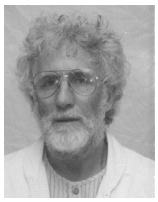
AEES NEWSLETTER

May 2010

Contents

President's Report



Over the last decade or more AEES committees have discussed sending a reconnaissance team to the site of a recent earthquake either to help or to learn from the earthquake. The first requirement is willing volunteers but the list of potential members never eventuated, we got hung up on the issue of insurance. We must get back to compiling such a list.

This year though we have managed to participate in two missions, Professor Hong Hao drove from Perth to Kalgoorlie one weekend and assessed the damage from a magnitude 5 seismic event near Kalgoorlie, Western Australia. Even as he picked his way through the debris laden streets of this western mining town, over on the other side of the continent Gary Gibson was preparing to depart on a joint NZSEE/AEES mission to Chile following a destructive M8.8 earthquake and tsunami along the west coast of the South American continent.

The AEES committee were happy to support these missions and we are grateful to the University of Western Australia and particularly ES&S who made their employees available. We are deeply indebted to the NZSEE for arranging the Chilean mission in its entirety.

This day and age we don't have to wait long for results, Professor Hong Hao's report with many photos was on our website within days and Adam Pascale has set up a blog so that we can follow Gary Gibson's daily outings in Chile with photos (see www.aees.org.au).

Elsewhere in this Newsletter are summary reports of each of these earthquakes and we hope there will be several papers at this year's annual conference focussing on what we have learned in the field.

A call for papers has been distributed for the Perth AEES2010 being hosted by Professor Hong Hao and his team at UWA with support from Sharon and the Secretariat team in Melbourne.

It would be a great help if papers could be submitted before the deadline so that we avoid the usual last minute rush for the reviewers (volunteers), the Secretariat and the organising committee (also volunteers). I hope you have made a start on your abstract. This year mining induced seismicity was included in the themes and then there was Orange NSW and Kalgoorlie WA!

At the AGM we should again raise the issue of establishing a database of volunteers willing and able to go overseas at a moments notice. We should also discuss the limits to suitable destinations; should we focus just on the SW Pacific and Indonesia?

The conference organising committee, management committee and I look forward to seeing you at the beautiful UWA campus in Perth and on the Saturday afternoon visit to the Gingin WA Gravity observatory. http://www.gravitycentre.com.au/

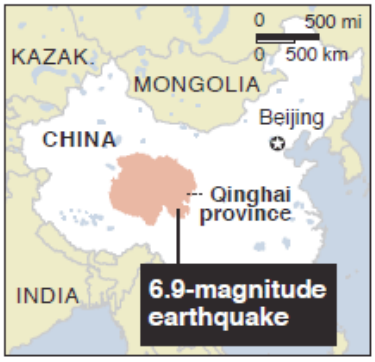
Keep safe and well until then

Kevin McCue
President

Tibetan Plateau earthquake M6.9

XINING, China – 13 April 2010 at 23:49:38, magnitude 6.9

SOUTHERN QINGHAI, CHINA Soldiers and civilians used shovels and their bare hands to dig through collapsed buildings in search of survivors after a large shallow earthquake struck a mountainous Tibetan region of China on Wednesday 13 April, killing 2183 people and injuring more than 12,000.



The quake flattened buildings across remote western Yushu county

sending survivors flooding into the streets of Jiegu township. State television showed block after devastated block of toppled mudbrick and wood homes. Local officials said 85 percent of the structures had been destroyed.
Residents and troops garrisoned in the town used shovels and their hands to pull survivors and bodies from the rubble much of the day. Several schools collapsed, with the state news agency saying at least 56 students died. Worst hit was the Yushu Vocational School, where Xinhua cited a local education official as saying 22 students died.
Crews set up emergency generators to restore operations at Yushu's airport, and by late afternoon the first of six flights landed carrying rescue workers and equipment.
But the road to town was blocked by a landslide, hampering the rescue as temperatures dropped below freezing. Tens of thousands of the town's 70,000 people were without shelter, state media said.

