	A4	A4	A4	A4	A4	A4
Kennett 02-05T	ANU, RSES	Tasman Line, NSW, NT, Qld, SA, Vic	B24	B24	B24	B24	B24							
Huston 04-03R (L171)	GA, NTGS, GSWA, Tanami Gold, Newmont	Tanami, NT, WA	VR											
Kennett, Heintz 04-12T	ANU	Mt Gambier, SA					B6	B6	B6	B6	B6	B6	B6	B6
Keep, Kennett, Cummins (LEIF)	UWA, ANU, GA	Seismicity N.W. WA				B8	B8	B8	B8	B8	B8	B8	B8	B8
Rawlinson 04-15T	ANU	Eastern Vic	S20	S20	S20	S40	S40	S40	S40	S40	S40	S40	S40	
Sherlock 05-01R (L177)	CO2CRC	Otway Basin, Vic								mv				
Goleby 05-02T	GA	Tanami, NT, WA	S25											
Robson 05-04R (L173)	DPI NSW	Thomson-Lachlan, NSW		VR	VR									
O'Shea, Korsch 05-08R (L178)	GSV, GA	Central Vic.											VR	VR
Robson 05-09R (L174)	DPI NSW	Broken Hill, NSW		VR										
Choudry 05-10R (L175)	Sydney Gas	Sydney Basin, NSW		mv										
Kennett, Reading 05-12T	ANU	N.W. WA											B20	B20
Poole 05-13R (L176)	BHPB Coal	Appin, NSW					mv							V
Asten 05-14T	Monash Univ	Microseismic, Vic			G8	G8	G8	G8						
Benshemesh 05-15T	Monash Univ	Marsupial Moles, NT	G32	G32	G32	G32	G32	G32	G32	G32	G32	G32	G32	G32
Olsen 06-01R (L179)	Ballarat Goldfields	Ballarat, Vic										VR mv		
Sherlock 06-04R (L177 cont.)	CO2CRC	Otway Basin, Vic												mv

Key:

S - Short period instruments (+number); B – Broad band instruments (+number);
A - Broad band instruments in Antarctica (+number); R – Reflection recording system;
V – Vibrators; mv – minivibrator; G – Geophone strings (+number); 3C – 3 component geophones; M – Seismometers (+number).

Table 2: ANSIR proposed schedule for 2006/2007

Proponent	Institution	Location	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Reading, Kennett 02-00T	ANU, RSES	Antarctica	A4	A4	A4	A4	A4	A4	A4	A4	A4	A4	A4	A4
Kennett, Heintz, Fontaine 04-12T	ANU	Mt Gambier, SA	B6	B6										
Keep, Kennett, Cummins (LEIF)	UWA, ANU, GA	Seismicity N.W. WA	B8	B8	B8	B8	B8	B8	B8	B8	B8	B8	B8	B8
Korsch, Southgate 05-11R (L180)	GSQ, GA	Mt Isa region, Qld				VR	VR	VR						
Kennett, Reading 05-12T	ANU	N.W. WA	B20	B20	B20	B20	B20	B20	B20	B20	B20	B20	B20	
Asten 05-14T	Monash Univ	Microseismic, Vic	G8	G8	G8	G8	G8	G8						
Benshemesh 05-15T	Monash Univ	Marsupial Moles, NT	G32	G32	G32	G32	G32	G32	G32	G32	G32	G32	G32	G32
Rawlinson 06-02T	ANU	S. Eastern Tas				S40	S40	S40	S40	S40	S40	S40	S40	
Collins, Lister 06-05R	JCU, ANU	North Queensland												VR
Collins 06-06R	GA	Echuca, NSW											G100	
Urosevic 06-07R	Curtin Univ	Leinster, WA					mv							
Meyers 06-09R	Curtin Univ	Argyle, WA				mv								
Harris 06-11R	Curtin Univ	Perth Basin, WA						mv						
Rawlinson, Kennett, Robson 06-13T	ANU, DPI NSW	Murray Basin, NSW								S35	S35	S35	S35	S35
Robson 06-14R	DPI NSW	NW NSW								VR	VR			
Fontaine 06-17T	ANU	Murray Basin, NSW								B5	B5	B5	B5	B5
Meyers 06-18R	Curtin Univ	Jundee, WA					mv							
Goleby 06-20R	GA, GSQ	North Queensland										VR	VR	VR
Goleby, Heinson 06-21M	GA, Adelaide Univ	Yilgarn, WA		MT										

