



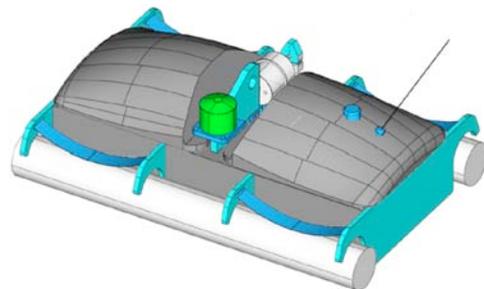
AGOS Progress Quarter 4 2012

At the conclusion of Quarter 4 2012 (30 June 2012), most planned milestones had been reached in line with the AGOS Agreement. Establishment of the AGOS infrastructure is now well advanced and a number of deployments by end-user groups already in place.

The Earth Sounding Network

All components of AGOS Earth Sounding are on track for completion on or before the due date, and are running either on or below budget. In summary:

- The broadband recorder set was updated and expanded before the due date of December 2011. In early 2012, this instrument set was deployed as part of an active source refraction survey in South Australia. Currently, several instruments have been deployed as part of the BASS array (joint passive source experiment between ANU and UTas), and another ten are due to be sent to New Zealand for a high resolution receiver function experiment.
- The new generation SP recorder prototypes have been build and tested according to schedule. The electronics and mechanical workshop at ANU have begun large scale production of the units. All components have been purchased, and the new pick and place machine has been used to populate circuit boards.
- The new pool of Ocean Bottom Seismometers has been purchased, and we are awaiting delivery (October 2012 - March 2013). Currently, the OBS steering committee is in discussions with MNF (Marine National Facility) regarding storage, maintenance and access.
- At Adelaide, all part orders have now been received and the phase of construction of instrumentation will be completed over the next three months. Part orders came through later than expected which is why construction is slightly behind plan.



Ocean Bottom Seismometer

The Geohistory Laboratory

Refurbishment, construction and equipment installation is complete at the University of Melbourne and at Curtin University.



Geohistory Laboratory at Curtin University

The Subsurface Observatory

Q4 2012 saw good progress towards the final remaining SOB equipment acquisitions as well as deployment and utilisation of existing infrastructure.

The Petrophysics laboratory is now running at increased capacity and throughput is expected to increase in the coming month with the acquisition of two additional natural gamma sensors which release a bottleneck in the current data recording workflow. This will allow either increased spatial resolution in the logging of total counts of natural gamma or a substantially higher throughput at the current resolution. There are a number of projects currently being run through the lab with VicDPI as well as the DETCRC and at least two additional projects coming on line soon with DMITRE in SA and VicDPI.

Following the recent seismicity in the Thorpdale region of Gippsland all of the new aftershock seismometer kits have now been deployed in the field. Some of these are in temporary installations and will be redeployed at some point in the near future while others are in semi-permanent deployments and will stay in place until there is a significant event elsewhere in the country at which time their redeployment will be evaluated. The data coming out of these AGOS instruments is exceptional and the Thorpdale aftershock sequence may end up being one of the most heavily monitored aftershock sequences in Australia.

Construction of the 7 borehole seismometers supplied by IESE in New Zealand has also been completed. One instrument is being shipped to Perth for deployment in monitoring wells associated with the EIF funded Pawsey Center geothermal project while the others will be deployed from Melbourne in the coming quarter. Final deployment localities are still being considered.

The borehole thermal logging and in-situ thermal conductivity logging capability is now in place as well with the receipt of an AP-Sensing GeoDTS system together with several lengths of active and passive optic fibre sensors. These systems will now be tested in the field at the Tynong geothermal monitoring well in Victoria prior to being made available for wider deployment. This system is receiving a large amount of interest from a variety of groups.

The access committee is currently reviewing two large proposals and a decision on Access Funding associated with these will be made before the end of August. At least three additional bids are currently in preparation.



Left: Deployment of aftershock seismometers in Gippsland. Right: Close-up view of aftershock seismometer in place in Gippsland.

The Inversion Laboratory

The Terrawulf upgrade is close to completion. The major hardware acquisition of IBM servers arrived in January and installation is now complete. Most of the new compute cluster is now in place and cabling, software installation and testing are underway. An OpenSUSE 12.1 operating system has been tailored for the new compute nodes and is being configured for automatic loading on new nodes as they come online.