The area is at an elevation of 4200m on the Tibetan Plateau. Most people live in Jiegu, with the remaining — mostly herders — scattered across the broad valleys. The small airport has no refueling supplies, so relief flights were carrying extra jet fuel, reducing their capacity for hauling supplies, state media reported.
Hospitals were overwhelmed, and rescue teams were slowed by damaged roads, strong winds and frequent aftershocks.
Workers released water from a nearby reservoir whose dam was cracked by the quake, according to the China Earthquake Administration.
Residents of Jiegu, known by Tibetans as Gyegu, about 20 miles from the epicenter, fled as the ground shook, toppling houses, as well as temples, gas stations, electric poles and the top of a Buddhist pagoda in a park, witnesses and state media said.
Many of the students boarded at the schools and were preparing to head to class when the quake struck. One rescue worker said he didn't know how many students had died but he had helped recover several bodies. "Students just got up and were yet to go to class when the quake happened.
The destruction of schools is an eerie echo of the massive magnitude-7.9 quake that hit neighboring Sichuan province two years ago, leaving more than 70,000 people dead or missing. Thousands of students among the dead were killed when their schools collapsed. Poor design, shoddy construction and lack of enforcement of building codes contributed to the damage.
This area of China is intraplate like Australia the earthquake epicentre several hundred kilometres north of the converging India/Eurasia plate boundary. This earthquake is one of the largest known historic earthquakes within several hundred kilometres of the epicentre.
The magnitude 7.9 Wenchuan (Sichuan) earthquake of May 12, 2008 occurred on the margin of the Tibetan Plateau, in contrast with the April 13, 2010 earthquake, which occurred in the plateau's interior. The 2008 earthquake killed over 70,000 people and displaced over 15 million.
The magnitude of the earthquake is similar to those of Meckering WA in 1968 and Tennant Ck NT in 1988.
The earthquake mechanism by contrast with most large Australian earthquakes was principally strike slip on a fault trending northwest. There have been no reports of surface faulting.

NZSEE2010 Wellington NZ, 26-28 March 2010

Held at Te Papa Museum, Wellington for the first time, the annual conference was preceded by a Research Forum to look at earthquake engineering research directions for the next 10 years to deliver a resilient New Zealand - a big challenge. The mayor of Wellington opened the conference with the news that the recent reassessment of hazard had saved the city $2M annually in insurance premiums!
Professor Calvi, keynote speaker, gave a spirited presentation on the novel reconstruction of L'Aquila, Italy after the recent destructive earthquake. They tested base-isolated buildings to high loads with residents at home. This was followed by a forum of 8 panelists chaired by Peter Wood on the theme of the conference *Earthquake prone buildings – how ready are we?* About 40% of pre-1976 NZ buildings are earthquake prone and those strengthened to only 33% of the new code are 10 times more likely to be damaged said Mike Stannard. According to Kelvin Berryman a maximum credible earthquake in NZ is assessed at magnitude 8.8 and the next cluster of earthquakes is closer following the seismicity gap of the last 100 years.
There were few seismology papers but most aspects of earthquake engineering were covered. One on Myanmar explained how WSSI had helped establish an earthquake engineering society there to develop a new hazard map and loading code. David Hopkins is a Director of WSSI and I queried whether this was a model that could apply in the SW Pacific.
At the AGM, Graeme Beattie stood down and a new committee was elected who later chose Peter Wood as their president. The society has 648 members.
We wish Peter and NZSEE the best of good fortune over the duration of his stewardship and we will work to strengthen our partnership across the Tasman.

NZSEE/AEES Learning from Earthquakes Mission to Chile

A magnitude 8.8 earthquake occurred offshore Chile on Saturday, February 27, 2010 at 3:34am local time. The earthquake generated a destructive tsunami and landslides that between them caused the deaths of almost 500 people and the destruction of 200,000 buildings.

