



Passive microseismic monitoring at an Australian CO₂ geological storage site

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Prior to the injection of CO₂, background micro-seismic (MS) monitoring commenced at the CO₂CRC Otway project site in Victoria, south-eastern Australia on the 4th of October 2007. The seismometer installation consisted of a solar powered ISS MS™ seismometer connected to two triaxial geophones placed in a gravel pack in a shallow borehole at 10m and 40 m depth respectively. The seismometer unit was interfaced to a digital radio which communicated with a remote computer containing the seismic data base. This system was designed to give a qualitative indication of any natural micro-seismicity at the site and to provide backup to a more extensive geophone array installed at the reservoir depth of approximately 2000m.

During the period, October to December 2007 in excess of 150 two-station events were recorded. These events could all be associated with surface engineering activities during the down-hole installation of instruments at the nearby Naylor 1 monitoring well and surface seismic weight drop investigations on site. Source location showed the great majority of events to be clustered on the surface. MS activity then quietened down with the completion of these tasks. Injection of a CO₂ rich gas commenced in mid March 2008 continuing until late August 2009 with approximately 65,000 tonnes being injected at 2050m depth in to a depleted natural gas formation. Only a small number of subsurface MS events were recorded during 2008 although the monitoring system suffered from long periods of down-time due to power supply failures and frequent mains power outages in the region. In March 2009 the surface installation was upgraded with new hardware and software. The seismometer was replaced with a more sensitive ISS 32-bit GS™ unit. Internet access to the monitoring system and data base was then established with a Telstra Next G connection. Due to the higher sensitivity of the seismometer, many more low amplitude sub-surface events are now being recorded, possibly associated with deep truncated faults in the south west corner of the injection site although any causal link with the CO₂ injection remains to be determined.