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AEES is a Technical Society of IEAust The Institution of Engineers Australia and is affiliated with IAEE

2/2005

AEES Newsletter

Contents

President's Column

Welcome to the second edition of the newsletter for 2005. The AEES executive has been actively involved in organising the next conference scheduled for November the 25th to 27th in Albury. The format will be similar to last year's Mount Gambier conference with technical seminars on Friday afternoon, Saturday morning and Sunday morning and dinners on the Friday and Saturday nights, including a winery destination. Albury was selected as a regional centre with good proximity to Adelaide, Sydney, Canberra and Melbourne and good air connections for those travelling from further north and west, particularly Brisbane and Perth. The conference will feature around 20 oral presentations and 25 oral/poster presentations on the subjects of seismology, earthquake design of structures, tsunamis, extreme blast loading, risk modelling, extreme event insurance and urban search and rescue (USAR) operations with the Canberra bush fires as a case study. The poster presentations are a very important part of the conference, with the more detailed papers to be delivered in this format with the opportunity for a 3 minute introductory oral presentation followed by a dedicated poster session for all delegates to attend and interact at a personal level. The executive is keen for the society to maintain the strong earthquake engineering and seismology links with the past, but also to broaden interests to include other extreme events that have some similarities, from engineering insurance, risk and emergency response perspectives.

The executive is keen to invest in and upgrade the society's web page to provide a focus for the dissemination of information by AEES. Also, to supplement the other forms of communication through email bulletins (thank you to Col Lynam for his continued and vibrant support), the newsletter (thank you to A/P Nelson Lam) and the annual conference.

The updated AS1170.4 Earthquake Loading Standard is hopefully nearly ready for publication and acceptance by the ABCB for the Building Code of Australia. The revision of the Standard is described later in the newsletter but is another very important and voluntary contribution made by AEES members to the design of buildings and importance in this country.

AEES also has the potential to contribute to the development of training and a register for qualified engineers to assist in Urban Search and Rescue (USAR) operations in each state around Australia. Past president Mike Griffith, in conjunction with myself and Des Bull and Dave Brunsdon both from New Zealand, undertook the training of around a dozen engineers in South Australia earlier this year. This program of training is gaining momentum as Victorian and NSW State

Governments endeavour to strengthen their USAR capabilities to respond to rescues associated with collapsed structures from extreme loading.

We thank all our AEES members for their continued support and look forward to meeting you in Albury at our 2005 conference.

John Wilson, AEES President
July 2005

AEES Executive

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Obituary : Emeritus Professor Keiiti Aki

Based on report by Naomi Lubick in Geotimes March 2005.

The greatest earthquake scientist of the second half of the 20th century was the Japanese-born Keiiti Aki, who died in May this year, aged 75, from a brain haemorrhage following a fall. Born in Japan, Aki received his bachelor's degree in 1952 and Ph.D. in 1958 at the University of Tokyo. He conducted research until 1960 at the university's Earthquake Research Institute, after which he made his first foray to the United States, to work with Frank Press at Caltech's Seismological Laboratory in Pasadena, California, for several years. After returning to teach at the University of Tokyo for several years, Aki's second visit to the United States coincided with the 1966 Parkfield earthquake. He met with USGS seismologists at Menlo Park, California, who introduced him to coda waves, the train of scattered waves that occur after an earthquake's major identifiable waves. Aki joined MIT in 1966 to teach geophysics until 1984, when he moved back to California to work at the University of Southern California. There, Aki established the SCEC, a leading seismology research center focused on characterizing (and potentially forecasting) Southern California earthquakes.