Figure *Aftershock extent after 2 days outlining the fault break in the mainshock extending 350 km NNE and SSW of the epicentre which was 115km north-northeast of Chile's second largest city, Concepción, and 325km southwest of the capital Santiago.*

At the NZSEE annual conference in Wellington in late March, NZSEE and AEES committee members discussed sending a joint mission to Chile under the *learning from earthquakes* banner. The purpose of such a mission is to gather data on the earthquake and on the earthquake resistant performance of systems, buildings and infrastructure. The lessons to be learnt range over a wide spectrum; how strongly the ground shook compared with design levels, building structure performance and planning, and governance/legislative initiatives.

Subsequently fourteen members from New Zealand, and one Australian (engineering seismologist Gary Gibson from ES&S) volunteered to join the team led by Hugh Cowan and Peter Smith. Gary is the IAEE representative for AEES and has been to Chile on several occasions. NZSEE undertook all the organising for the trip and we are grateful to them for inviting AEES participation. The hosts of the mission are the University of Chile (UC) and the Pontifical University of Chile (PUC). Two members of the mission are Chilean doctoral candidates in NZ, one of them jointly supervised by Prof Mike Griffith in Adelaide.

Building performance is a particular interest; buildings constructed or retrofitted since the mid-1970s that have been designed to a similar philosophy and standard to those in New Zealand and many SW Pacific countries that have adopted a New Zealand code. Essentially we need to know if the design/construction details provide an acceptable level of performance to protect the building and its function.

Significant investigations have already taken place by Chilean organisations and external teams. Additional investigations will:

1. Obtain information on the ground motion, on foundation materials, and on the dynamic interaction of buildings and foundations.
2. Choose appropriate buildings, damaged and undamaged, and obtain as much information as possible on the design details and materials of construction, likewise for special structures such as schools and hospitals, dams and pipelines.
3. Obtain information on the loadings and materials standards used in the design.
4. Investigate the interaction of buildings to determine whether pounding was an issue and how the flooring systems performed.
5. Residential buildings will be examined including light timber framed houses.
6. Examine the performance of non-structural elements within buildings, including facades, partitions and suspended ceilings.
7. Noting that liquefaction was extensive in several areas investigate the impact on the stormwater and sewerage system.
8. Collect tsunami information which will be of use to tsunami warning groups throughout the SW Pacific.
9. Discuss proposed changes to regulations because of the experience from the earthquake, to emergency management, environmental protection, public health issues, etc

Some of the party left for Chile on 23 April, the rest depart on 01 May and were to be away for approximately 15 days. NZSEE and AEES are paying the travel costs whilst members' time is being generously donated by their employers.

***Editor's note**: Apologies for using the same photo as in the last issue but I think it is useful to get across the idea of an earthquake not being a point source and the bigger the magnitude, the bigger the source area and thus the bigger the potential damage area.*

Photos Edificio Festival, in Viño del Mar (above) and Alto Rio, Concepcion (below) by Gary Gibson. There are more photos on the AEES website.

The Alto Rio building in Concepcion was an apartment block of about 12 stories. It was displaced and rotated 90 degrees and now lies flat on the ground. About 7 or 8 occupants were killed when the building fell, but about 80 occupants survived the fall. In the attached photograph the group member taking a photograph is facing the ceiling of the entry area into the building, now rotated to vertical.

How the media saw it:

Earthquake rocks Goldfields

*Tuesday 20th April 2010, 9:45 WST (*kalgoorli.thewest.com.au/regionals)

Reports of significant damage are emerging from the Goldfields this morning after the biggest earthquake in 50 years struck the region. (Ed.The previous largest, a magnitude 4.5 mining related event, struck the Boulder area in 1987).

The magnitude 5.0 quake struck south-west of Kalgoorlie at 8.17am. Residents reported a "sizeable tremor" lasting between five and 10 seconds. Significant tremors were felt in Kalgoorlie, Boulder and Coolgardie.

FESA reports quake damage is mainly confined to the Boulder area with five or six older hotels on Burt Street hit. Burt and Lane Streets in Boulder have been closed and people are asked to avoid the area. It is understood the Golden Eagle Hotel in Boulder has been badly damaged. Firefighters were called to the historic Lionel Street pub at 8.19am because of extensive roof and wall damage.