Key:

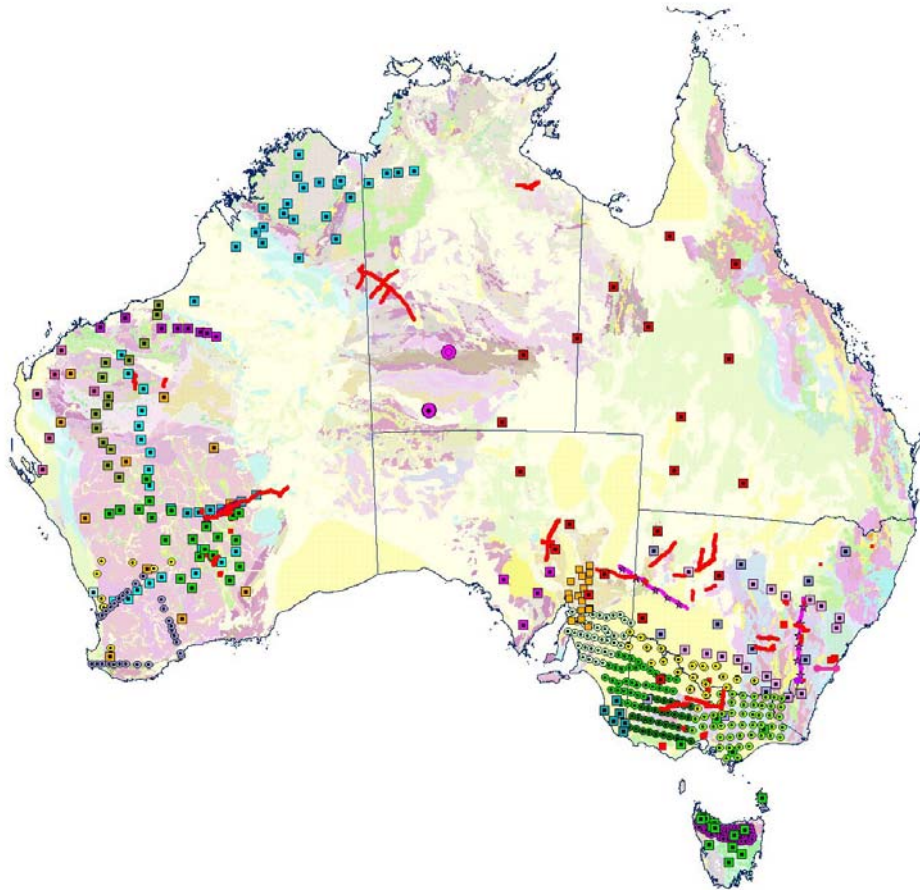
S - Short period instruments (+number); B – Broad band instruments (+number);
A - Broad band instruments in Antarctica (+number); R – Reflection recording system;
V – Vibrators; mv – minivibrator; G – Geophone strings (+number); 3C – 3 component geophones; M – Seismometers (+number); MT - Magnetotellurics.

Note: Projects indicated in light grey were approved but funding was not available at the time of this report.

Cumulative Coverage by ANSIR Experiments 1997/2006:

The impact made by the ANSIR Facility since its inception is most clearly seen in Figure 2 of all the work undertaken between 1997 and June 2006. Work has been carried out across the whole continent, with an increasing number of line kilometres for reflection profiling in recent years and larger scale (and longer term) deployments of portable instruments.

Figure 2. ANSIR Experiments undertaken from 1997 to 2006



Key:

- ▣ Broad-band instrument
- ⊙ Short-Period instrument
- ▬ Reflection profile
- ★ Refraction profile – with shot
- ⊙ Marsupial mole study

ANSIR Structure and Management

ANSIR is an unincorporated joint venture of The Australian National University (ANU) and Geoscience Australia (GA). The Director of the Research School of Earth Sciences at ANU and the Chief Executive Officer of GA are advised on the broad management directions of ANSIR by a Steering Committee, whose membership is listed in Table 3. The Steering Committee met twice in 2005/2006 (October 2005 and April 2006). This Steering Committee replaced the previous Management Advisory Board which had been in operation from the inception of the facility in 1997 until the completion of the DEST Commonwealth Agreement in June 2005.