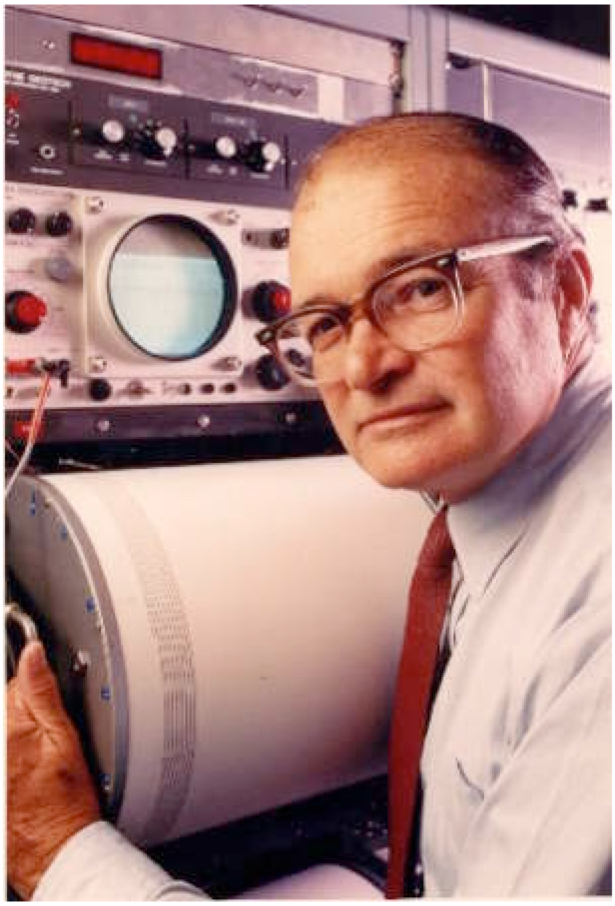
Like the seismic waves he studied, Keiiti Aki's pioneering work on the basic tenets of seismology reached across the planet. Determining the key physical attribute of earthquake magnitude was one of Aki's more important breakthroughs, says Paul Richards, a seismologist at the Lamont-Doherty Earth Observatory. In a landmark paper published in 1966, Aki determined the so-called seismic moment of the 1964 Niigata earthquake in Japan, showing how it can be measured on seismograms. He also showed that it is the product of how far a fault slipped and the area of the fault on which the slip occurred. The concept of seismic moment and the magnitude derived from it quickly replaced the empirical Richter magnitude scale as the most "appropriate single way to characterize" an earthquake's size, Richards says.

In recognition of his global impact, the American Geophysical Union (AGU) and European Geosciences Union awarded Aki with their highest honors: the William Bowie and Beno Gutenberg medals, respectively. Keiiti Aki, a groundbreaking seismologist, was awarded the Bowie Medal at the American Geophysical Union's annual meeting in December 2004 and the European Geosciences Union's Gutenberg Medal in April 2005.

Keiiti Aki died while working on La Reunion, a volcanic island in the Indian Ocean.

Obituary : Emeritus Professor Bruce Bolt

(Extracted from a number of sources by Kevin McCue)



Bruce Alan Bolt died on Thursday 21 July 2005 of pancreatic cancer at a hospital in Oakland at the age of 75.

Bruce was director of the UC Seismographic Stations for 28 years, he traveled the world to investigate major earthquakes and served on a number of panels and commissions. Bruce wrote several books including, *Nuclear Explosions and Earthquakes: – the parted* veil in 1976, *Earthquakes: A Primer* in 1978, *Inside the Earth: Evidence from Earthquakes* in 1982. He revised Bullens book *An introduction to the theory of Seismology* in 1985.

He served for 15 years on the California Seismic Safety Commission and was chairman in 1986. He served as president of the Seismological Society of America for two years and was on the board for many more. Bolt was president of the California Academy of Sciences from 1982 to 1985, and also served on its board of trustees for 12 years. He pushed for an exhibit about earthquake preparedness and narrated a demonstration about the 1906 earthquake for that exhibit, which was on view for about 20 years, said academy provost Terrence Gosliner who recalled walking by that exhibit many times and hearing Bolt's voice saying, *We must be prepared; it will happen again*.

Bruce was born at Largs near Taree in northern New South Wales, Australia, on 15 Feb 1930, and went to school in Maitland. He was awarded all his degrees, including a Ph.D. in applied mathematics, from the University of Sydney. He lectured there from 1954 until 1962 and became interested in mathematical modeling of the Earth's interior, not surprising given his PhD supervisor was New Zealander Keith Bullen of Jeffries and Bullen travel-time tables fame.