Kalgoorlie School of the Air has been closed after suffering significant structural damage. Students at Boulder Central School have been evacuated and emergency services are diverting traffic. A ceiling collapsed at Boulder Primary School and children have been moved to a newer part of the school. O'Connor Primary School's administration block has been evacuated and the junior block at Kalgoorlie Primary School has been closed. Cracks have appeared in the walls of North Kalgoorlie Primary School. Structural engineers will assess that and other schools in the quake area today to determine if more need to be closed.

Workers have been pulled out of the Super Pit's open pit and underground mine.

A Kalgoorlie Consolidated Gold Mines spokeswoman, which operates the Kalgoorlie Super Pit, said the quake was felt "pretty harshly" in the town. Speaking from the Super Pit shop on the corner of Burt Street and Hamilton Street, Holly Philips said: "It was a scary event all round," but she was still waiting to find out if there had been any impact on the mining operations. Ms Philips said the tremor had damaged some of the balconies on historical hotels close to the shop, at least one building had collapsed and police cordoned off the area.

Callers to ABC radio, some 50km from Kalgoorlie, said the tremor lasted for several seconds and that there have been aftershocks. One resident said the tremor was the worst they had felt in 30 years.

Wednesday 21st April (http://au.news.yahoo.com/thewest/)

The biggest quake on record to hit the region struck yesterday, causing a damage bill estimated to go into millions of dollars. It caused no serious injuries but forced the evacuation of miners from the Super Pit and the closure of schools. Boulder Primary School remained closed today but all mines in the area were back in full production.

Structural engineers are assessing whether earthquake-damaged heritage buildings in Kalgoorlie need to be pulled down. Five engineers arrived from Perth today to inspect historic hotels, the town hall and other premises in Boulder where the magnitude 5.0 quake did its worst damage.

A number of smaller aftershocks were felt overnight.

Kalgoorlie-Boulder Mayor Ron Yuryevich said after surveying damaged buildings in Boulder that he thought a few might have to be demolished, with safety a priority. Boulder's main street, Burt Street, remained closed but Mr Yuryevich hoped at least half of it could be re-opened later on Wednesday.

The Fire and Emergency Services Authority said it expected the assessment of Bert Street to take up to two to three days, with the precinct to be reopened progressively. "Residents and local business owners are asked to remain patient," FESA said. Around 30 accommodation vouchers had been issued, mainly to mine workers who had been staying in heritage hotels on Burt Street.

About 40 public and commercial buildings in the area were damaged.

The balcony at the Golden Eagle Hotel on Lionel Street collapsed and many buildings were left with cracked walls. Mr Yuryevich said Boulder's historic town hall was severely damaged, with its western wall having partially come away. Many tourists visited the town hall to view the 102-year-old Goatcher stage curtain valued at more than $1 million and fortunately that was undamaged, he said.

Emergency demolition orders had already been issued for some building facades, the mayor said. Insurance assessors were also on the ground. The total damage bill would be in the millions of dollars, Mr Yuryevich said.

It is interesting to compare the location determined by various agencies as tabled below

Agency	*Origin Time UTC*	*Latitude °S*	*Longitude °E*	*Depth km*	*Place*
USGS	0017 08	30.530 ± 13.7 km	121.653 ± 13.7 km	10	30km NE Kalgoorlie
GA	0017 09	30.83	121.429	?	6km SSW Kalgoorlie
ASC	0017 09.6 (± 0.14)	30.798 (±0.007)	121.485 (±0.010)	0G (±5)	3km SSW Kalgoorlie

Note: the USGS epicenter is well outside the quoted error bars from an epicenter SSW of Kalgoorlie.

Photos: *Earthquake damage in Boulder and Kalgoorlie. Note the similarity with damage in Newcastle (see photos at www.aees.org.au). Photographer Professor Hong Hao UWA & AEES*

There was one foreshock and hundreds of aftershocks, 8 of them large enough (magnitudes 2.4 to 2.9) to be located by GA using their regional network stations to the 10th of May (see www.ga.gov.au) and to be felt locally.