Since July 2002, all the equipment assets have been owned by The Australian National University, which also acts as the Financial Agent for the Facility. Professor Brian Kennett (ANU) is Director, supported from Geoscience Australia by the Deputy Director (Dr Bruce Goleby) and Executive Officer (Mr Tim Barton) who provide the main interaction with users of the reflection profiling equipment.

The operation of the facilities has been supported by the owners. A modest mobilisation fee is charged for the use of the portable equipment, with deployment costs the responsibility of the user. For the reflection equipment the full cost of profiles has to be provided to ANSIR who then engage a commercial Facilities Manager, Terrex Seismic Pty Ltd (formerly Trace Energy Service Pty Ltd) to undertake the surveys.

The portable short-period and broad-band recorders housed at RSES are supervised by Mr Stefan Sirotjuk (Assistant Operations Manager) with support from Mr Tony Percival. RSES staff have both prepared equipment for field use and provided training (sometimes in-field). Dr Nicholas Rawlinson acts as Assistant Director at RSES providing oversight of the short-period recorders.

Proposals are vetted by the ANSIR Access Committee, see Table 4, that advises the Director of the scientific merit of each proposal. The Director then prepares a work plan for the coming year that is notified to the Steering Committee. The Director, Deputy Director and Executive Officer provide assistance and support to proponents in the development of proposals, particularly with regard to equipment needs for the proposed projects. In 2005/2006 all submitted proposals were considered to be worthy of support, but as in previous years some have yet to secure sufficient financial resources to enable the project to be scheduled.

TABLE 3: ANSIR Steering Committee Members, 2005/2006

Prof. Mark Harrison	Director, Research School of Earth Sciences, ANU.	Representing ANU.
Dr Chris Pigram	Chief, Minerals Division, GA.	Representing Geoscience Australia as delegate of CEO.
Dr Neil Williams	Chief Executive Officer, GA.	Alternate Geoscience Australia representative.
Prof. Brian Kennett	ANSIR Director, ANU.	
A/Prof. G. Heinson	The University of Adelaide.	Co-opted member.
Dr Ted Tyne	Primary Industries, South Australia.	Representing State and Territory Geological Surveys.

TABLE 4: ANSIR Access Committee, 2005/2006

Dr Bruce Goleby	GA, ANSIR Deputy Director	Access Committee Chairman
Prof. Brian Kennett	ANSIR Director	
A/Prof. Mike Dentith	University of Western Australia	
Andrew Shearer	Primary Industries, South Australia	
Dr S. Hearn	University of Queensland	
Dr Michael Roach	University of Tasmania	

Equipment

A summary of the equipment that can currently be accessed through ANSIR can be found in Appendix 3 or at the ANSIR web site (<http://rses.anu.edu.au/seismology/ANSIR/ansir.html>). Most of the equipment is based in Australia, but the previous ANSIR Management Advisory Board had agreed to allow a number of portable broad-band stations to be permanently based in Antarctica to allow full year deployment with a consequent reduction in the complexity of logistics and transport costs.

All of the ANSIR assets are based at the ANU, and the sets of broad-band and short-period equipment formerly operated by RSES have been merged into the ANSIR pool to provide a substantially larger number of recorders to projects. The seismic reflection acquisition system and seismic vibrators are usually stored at the end of each project at locations which minimise mobilisation and storage expenses between projects.

Although ANSIR has a significant number of portable instruments, much of the stock is ageing and has been heavily used. Discussions with a number of University groups have identified the benefits of having both seismic and electromagnetic recording capability to provide additional information on lithospheric structure. A successful application was made to the LIEF infrastructure program of the Australian Research Council in 2005 for enhanced equipment for earth sounding by ANU with involvement from the University of Adelaide and Macquarie University. Sufficient funding was secured to purchase a set of 15 instruments equipped with both broad-band seismic and electromagnetic sensors. Maintenance costs for the seismic vibrators has been steadily increasing over the year in review and some commercial use of these equipment has allowed ANSIR to offset these costs to a significant degree.