Bruce was involved in the monitoring of the Maralinga and Emu Springs nuclear explosions in the mid 1950s. Amongst his earlier research interests were the relocation of the 1954 Adelaide and 1939 central South Australian earthquakes. Before 1960 he wrote the first computer program for earthquake locations.

In 1963, he became director of the Berkeley Seismographic Stations, now the Berkeley Seismological Laboratory. Bruce became a naturalized citizen of the United States and remained director until 1989, retiring to emeritus professor of Earth and Planetary Science in 1993.

Bruce Bolt was one of the first people to recognize the importance of near-fault effects of earthquakes, a term he denoted the *fling* of the fault.

He really was the founder of the modern field of engineering seismology, which is the interface between earth science and the fields of geotechnical and structural engineering, Gregory Fenves, UC Berkeley professor and chair of civil and environmental engineering, said in a statement.

Bruce advocated installing strong-motion sensors near earthquake faults to measure the true ground movement, said Fenves. Bruce contributed to many other areas of seismology through analysis of seismic wave recordings.

Bruce was a keynote speaker at three AEES annual conferences: in Canberra 1994, Melbourne PCEE, 1995 and Adelaide in 2002. He also visited Newcastle after the 1989 Newcastle earthquake and gave advice to the Newcastle Lord Mayor's committee.

Bruce led a very active life that was not only limited to science. He often acted in and directed plays to raise money for students' scholarships and grants. He was an avid sailor who often took his students and colleagues sailing on his boat.

Bruce was very generous to Australian seismologists visiting Berkeley, giving of his time and advice and would often take us to lunch at the Faculty Club of which he was President for 10 years.

He is survived by his wife, Beverley (also a Maths graduate from Sydney Uni), daughters Gillian Bolt Kohli of Wellesley, Mass., Helen Bolt Juarez of Fremont, Margaret Barber of Rumson, N.J., and son, Robert, of Hillsborough.

Testimonials can be found at
http://seismo.berkeley.edu/memorial/bruce_bolt/

Recent changes to the administration of AEES include a change in management of the database and subscriptions. This will now be in the care of Engineers Australia and ALL members, whether they be members of Engineers Australia or not, will be issued with subscription notices by that organisation. Please direct any enquiries regarding subscriptions to Lois Wurzer at Engineers Australia:

(email: LWurzer@engineersaustralia.org.au*)*

The mailing address for other matters remains the same (PO Box 829, Parkville, 3052) and to contact Barb Butler at the Secretariat the following details apply:

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AEES Annual General Meeting and Conference – Albury November 25-27, 2005

(See the registration brochure included with your newsletter)

Report on the 2005 NZNSEE Conference Wairakei New Zealand, 11-13 March

The theme for this year's conference was *Planning and Engineering for Performance in Earthquakes* reflecting the incorporation for the first time of a performance factor in the just-published NZ Loading Code AS1170.5.

The organisers managed to squeeze fortythree 15-minute-long oral papers and one keynote paper into the two morning and one afternoon slots which meant that there was precious little time for questions or the poster papers. That is my only gripe; otherwise it was an excellent way to spend a very fruitful three half-days in New Zealand.

The papers covered the full range of earthquake engineering from seismicity and paleoseismicity to foundation response and earthquake resistant design plus a special session on the NZSEE reconnaissance mission to Thailand and Sri Lanka following the December 2004 earthquake and tsunami. The three reconnaissance team members focussed on the relevance of their observations for New Zealand.

A new concept for me was displacement-focused, force-based design, discussed in a paper immediately after Nigel Priestley's presentation on displacement based design.

Session headings were:

- Defining Earthquake Hazards
- Understanding Local Effects
- Poster Papers
- Learning from Earthquakes
- Assessing Effects on the Built Environment
- Making Progress
- Planning and Mitigation for Earthquake Performance
- Performance Based Design for Earthquake Performance
- Designing for Earthquake Resistance

The Making Progress session was a useful rundown of progress in risk assessment, earthquake response, a technician-level qualification in earthquake engineering and upgrade of earthquake-prone building legislation amongst others. Foundation response and retrofit of bridges and RC buildings were also topics for discussion.