Progress on Inversion software suite has also made good progress:

- A C library has been created that allows a number of different methods of Monte-Carlo Markov Chain (MCMC) inversions for 1D and 2D problems. The C library is comprehensively documented using the Doxygen code documentation system with the documentation containing a summary of the underlying theory involved in the computation. The C library has been ported to Linux, Mac OSX and Windows, and includes MPI extensions to run on parallel supercomputers for computationally expensive forward model problems.
- A Python interface was similarly created for the 1D regression methods, primarily for a proposed course at Geoscience Australia. As part of this work, course material was developed which serves as a tutorial on how to use the Python interface in conjunction with other existing Python libraries.
- Work on the escript software tools continued. The project is now focusing on specific inversion problems including gravity, magnetic and seismic inversion with the objective of performing large-scale joint inversions using the escript software environment. A prototype for gravity inversion has been build. Integration into the EIF-funded NeCTAR Virtual Geophysical Laboratory with GA and CSIRO is progressing. Appropriate data management procedures including compiling gravity and magnetic data, quality control such as correction and spacing and building data base for testing have been implemented.

The Geospatial Observatory

An architect has been engaged to undertake the antenna calibration facility design and also facilitate planning approvals. Advice from electrical, civil and communication engineers has also been sought. The first robotic antenna calibration system will be delivered to Canberra in Q1 2013.

A procurement of the second tranche of deployable GNSS equipment is complete and all the GNSS equipment will be delivered in Q1 2013. Data have been received from the first deployments of the portable GNSS equipment and analysis of the first three AGOS surveys has commenced by Geoscience Australia.

Work on the remote sensing portal continues. A proposal has been submitted to the European Space Agency (ESA) to gain open access to Australian satellite data for the AuScope community; a response to this proposal is expected in Q1 2013. A second proposal has been submitted to the German Space Agency to



GNSS Robotic Calibration System

gain open access to Terra-SAR satellite data for the AuScope community; a response to this proposal is expected in Q1 2013.

Prototype corner cube reflectors are currently being developed and actual testing using satellite data planned for Q2 2013 in the Canberra before they are deployed to the Surat Basin in Queensland.

The geodetic calibration system (total station) has loaned to the University of Tasmania supporting research on the AuScope VLBI array.

Contractual discussions with the Queensland Government are progressing regarding the build of a survey network in the Surat Basin and contracts are expected to be signed in Q1 2013. Contractual discussions have commenced with the NSW Government regarding the build of a survey networks in NSW.

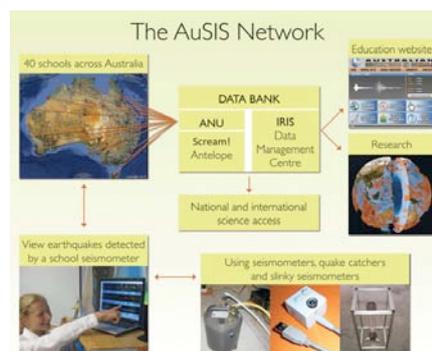
The Geophysical Education Observatory

The Australian Seismometers in Schools Network was officially launched by Minister Kate Lundy on the 31st of May 2012.

This launch marked the transition from the pilot program to a national level program. Invitations for schools to submit an "Expression of Interest" form through the AuSIS website went live at the same time as the launch. Since the launch applications from 55 schools (including 44 Secondary and 11 Primary schools) that wish to participate in the program have been received.

Two schools within the ACT have had seismometers successfully installed and data has been sent to ANU.

Two other seismometers have been operating over this period, including one at RSES, ANU and one at Mt Stromlo. All the data being recorded is now sent to an international data repository at the International Research Institutions in Seismology (IRIS) Data Management Centre (DMC) for long term archiving and access. All data sent to the IRIS DMC is publicly available through online request services and in near real-time via a SeedLink.



The AuSIS Network



Left: AuSIS Launch –from left Bob Haydon, Minister Kate Lundy, Natalie Balfour, Melrose High Principal George Palavestra and Malcolm Sambridge. Centre: Melrose High student explaining the seismometer to Minister Lundy and guests. Right: Melrose High students introducing Minister Lundy to seismic data recorded through the AuSIS network.