Researchers are asked to acknowledge ANSIR's role in their research when presenting their results at conferences and in formal publications. Users of the facility who undertake approved projects are also requested to submit annual returns on their work. This provides ANSIR with a quantitative measure on the impact of the facility and also provides an indication as to where the facility is being promoted.

Executive Activities

The Director received the Murchison Medal from the Geological Society of London in May 2006. He also continues as a member of the Executive Committee International Association of Seismology and Physics of the Earth's Interior until 2007 as Past-President. He maintains links with a number of international initiatives, in particular the development of seismological studies in Antarctica in the context of the forthcoming International Polar Year, e.g. the POLENET project.

The Deputy Director received a short term fellowship through the Japanese Society for the Promotion of Science in February 2006. He is chairman of IGCP project 474 "Images of the Earth's Crust & Upper Mantle" which aims to provide ready access to seismic images of the Earth's basement geology, deep crust and upper mantle. He maintains links with many of the international deep seismic reflection programs.

ANSIR organised a National Meeting on January 31 2006 at RSES to initiate discussions on a concerted approach by the Solid Earth Sciences to the opportunities offered by the Australian Government National Collaborative Research Infrastructure Strategy (NCRIS) Topic 5.13 "Structure and Evolution of the Australian Continent". Subsequently the Director joined the AuScope Steering Committee formed to prepare an Investment Plan to be submitted to the NCRIS Committee and the Deputy Director acted as an alternate during Professor Kennett's absence overseas.

ANSIR will have a Poster and two oral presentations on the deployment of active and passive seismology through the Facility at the Australian Earth Sciences Convention in Melbourne in July 2006 – this is an important meeting since the Australian Society of Exploration Geophysicists and the Geological Society of Australia have joined forces with a comprehensive program.

Appendix 1: Projects undertaken in 2005/2006

PROJECT TITLE	PRINCIPAL INVESTIGATOR	OBJECTIVE
02-00T: The deep seismic structure of East Antarctica.	Dr A.M. Reading, RSES, ANU.	Deployment of broad band seismic instruments at Davis Station and Beaver Lake. Recorded seismic events will allow the first determinations of deep crustal and mantle structure in this part of East Antarctica. This is a continuing project from 2004/2005 and project 00-14T.
02-05T: Tracing the Craton Edge – Tasman Line and Central Line, NSW, NT, Qld, SA & Vic.	Prof. Brian Kennett, RSES, ANU.	Investigation of structure in along the length of the Tasman Line. Examination of structure in the “mobile belt “ in eastern Central Australia between the northern and southern cratons and the link to the craton edge to the east. This is a continuing project from 2004/2005.
04-03R: Tanami Seismic project, WA & NT. Survey L171	David Huston, North Australia Project, Minerals Division, Geoscience Australia.	The Tanami region of the Northern Territory is a major Australian gold province and contains the world class Callie gold deposit. Shallow cover sediments largely obscure basement host rocks, so the application of geophysical techniques has become an important mapping tool for explorers in the region. Acquisition of seismic data along four lines are proposed and will test our understanding of the 3D architecture by targeting a number of key structures and granitic bodies, some of which are related to mineralisation. This was a continuing project from 2004/2005.
04-12T: Mt Gambier Geothermal investigations, SA	Prof. Brian Kennett, RSES, ANU	The objectives of the project are to image either or both of high velocity ‘frozen’ intrusions and low velocity ‘unfrozen’ mafic magma bodies in the upper to mid-crust beneath the volcanics. To image similar features in the lower crust and / or upper mantle and to evaluate microseismic evidence for deformation associated with injection and/or cooling of intrusions.
04-15T: EVA – Eastern Victoria seismic array, Vic.	Dr Nick Rawlinson, RSES, ANU.	Acquire data using short period seismic recorders across eastern Victoria to detect distant earthquakes from plate margins to develop 3-D images of the crust and upper mantle using teleseismic traveltimes tomography.