The Australian Earthquake Engineering Society

AEES 2010

26-28 November 2010

Hosted by the University of Western Australia

Perth, WA 6009

Call for Participants: The 2010 AEES annual conference will be held at the University of Western Australia, Perth, Western Australia, 26-28 November 2010. Authors are invited to submit papers in any of the related topics outlined below. The conference will include keynote speakers, oral and poster presentations. Accepted papers will be peer reviewed and published in the conference proceedings. AEES 2010 will be extended to include mining seismology and earthquake effects on mining activities.

On behalf of AEES, the local organizing committing would like to warmly invite researchers and industry experts to participate in the AEES annual event. Contact the organising committee to express your interest in attending or send in an abstract of not more than 200 words (attn Sharon Anderson) at the email address sharon@wsm.com.au by **15 June, 2010**. Authors will receive further instructions on acceptance of their abstract and instructions for writing full papers.

For AEES members, the AEES AGM will also be held during the conference.

Topics:

- Earthquake engineering
- Engineering seismology
- Blast induced ground motion
- Tsunami
- Critical infrastructure protection
- Disaster response
- Emergency management and insurance
- Earthquake influence on mining infrastructure
- Micro seismic response and damage in mining
- Influence of earthquakes on mine slope stability

Keynote Speakers: To be invited

Programme:

	26 Nov (Friday)	27 Nov (Saturday)	28 Nov (Sunday)
Morning		Presentations	Presentations
Afternoon	Presentations	Site visit	
Evening	Reception	Dinner	

Deadlines: Abstracts due: 15 June 2010 Full Papers due: 1 September 2010

Venue: UWA Campus

Site visit: Gingin Gravity Discovery Centre, 1098 Military Road, Gingin West 6503

Enquiry:
Winthrop Professor Hong Hao, Tel: +61 8 6488 1825, Email: hao@civil.uwa.edu.au

AEES is a Technical Society of The Institution of Engineers, Australia

The largest seismic event in Australia in this period struck Kalgoorlie WA on 20th April, the magnitude 5.1 seismic event damaged several schools and heritage-listed hotels, some more than a century old. Aftershocks from this event were still occurring as we went to press. For a discussion of the Kalgoorlie events see the special article in this Newsletter.

On 16th April the largest earthquake since 1954 within 50 km of Adelaide, shook the greater metropolitan area and surrounding region as far as Kangaroo Is. The interesting aspect of the Mt Barker earthquake was its focal depth, 25km below the surface, where the rock might be expected to be ductile and incapable of failing by brittle fracture. This has implications for the maximum credible earthquake on faults such as the Eden-Burnside and Para Faults through the metropolitan area. PIRSA installed a couple of seismographs in the epicentral region to record aftershocks and wasn't disappointed.

A larger earthquake ML~4.5 occurred in the Mt Barker region on 7th July 1883.

Table Earthquakes in the Australian region, 14 Mar 2010 – 10 May 2010, magnitude 2.5 or greater, located by Geoscience Australia, PIRSA, ES&S, and ASC. The implied accuracy in epicentral coordinates is fanciful, the best are located no better than 3km horizontally and 5 km vertically.