The highlight of Q4FY12 has been the AuSIS launch. So far this year we have had an enthusiastic feedback from the two schools involved and have recorded high quality data from several notable earthquakes. The quality of the data has been surprisingly high. Small local earthquakes (magnitude ~1) have been recorded near Canberra (including 20th April Canberra Earthquake magnitude 3.7),

moderate regional earthquakes (Ernabella earthquake, South Australia, magnitude 5.8 and Moe earthquake, Victoria, magnitude 5.3) and large distant earthquakes (magnitude > 5). The students have been very enthusiastic about recording data from local and distant earthquakes as well as “noise” at the school.

Implementation of the GPS in Schools has commenced with the purchase of 15 of the 16 receivers and antennas for the Schools equipment. Discussions with Schools have commenced.

Promotions

Inversion Software has been featured in some key areas although no direct promotion has been undertaken of the software library while it is in beta test form. The inversion software library was featured in presentations at the American Geophysical Union meeting in San Francisco in December 2011, and also at a multi-disciplinary workshop at the Royal Society of London in March of 2012. Arising out of that have been further requests for access to the software. While in beta form we have only been able to partially meet these requests. A number of peer reviewed scientific papers have been submitted to international journals which make use of the beta form of the software (mainly by testers). In each case AuScope inversion laboratory has been acknowledged. A specific section of a manuscript describing the software library will appear in a special issue of the Philosophical Transactions of the Royal Society of London A. Once released a summary paper will be submitted to a geoscience software journal, most likely in 2013.

AuSIS has been widely promoted at International and Australian Meetings and Conferences, Newsletters, media and Facebook. Considerable interest and very positive feedback has been shown in the program.

Presentations have been made at a number of industry forums including PESA and ASEG meetings outlining the Subsurface Observatory program. Meetings have taken place with DIMTRE and SACGER in SA resulting in the submission of a proposal to the Access Committee. A paper was published on the AGOS program in the Victorian PESA supplement. The seismicity in Gippsland has provided opportunities for exposure of the AGOS and SOB programs in the press in Victoria. Numerous interviews (Sandiford and Rawling) have resulted and a short article published in theconversation.edu.au news website.

Project Milestones

The status of project milestones is shown in the table below. Note that milestones (19,21,22,26,31) shown incomplete in the Quarter 3 Report are included below to show that their status is now complete.

No.	Milestone	Projected completion Date	Status
Milestones to 31 December 2011 (reported not complete at Q3) Report)			
19	Geohistory Laboratory: Mass spectrometers installed	31 December 2011	Complete
21	Geospatial Observatory: Purchase equipment for the 4 new permanent GNSS CORS stations	31 December 2011	Complete
22	Inversion Laboratory: Inversion software portal established and prototype inversion software suites released	31 December 2011	Complete, beta version release for testing

26	Geophysical Education Observatory: First batch of GNSS pool purchased and installations begun	31 December 2011	Complete
Milestones to 31 March 2012 (reported not complete at Q3)			
31	Geohistory Laboratory: Laser installed	31 March 2012	Complete
Milestones to 30 June 2012			
34	Annual Business Plan 2	15 May 2012	Complete: approved by DIISRTE 17 July 2012
35	Earth Sounding Network: Second batch of 50 electric field loggers constructed	30 June 2012	30% complete, delays in receipt of parts order has delayed final construction by 3 months
36	Earth Sounding Network: Short- period recorder prototype built and tested	30 June 2012	Complete
37	Geohistory Laboratory: Hardware acceptance testing completed	30 June 2012	Complete
38	Geophysical Education Observatory: Specifications and design final stage complete	30 June 2012	90% Complete through success of pilot sites, Finalisation requires processing EOI's from large number of interested schools
39	Geospatial Observatory: Second/final tranche of GNSS instrumentation pool purchased	30 June 2012	Complete
40	Subsurface Observatory: Workover collar procured	30 June 2012	Milestone removed and approved through ABP2013
41	Subsurface Observatory: Seismometer pool purchased	30 June 2012	Complete and deployed
42	Milestone Report 6 (removed from Commonwealth Agreement)	30 June 2012	Complete August 2012 (internal)