Appendix 1 (cont.): Projects undertaken in 2005/2006

PROJECT TITLE	PRINCIPAL INVESTIGATOR	OBJECTIVE
05-01R: Baseline seismic for CO2CRC Otway Basin Pilot Program, Vic. Survey L177.	Dr Don Sherlock CO2CRC / CSIRO Petroleum.	Evaluation of mini-vibrator suitability for future time-lapse surface seismic and VSP acquisition for monitoring changes in depleted gas reservoir from injection of CO2.
05-02T: Tanami passive listening, WA & NT.	Dr Bruce Goleby, Minerals Division, Geoscience Australia.	Investigate the crustal velocity structure and its relationship to lithology in the Tanami region of NT along the NW-SE transect of the 2005 Tanami deep seismic reflection survey using a large scale passive listening refraction survey to record wide angle seismic events from the reflection vibroseis source. This was a continuing project from 2004/2005.
05-04R: Thomson / Lachlan Seismic project, NSW. Survey L173	Dr Richard Glen Geological Survey of NSW.	Investigate the boundary between the Lachlan and Thomson Orogens and its implications for the evolution of the Tasmanides.
05-08R: Central Victorian Seismic transect, Vic. Survey L178	Peter O'Shea, Geoscience Victoria, Russell Korsch, Geoscience Australia.	Generate a key element of the Geoscience Victoria program "Gold Undercover" to better understand the nature of the crust in central Victoria and its relationship with key mineralising systems.
05-09R: Broken Hill High Resolution Seismic Survey, NSW. Survey L174	David Robson Geological Survey of NSW	To improve the resolution in the upper few kilometres of the subsurface in a key area in the Broken Hill region and to use the data as a comparison data set with the 1996 dynamite acquisition along line 96AGS-BH1B.
05-10R: Seismic reflection studies for the detection of CBM in coal seams, NSW. Survey L175	Dr Milovan Urosevic, Curtin University	To distinguish fractures zones from other inhomogeneities by analysing reflected shear waves to observe their splitting intensity and direction and relate this to fracture density and principal stress direction.
05-12T: Seismic constraints on cratonic assembly in northwest Australia, WA.	Dr A.M. Reading, RSES, ANU.	Deployment of broad band seismic instruments to provide improved control on crustal and mantle structure in Northwest Australia.
05-13R: Use of vibroseis source for imaging coal seams, NSW. Survey L176	Greg Poole BHP Billiton Illawarra Coal	Investigation of the use of vibroseis sources and comparison with co-incident 2D explosive source P-wave seismic reflection data.

Appendix 1 (cont.): Projects undertaken in 2005/2006

PROJECT TITLE	PRINCIPAL INVESTIGATOR	OBJECTIVE
05-14T: Microtremor array to measure sediment thickness, Vic.	Prof Mike Asten, Monash University.	Use of microtremor array methods to measure shear wave velocity profiles to depths in the order of 100 m.
05-15T: Conservation ecology of Itjaritjari (Southern Marsupial Mole <i>Notoryctes typhlops</i>) in Central Australia, NT.	Dr Joe Benshemesh, Biodiversity Conservation, Dept NRETA (NT).	To detect Itjaritjari (marsupial mole) underground and track their movements using seismic sensors; describe the activity budget of Itjaritjari; compile an inventory of animal sounds/vibrations underground; relate the movements of Itjaritjari to the distribution and abundance of their foods.
06-01R: Ballarat West High Resolution Seismic Survey, Vic. Survey L179	Steven Olsen Ballarat Goldfields NL.	To investigate whether the seismic reflection technique is able to image geological features beneath basalt cover.
06-04R: Borehole seismic survey assessment for CO2CRC Otway Basin Pilot Program, Vic. Survey L177 cont.	Dr Don Sherlock CO2CRC / CSIRO Petroleum.	Establish the suitability of the minivibrator as a source for VSP surveys for monitoring changes in depleted gas reservoir from injection of CO2.