Mag	Date (UTC)	Time (UTC)	Latitude (Deg)	Longitude (Deg)	Depth (km)	Location
2.8	09-May-2010	16:55:10	-30.650	121.113	0	Kalgoorlie, WA#
2.6	02-May-2010	04:30:41	-30.714	118.002	10	NE of Bencubbin, WA
2.7	30-Apr-2010	11:48:58	-30.795	121.451	0	S of Kalgoorlie WA#
2.8	30-Apr-2010	00:38:17	-30.754	117.763	7	Bencubbin, WA
2.8	25-Apr-2010	15:40:34	-30.764	121.526	0	Kalgoorlie WA#
2.9	25-Apr-2010	13:05:55	-36.879	144.253	10	S of Bendigo VIC.
2.8	23-Apr-2010	15:49:37	-30.899	121.419	0	S of Kalgoorlie, WA#
2.6	22-Apr-2010	22:24:25	-30.786	121.525	10	Kalgoorlie, WA#
2.8	22-Apr-2010	11:22:43	-32.838	121.520	0	S of Norseman WA
2.6	20-Apr-2010	18:38:13	-30.823	121.464	1	Kalgoorlie, WA#
2.6	20-Apr-2010	10:19:45	-32.356	122.199	0	SE of Norseman WA
5.1	20-Apr-2010	00:17:08	-30.794	121.406	0	Kalgoorlie, WA#
2.6	18-Apr-2010	23:20:04	-32.160	150.965	10	W of Dangarfield, NSW
3.8	16-Apr-2010	13:57:22	-35.099	138.866	25	Near Mt Barker, SA (4km S)
2.6	13-Apr-2010	11:10:49	-31.309	117.284	4	SW of Wyalkatchem, WA
2.8	12-Apr-2010	12:38:16	-16.911	132.823	20	NW of Newcastle Waters, NT
3.4	11-Apr-2010	12:02:58	-16.924	132.830	20	NW of Newcastle Waters, NT
2.6	06-Apr-2010	06:37:38	-38.133	147.645	0	SW of Lakes Entrance, VIC
5.0	05-Apr-2010	11:23:45	-42.423	124.939	10	South of Australia, Indian Ocean
2.6	03-Apr-2010	20:50:25	-30.683	118.316	0	Mukinbudin, WA
2.6	03-Apr-2010	17:49:42	-38.628	146.074	0	S of Leongatha, VIC
3.0	30-Mar-2010	08:08:26	-38.075	144.675	10	NE of Portarlington, VIC
3.0	29-Mar-2010	20:38:21	-30.533	117.032	0	Burakin WA
2.7	28-Mar-2010	16:37:36	-30.832	121.558	10	Near Kalgoorlie, WA#
3.0	23-Mar-2010	03:40:26	-15.797	128.712	3	Kununurra WA
3.3	22-Mar-2010	21:11:50	-33.469	148.969	2	SW of Orange NSW#
2.9	20-Mar-2010	10:56:39	-18.718	126.785	0	SW of Halls Creek WA
2.5	15-Mar-2010	21:06:39	-33.503	148.950	1	SW of Orange NSW#
3.0	14-Mar-2010	18:29:02	-33.465	148.945	0	SW of Orange NSW#

(# possibly mine related)

The 'earthquakes' near Orange NSW turned out to be collapse events in an underground goldmine, not blasts or natural earthquakes but it took a phonecall to the mine operator to ascertain this. On seismograms it is difficult to distinguish between natural and man-made seismic events although blasts can in theory be discriminated because of the use of delays between shot holes and between rows of holes. Time-of-day combined with location and coda shape have also been used to label blasts but this may have lead to real earthquakes being incorrectly identified as mine blasts in the past.