There were about 100 registrants including long-term members Ivan Skinner (designer of the MO-2), David Dowrick and Richard Fenwick. Notable for their absence were Professors Bob Park and Frank Evison who have died since the last conference. New Zealand Universities were well represented by staff and students. Many GNS staff gave up their weekend as did engineers and insurers from several private companies. There were only four and a half attendees from Australia; Russell Blong, Amy Heath, Alton England and myself (the latter three AEES members). The half is Dr Paul Somerville who is this year based halftime in the US, the other half at Risk Frontiers, Macquarie University.

Amy presented a paper discussing the ambivalent interpretation of a trenching log from a Recent fault scarp near Echuca in Victoria. Dr Somerville was the keynote speaker and gave a very polished talk about near source ground motion including effects such as directivity. A near-field term has been included in the new NZ Loading Standard so it was a very relevant topic. Though how one knows which way the fault will rupture is anyone's guess.

There were several papers on unreinforced masonry which was a surprise since URM is banned in New Zealand.

A quirky thing about the engineering presentations was the use of Californian strong motion records for both time history and spectral design, rather than NZ strong motion records of which there are many.

Saturday afternoon was set aside for people to get together in social groups. I joined a party led by Graeme McVerry to scale Mt Tauhara a small local volcano (small is relative). You can see we made it (I took the photo). The sole topic of conversation on the walk was earthquakes, mostly their strong motion characteristics. Following recovery we enjoyed the official conference dinner at the Wairakei resort which was another excellent venue for making or maintaining linkages.

Dr Mark Stirling (far left) Dr Graeme McVerry (2nd left) Dr Paul Somerville (far right) Kevin McCue (3rd left) Sonja Lenz (3rd right). Tongariro National Park behind.

The Conference Proceedings were provided at the conference in hard copy and on a CD as pdf files without a conference bag.

Whilst in New Zealand I delved into a few bookstores and came across two interesting recently published books relevant to New Zealand tectonics and I have written a brief summary of them under New Books.

Next year's conference may be held at Napier 75 years after the last damaging earthquake there and I would encourage members to try and get across for another great conference.

Kevin McCue
April 2005

Col Lynam's Column

(Extracted from the daily blog of a "seismetrician")

Hark now! Is yon bright and lustrous light not familiar? Focus upon its badge now. If I be not deceived, 'tis the AEES badge! See it swagger alongside Uni of Melbourne research Centres of esteemed provenance. See now, how they foster dialog of the Tsunami phenomena. Methinks I move amongst a learned and savvy executive…what hey, Jove?

And so it was when I opened up Barbara's email attachment announcing the June 20th "Tsunami Technical Forum", at Melbourne Uni. If a PDF file could encrypt sound, I'd expect nothing less than a blaring riff of trumpets from a Grenadier Guard's marching tune. It is a pretty good AEES "brand" enhancement and marketing strategy, would you not agree? Not to mention the 100% increase in Membership benefits to those in Melbourne!

Ah yes, AEES Membership, that's the nub of this issue's column. Let's look at why we, individually, need to help increase our AEES membership. From figures of attendees at the Annual AEES Conferences (1996 > 2004), the total attendees hovers in the mid 50's, with the ratio of paying Members to paying non-members declining from 50% (1996) to 17% (2004). All the while, Member attendees have been stable, around 30 (Yes 30!). Now this either means that this association is being progressively perceived as having nothing relevant to say to the allied science and engineering professionals (and prospective members) or that this relevant cohort of "allied" workers is decreasing. We need to seriously investigate this. Are we becoming extinct?

One strategy to increase membership could be to place a more professional attention to our AEES web site, to capture the public's attention, in its insatiable search for earth science and natural hazard information. Another might be to put even more effort into our list discussions. A few of us are members of the PSN list for "amateur" (USA) seismologists…the level of technical innovation and instrumentation discussion is quite high (developmental!) with knowledge freely shared, from componentry to software, including the wonderment of discovering their first earthquake signal on their home-built seismographs. Similarly, the interest must be there in those Australian public with a curious nature…How can AEES encourage it?