Appendix 2: ANSIR Projects submitted from June 2005 to October 2006

PROJECT TITLE	PRINCIPAL INVESTIGATOR	STATUS @ 30/10/06
05-03C: Borehole Seismic Data Acquisition on Land, WA.	Leon Dahlhaus, Schlumberger Oilfield Australia Pty Ltd.	Project transferred to commercial provider.
05-04R: Thomson / Lachlan Seismic project, NSW.	Dr Richard Glen, Geological Survey of NSW, Department of Primary Industries.	Completed. Survey L173
05-05R: Integrated P-wave / PS-wave seismic imaging for improved geological characterisation of coal environments, Qld.	Natasha Hendrick, Velseis Pty. Ltd.	Withdrawn as ANSIR equipment not compatible with client system.
05-06R: High-resolution seismic imaging of recent faulting and sedimentary structures for earthquake hazard assessment, NSW.	Clive Collins, Geoscience Australia.	Completed. Extension of Survey L169 (03-04R)
05-07R: Curnamona III Regional Seismic transect, SA.	Paul Heithersay, PIRSA Office of Minerals, Energy and Petroleum.	Unscheduled due to insufficient funding.
05-08R: Central Victorian Seismic transect, Vic.	Peter O'Shea, Geoscience Victoria, Russell Korsch, Geoscience Australia.	Completed. Survey L178
05-09R: Broken Hill High Resolution Seismic Survey, NSW.	David Robson Geological Survey of NSW.	Completed. Survey L174
05-10R: Seismic reflection studies for the detection of CBM in coal seams, NSW.	Dr Milovan Urosevic, Curtin University.	Completed. Survey L175
05-11R: Mt Isa regional seismic survey, Qld.	Dave Mason, Geological Survey of Qld.	In Progress. Survey L180
05-12T: Seismic constraints on cratonic assembly in northwest Australia, WA.	Dr A.M. Reading, RSES, ANU.	In Progress.
05-13R: Use of vibroseis source for imaging coal seams, NSW.	Greg Poole, BHP Billiton Illawarra Coal	Completed. Survey L176
05-14T: Microtremor array to measure sediment thickness, Vic.	Prof Mike Asten, Monash University	Completed.

Appendix 2 (cont.): ANSIR Projects submitted from June 2005 to October 2006

PROJECT TITLE	PRINCIPAL INVESTIGATOR	STATUS @ 30/10/06
05-15T: Conservation ecology of Itjaritjari (Southern Marsupial Mole <i>Notoryctes typhlops</i>) in Central Australia, NT.	Dr Joe Benshemesh, Biodiversity Conservation, Dept. NRETA (NT).	Continuing project. Extension of 01-01R.
06-01R: Ballarat West High Resolution Seismic Survey, Vic.	Steven Olsen Ballarat Goldfields NL.	Completed. Survey L179
06-02T: SETA – South East Tasmania seismic Array, Tas.	Dr. Nicholas Rawlinson, RSES, ANU.	In Progress.
06-03T: Wide-angle refraction experiment in the Mount Isa region, Qld.	Tanya Fomin, Geoscience Australia.	Insufficient Short Period instruments available in required timeframe.
06-04R: Borehole seismic survey assessment for CO2CRC Otway Basin Pilot Program, Vic.	Kevin Dodds, CO2CRC, ARRC, CSIRO.	Completed. Extension of Survey L177 (05-01R).
06-05R: North Queensland Geotransect, Qld.	Prof. W.J. Collins, School of Earth Sciences, James Cook University (JCU).	Awaiting funding.
06-06R: High-resolution seismic imaging of recent faulting and sedimentary structures for earthquake hazard assessment, NSW.	Clive Collins, Geoscience Australia.	Completed. Extension of Survey L169 (03-04R & 05-06R)
06-07R: Seismic reflection profiling for mapping Archaean stratigraphy and structure hosting nickel sulphide deposits in the Wiluna greenstone belt, WA.	A/Prof. Jayson Meyers, Exploration Geophysics, Curtin University of Technology.	Scheduled, November 2006.
06-08R: Capricorn Orogen transect, WA.	Peter A. Cawood & Ian Tyler, School of Earth and Geographical Sciences, University of Western Australia	Awaiting funding.
06-09R: Investigating the structure of the Southern Devonian Basin in the Argyle State Agreement Area, WA.	Milovan Urosevic, Curtin University of Technology.	Completed.
06-10R: 3D Seismic Reflection for Hydrogeology; Beenyup Treated Wastewater Injection Trial, Perth WA.	Brett Harris, Curtin University of Technology.	Scheduled, early 2007.