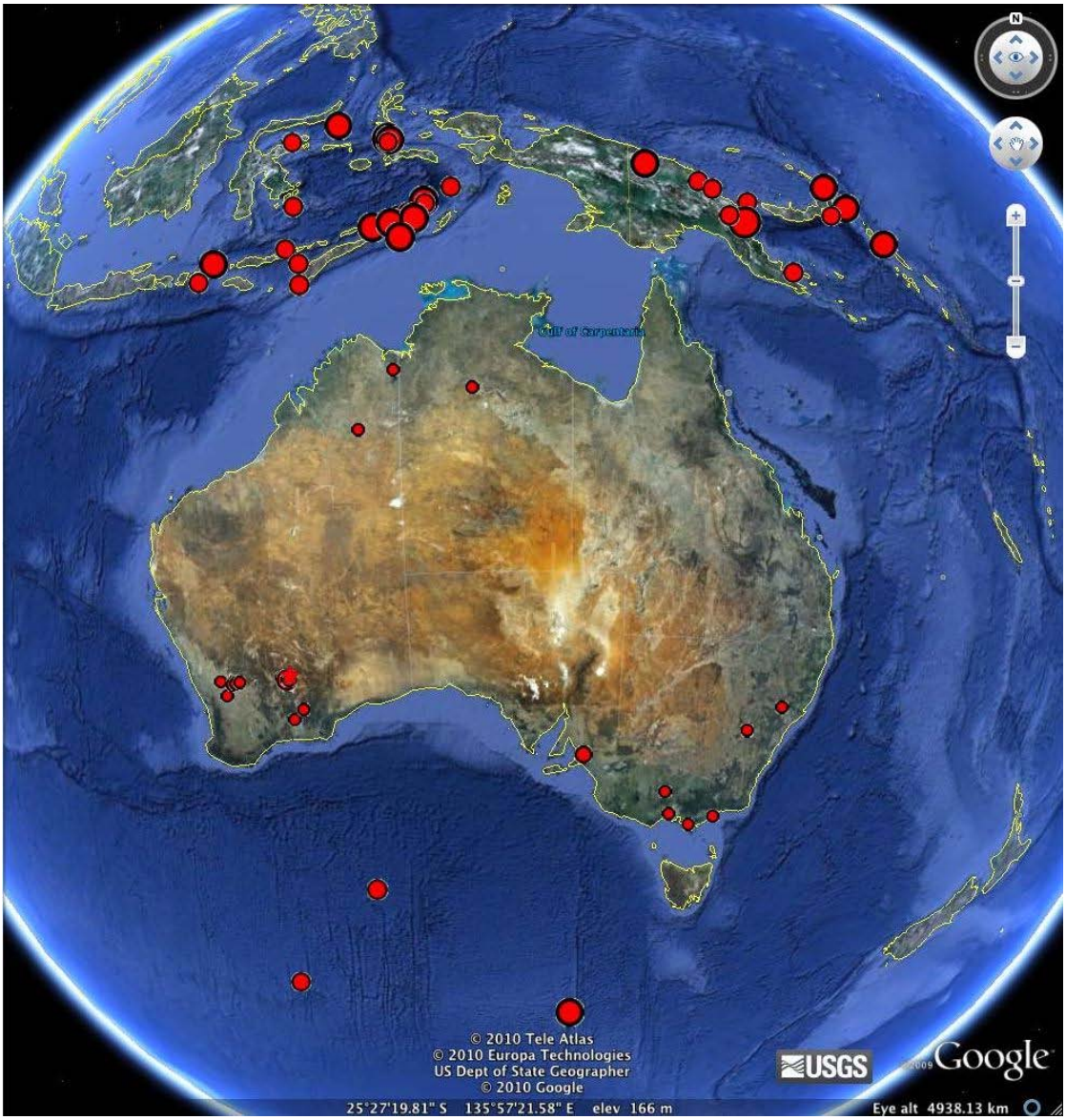


Figure *Epicentre of earthquakes in the Australian region, M ≥ 2.5 obtained using GoogleEarth and GA database online.*

Conferences

2010, 22–25 June
Western Pacific Geophysics Meeting Taipei, Taiwan.

2010, 4-8 July
Australian Earth Sciences Convention, Canberra. Earth systems: change, sustainability, vulnerability.

2010, 8-12 August
5th Civil Engineering Conference in the Asian Region and Australasian Structural Engineering Conference 2010. Sydney Convention and Exhibition Centre.

2010, 13-14 December
International Conference on sustainable Built Environment. Faculty of Enginering, University of Peradeniya and Earl's Regency, Kandy, Sri Lanka.

AEES Contact Details

Post:	PO Box 4014, McKinnon P.O. VIC 3204
Email:	sharon@wsm.com.au
Tel:	0414 492 210
Website:	www.aees.org.au

The 2010 AEES Committee

President:	Kevin McCue
Secretary:	Paul Somerville
Treasurer:	Mark Edwards
Committee members:	Gerhard Horoschun
	Helen Goldsworthy
IAEE Representative:	Gary Gibson
Secretariat/Newsletter:	Sharon Anderson
	Kevin McCue
Webmaster:	Adam Pascale

State Representatives

Victoria	Gary Gibson
Queensland	Russell Cuthbertson
New South Wales	Colin Gurley
Tasmania	Angus Swindon
ACT	Mark Edwards
South Australia	David Love
Western Australia	Hong Hao
Northern Territory	tba