To borrow the thoughts of the Group Manager, Paul Salteri (Tenix Group, Sydney); "We need to move innovation outside of the traditional cells of science and technology and create "innovation champions" who are both role models and spokespersons, in all sectors. . . In Australia, we need a philosophical change and, as a nation create a culture hungry for innovation and change: a nation not concerned with "She'll be right, mate", but one focused on "She'll be better". We need to look beyond the social divide between the "intellectual think tanks" or "the domain of the higher educated", and that of the "average person", to realize that we are each capable of innovation, and that innovation is not the sole right or responsibility of the well educated." (Engineering World April/ May 2005 pp18 - 23).

Let's aspire to being one of Mr Salteri's "innovation champions" and encourage Public Science knowledge in earthquakes and engineering. It is no different a process to that harnessed by the Environmental movement. He may even be interested in partnering AEES in a philanthropic partnership? In fact, how many Members would make a tax deductible donation to AEES (if legally registered) or be prepared to put a codicil in their WILL, to foster an AEES program of "innovative champion" for Public Education on Natural Hazard preparedness? Many, I suspect, knowing their passionate dedication and interest.

Last week I referred to the QUAKEWATCHER program that I have "stewarded" at the ESSCC Centre of UQ. I have just discovered a European version (EDUSEIS) of this project type. Please, take time out to view their inspired website (http://eduseis.na.infn.it/sitoing/index/inding.html). It just reaffirms my argument about public interest in AEES's specialist field. From a marketing point of view, we have a greater fiscal opportunity writing "fact sheets" and school syllabi, than we will ever earn from Conference Proceedings. Perhaps this was the thought behind the FIRST AEES pamphlet; "Sumatran Earthquake and Tsunami"?

(Col Lynam (Earthquake Services) has over 35 years experience in observatory seismology, in Brisbane; reply to; lynam@uq.edu.au)

Earthquakes in Australia

Earthquakes of magnitude 2 or more in the period January to May 2005 and located by Geoscience Australia, ES&S or PIRSA are shown in the following table. The two largest events were of magnitude 4.6, one each in South and Western Australia. Neither caused damage. There were five earthquake of magnitude 4 or more in March which is significantly above the average of one per month. The Burakin WA swarm continued at a low level and another started up nearby at Koorda WA. There were apparently none in Tasmania in this period.

Date	Time UTC	Lat S	Long E	Mag	Place
Jan					
01	32024	28.98	114.34	2	SW Geraldton WA
02	15644	35.39	148.65	2.9	Brindabella ACT
03	4030	30.65	117.48	3.5	N Koorda WA
05	83103	26.12	153.41	3.6	Off Sunshine Coast, Qld
08	10856	30.52	117.05	2.3	Burakin WA
08	43719	19.80	134.01	2.5	Tennant Ck NT
12	191717	23.00	127.88	2.8	SW L Mackay WA
12	225317	33.10	138.57	2.7	Jamestown SA
16	114920	19.85	134.06	2.3	SW Tennant Ck NT
18	100913	33.85	147.19	3.7	N West Wyalong NSW
20	94611	36.31	146.15	3.3	W Wangaratta Vic
24	94358	17.53	122.59	3.8	NE Broome WA
25	105218	17.02	127.23	2.3	N Halls Ck WA
25	220445	19.81	134.00	2.2	SW Tennant Ck NT
27	171734	31.42	119.24	3.5	W Southern Cross WA
27	172901	32.47	122.38	3.3	SE Norseman WA
29	120802	30.19	117.21	2	NE Kalannie WA
31	132248	30.81	121.45	2.6	S Kalgoorlie WA
31	203019	30.67	117.44	2.2	N Koorda WA
Feb					
09	224224	33.87	118.59	2.2	Ongerup, WA
12	2307	19.82	133.99	2.7	SW Tennant Ck NT
12	83010	30.65	117.54	2.7	N Koorda WA