Appendix 2 (cont.): ANSIR Projects submitted from June 2005 to October 2006

PROJECT TITLE	PRINCIPAL INVESTIGATOR	STATUS @ 30/10/06
06-11R: High Resolution Seismic Reflection for hydrogeology over the Pinjar Anticline below the Northern Gnamara Water Mound of the Perth Basin, WA.	Brett Harris, Curtin University of Technology.	Scheduled, December 2006.
06-12R: St Ives high resolution seismic investigation, WA.	Ned Stolz, Gold Fields.	To be scheduled 2007.
06-13T: SEAL2 - South East Australia Linkage project, part 2, Vic.	Dr. Nicholas Rawlinson, RSES, ANU.	Scheduled, early 2007.
06-14R: Koonenberry Belt / Thomson Orogen Seismic Survey, NSW.	David Robson, Geological Survey of NSW, Department of Primary Industries.	Awaiting full funding.
06-15R: Cobar / Thomson Orogen Seismic Survey, NSW.	David Robson, Geological Survey of NSW, Department of Primary Industries.	Awaiting full funding.
06-16R: Agnew Anticline seismic investigation, WA.	Ned Stolz, Gold Fields.	Proposal not endorsed by Access Committee in current form.
06-17T: MBALE – Murray Basin Asthenosphere and Lithosphere experiment, NSW.	Dr Fabrice Fontaine, RSES, ANU	Proposal modifications sought by ANSIR.
06-18R: Seismic reflection profiling for mapping Archaean stratigraphy and structure hosting mesothermal lode gold deposits in the Yandal greenstone belt, WA.	A/Prof. Jayson Meyers Exploration Geophysics, Curtin University of Technology.	Scheduled, November 2006.
06-19R: Wentworth Trough to Stawell-Bendigo Zones Seismic Survey, NSW.	John Watkins, Geological Survey of NSW, Department of Primary Industries.	Proposal at draft stage.
06-20R: Isa-Georgetown-Chartiers Towers Deep Seismic Reflection Survey, Qld.	Dr Bruce Goleby, Geoscience Australia.	Proposal at draft stage.
06-21M: Yilgarn MT investigations, WA.	Dr Bruce Goleby, Geoscience Australia.	Completed.

APPENDIX 3: ANSIR SEISMIC EQUIPMENT: 2005/2006

SEISMIC REFLECTION ACQUISITION SYSTEM:

ARAM24 (24 bit Delta-Sigma) comprising the following components:

- GPS True-time option
- 48 x RAM units @ 8 channels per RAM (384 channels)
- 4 x CRU Line Interface Cards
- 5 x Line Tap Units (LTU)
- 80 x 24V 12 AH Battery Packs
- 65 x ARAM24 Telemetry cable with 8 takeouts @ 43m
- 10 x ARAM24 Telemetry cable with 4 takeouts @ 40m
- 10 x ARAM24 Telemetry baseline cable 348m
- 5 x ARAM24 Telemetry baseline cable 105m
- 46 x ARAM24 Telemetry cable with 8 takeouts @ 12.5m

For technical specifications see:

Geo-X website: <http://www.aram.com/main/default.asp>

ENERGY SOURCES

Vibroseis:

- 4 x IVI Birdwagen Mk 4b with Hemi-60 Vibrator 60,000 lb P-wave Vibrators.
- 1 x IVI T15000 truck mounted Minivib 6,000 lb P and S-wave, 10 to 500Hz.
(This vibrator may also be interfaced with other seismic systems eg Strataview)

For technical specifications see:

Industrial Vehicles International website: <http://www.indvehicles.com/>

Explosives:

- Pelton ShotPro Dynamite radio firing system.

For technical specifications see:

I/O website http://www.i-o.com/content/includes/pdfs/ShotProII_datasheet_121065.pdf

VIBRATOR ELECTRONICS:

- Pelton Advance II Vibrator Controller

GEOPHONES:

- 432 x Strings of 12 x GS-32CT 10 Hz, 395 ohm vertical, 4m spacing (6S x 2P) in PC-801-LPC case.
- 200 x Strings of 4 x GS-32CT 10 Hz 395 ohm vertical, 4m spacing (2S x 2P) in PC-801-LPC case.
- 144 x Strings of 4 (2S x 2P) GS-20DH 40 Hz 600 ohm vertical in PC-21 case.
- 144 x Single GS-100 100 Hz 975 ohm vertical in PC-801-LPC case.
- 119 x 14 Hz Single 3 component GS-20DM 14 Hz geophones, PC-3D case

For technical specifications see:
Geospace website <http://www.geospacelp.com/>

1 x SENSOR SMT 200 geophone tester

For technical specifications see: <http://www.geosys.co.jp/GEO/Sensor/img/SMT-200.pdf>

2 x Geostuff BHG-3, Borehole Geophone, 3 component with fluxgate compass servo orientation system and motor driven, wall-lock mechanism, 80m cable.