12	144919	19.76	133.93	2.7	SW Tennant Ck NT
12	162502	19.72	133.94	2.6	W Tennant Ck, NT
12	162527	19.74	133.90	3.1	W Tennant Ck, NT
13	183537	30.65	117.54	2.8	N Koorda WA
13	192629	30.65	117.51	2.5	N Koorda WA
18	175743	32.83	121.09	3.3	SW Norseman, WA
20	91627	34.01	148.68	2.9	N Breakfast Ck NSW
20	173341	30.66	117.54	2.8	Koorda WA
22	41454	31.64	117.04	2.2	SE Meckering WA
23	193505	14.63	122.06	3.9	Scott Reef.
24	165742	30.63	117.49	3.3	N Koorda WA
24	175049	30.65	117.45	2.4	Koorda WA
27	61736	33.61	118.28	3.6	NE Gnowangerup WA
Mar					
02	148	22.70	128.50	2.2	SW Lake Mackay WA
03	105701	30.90	139.14	4	SE Leigh Ck, SA
04	3851	33.05	139.55	3.2	E Peterborough, SA
04	43045	34.04	148.85	2.2	SW Wyangala Dam NSW
04	135433	24.38	137.25	2.2	Simpson Desert NT
06	53741	28.10	115.73	2.5	NE Geraldton WA
07	145225	24.31	112.57	3.3	NW Carnarvon WA
07	162237	26.47	151.48	3.6	Durong Qld
08	45426	14.66	122.17	3.6	Scott Reef.
08	50012	34.33	148.43	2.5	E Young NSW
08	93351	29.85	119.48	2	W Menzies WA
12	155518	30.66	117.45	2.9	Koorda, WA
13	20949	26.16	131.64	**4.6**	W Ernabella SA
13	105657	19.99	130.37	2.1	Tanami Desert, NT
15	124956	32.53	116.84	2.7	SW Brookton, WA
16	12717	30.64	117.46	4.2	N Koorda WA
17	163612	31.12	116.60	2.7	Calingiri WA
18	110450	30.72	117.34	2.8	NW Koorda, WA
19	72928	26.09	130.87	4.1	Central Desert NT
19	213850	20.47	115.51	3.7	Barrow Island WA
22	195154	21.00	119.61	4.4	NW Marble Bar WA
23	100426	19.78	134.07	3.1	Tennant Ck NT
25	41646	31.16	117.22	2.9	Dowerin WA
25	91032	20.35	145.83	2.7	SW Charters Towers Qld
28	90330	17.88	126.42	2.4	E Fitzroy Crossing WA
29	74101	31.14	116.30	2.1	SW Calingiri WA
29	161558	22.14	126.61	3.5	W Lake Mackay WA
Apr					
02	81721	19.87	134.06	2.3	SW Tennant Ck NT
02	91448	16.65	127.24	2.9	N Halls Ck WA
03	174426	30.58	117.00	2.4	Burakin WA
03	214334	30.56	117.01	2.4	Burakin WA
04	35839	30.58	117.00	2.5	Burakin WA
04	52129	30.57	117.00	2.6	Burakin WA
05	192956	10.60	124.11	3.9	Timor Sea.
05	214224	30.86	116.80	2	Ballidu WA
06	4639	31.99	117.27	2.2	Beverley, WA
09	233409	19.78	133.96	2.6	Tennnant Ck NT
12	115935	30.59	117.01	3.5	SW Burakin WA
12	120002	30.56	117.01	4	W Burakin WA
12	180442	30.57	117.00	2.3	W Burakin WA
14	20304	30.57	117.01	2.7	W Burakin WA