For technical specifications see: <http://www.georadar.com/geophone.htm>

FACILITIES MANAGER:

Field operations for the ANSIR reflection seismic facility are carried out by:

Terrex Seismic Pty. Ltd.

Unit 2, 1st Floor,

37 Howson Way,

Bibra Lake,

Western Australia 6163

Phone: 08 9434 4388

Fax: 08 9434 5211

Email: steve@terrexseismic.com

PORTABLE INSTRUMENT COMPONENT:

From July 1, 2002 the instrumentation available includes both equipment bought with the ANSIR capital grant and equipment owned by the Research School of Earth Sciences, ANU (when not required by ANU researchers)

SHORT PERIOD RECORDERS

50 x 16 bit recording units -
Solid state, 512 Mb flash card memory
1 Hz seismometer
4.5 Hz three-component geophone

50 x 13 bit recording units
Solid state, 80 Mb flash card memory
1 Hz seismometer

BROAD BAND SYSTEMS (based in Australia)

15 x Earth Data recorders
24 bit, 3 channel
9 Gbyte disc storage, Solar power assembly

10 x Earth Data recorders
24 bit, 6 channel
9 Gbyte disc storage, Solar power assembly

15 x Nanometrics Orion recorders
24 bit, 3-channel
2 Gbyte disc storage, Solar power assembly

4 x Reftek 72A-02 recorders
16 bit, 6 channel
2 Gbyte disc, Solar power assembly

BROAD BAND SEISMOMETERS

3 x Streckeisen STS2 seismometers

22 x Guralp CMG-3ESP seismometers

15 x Guralp CMG-40T seismometers

2 x Nanometrics Trillium seismometers

BROAD BAND SYSTEMS - (based in Antarctica)

7 x Nanometrics Orion recorders

24 bit, 3-channel

Dual solar power assembly

2 Gybte disc storage

6 x Guralp CMG3ESP seismometers

1 x Streckeisen STS2 seismometer

APPENDIX 4: ANSIR CONTACT DETAILS 2005/2006

General Enquiries

Email ANSIR@anu.edu.au

ANSIR Director: Prof. B. L. N. Kennett,
Research School of Earth Sciences
Australian National University
Canberra ACT 0200
Phone: 02 6125 4621
Fax: 02 6257 2737
Email: brian@rses.anu.edu.au

ANSIR Deputy Director: Dr Bruce Goleby
Geoscience Australia
GPO Box 378
Canberra ACT 2601
Phone: 02 6249 9404
Fax: 02 6249 9972
Email: Bruce.Goleby@ga.gov.au

ANSIR Executive Officer: Tim Barton.
Geoscience Australia
GPO Box 378
Canberra ACT 2601
Phone: 02 6249 9625
Fax: 02 6249 9972
Email Tim.Barton@ga.gov.au

Mrs Lisa Pope (Finance & Grants Officer)
Research School of Earth Sciences
Australian National University
Canberra ACT 0200
Phone: 02 6125 2610
Fax: 02 6125 0738
Email: lisa.pope@anu.edu.au

Mr Steven Sirotnjuk (Assistant Operations Manager)
Research School of Earth Sciences
Australian National University
Canberra ACT 0200
Phone: 02 6125 4922
Fax: 02 6257 2737
Email: Stefan.Sirotnjuk@anu.edu.au

ANSIR website: <http://rses.anu.edu.au/seismology/ANSIR/ansir.html>

LEGACY DATASETS

ANSIR is the custodian of BMR, AGSO and Geoscience Australia onshore controlled source seismic datasets acquired since 1949. Details of seismic lines may be obtained using the Geoscience Australia on-line mapping tool at: <http://www.ga.gov.au> or contact the ANSIR Executive Officer, Tim Barton