14	131627	28.55	149.27	3.2	SE St George Qld
14	171760	33.51	118.34	2.8	S Lake Grace WA
15	81233	31.97	116.71	2.5	Beverley WA
16	120653	32.02	117.27	2.2	E Beverley WA
16	171840	19.85	133.97	2.1	SW Tennant Ck NT
17	91739	35.72	149.52	2.2	SE Captains Flat NSW
17	144243	36.30	148.66	2.3	N Jindabyne NSW
18	90220	30.57	117.00	3.2	W Burakin WA
18	90637	30.57	117.00	2.1	W Burakin WA
18	111412	22.21	131.27	2.2	Yuendumu NT
18	111834	22.23	131.35	2	Yuendumu NT
18	135332	33.61	118.27	2.8	Gnowangerup WA
18	150107	30.57	117.00	2.8	Burakin WA
18	150245	22.19	131.21	2.3	Yuendumu NT
18	211814	38.30	146.35	2.6	NE Yinnar VIC
20	215322	38.53	146.53	3.5	Hiawatha VIC
21	112913	33.29	117.22	2	E Arthur R WA
21	114809	30.58	117.00	2.5	Burakin WA
21	115723	30.59	117.01	2.5	Burakin WA
22	11256	30.24	117.86	3.1	N Beacon WA
22	194553	30.57	117.01	2.7	W Burakin WA
23	91349	31.18	117.18	2.1	E Dowerin WA
26	112944	19.84	134.00	2.6	SW Tennant Ck NT
28	55846	19.92	134.28	2.3	S Tennant Ck NT
May					
01	94316	30.19	117.91	4.1	N Beacon WA
01	100231	30.25	117.83	2	N Beacon WA
01	153841	30.20	117.89	3.6	N Beacon WA
02	194243	32.87	139.40	2.7	E Peterborough SA
04	184516	25.93	117.32	3.2	SE Erong Springs WA
06	65904	31.64	115.96	2.8	S Bindoon WA
08	180914	30.83	117.09	2.2	Manmanning WA
09	145243	30.58	116.98	3.2	W Burakin WA
10	213113	31.73	117.06	2.2	SE Meckering WA
12	11837	31.95	117.20	2.6	NE Beverley WA
14	133328	28.74	136.57	3.8	William Ck SA
14	195306	31.00	139.15	4.5	North Flinders SA
15	215426	30.69	117.42	2.8	N Koorda WA
16	122158	34.47	149.12	2	W Mullengrove NSW
16	213242	30.63	117.49	2.3	Koorda WA
17	53431	30.21	117.92	3.3	N Beacon WA
18	233948	20.11	119.37	**4.6**	E Port Hedland WA
20	12553	30.57	117.00	2.4	W Burakin WA
20	102531	31.70	117.05	2.4	SE Meckering WA
21	30013	30.66	117.44	2.5	N Koorda WA
22	44618	30.57	117.01	2.4	W Burakin WA
24	220213	30.48	117.05	2.3	W Burakin WA
27	10358	30.65	117.44	2.4	N Koorda WA
27	121045	30.65	117.45	3.3	N Koorda WA
27	124819	30.63	117.46	3	N Koorda WA
27	140846	30.64	117.47	2.8	N Koorda WA
27	175551	30.65	117.44	2.2	N Koorda WA
28	220343	30.69	117.40	2.3	Koorda WA
28	235044	30.70	117.39	2.1	NW Koorda WA
28	235302	30.70	117.39	2.1	NW Koorda WA
29	1148	30.66	117.43	2	N Koorda WA
29	35726	30.67	117.43	2.2	N Koorda WA
29	154819	30.66	117.43	2.5	N Koorda WA

Other News !

New Australian Standard for Earthquake Actions

The revised AS1170.4 developed by Committee BD6/11 is nearly ready for publications by Standards Australia. The revised edition is now very much a loading standard with specific material detailing requirements now moved to the relevant materials Standard (eg. AS1720 – timber, AS3600 – concrete, AS3700 – masonry and AS4100 – steel) and domestic structures moved to a dedicated Appendix A. This revision has some significant changes with a new Australian specific response spectrum with inelastic displacement demands incorporated into the Standard. All structures will have to be designed for earthquake loading using a 3 – tier process of increasing complexity reflecting a normal earthquake loading regime, a static analysis and a dynamic analysis for taller structures. In addition, designers competent in the use of the capacity spectrum method, can use this higher tier approach to rationally justify their design. The section for the design of parts and components (non-structural elements) is considered more rational and transparent with a 2 – tier approach available for designers.

The committee BD6/11 (AS1170.4) is currently in discussion with committee BD4 (AS3700 – masonry) to resolve specific issues relating to the earthquake design of unreinforced masonry structures which has been moved from AS1170.4 to form a new Appendix A in AS3700. Until this issue is resolved, ABCB will not "call up" the new AS1170.4 in the Building Code of Australia. BD6/11 is hopeful that a resolution will be achieved in the coming months allowing publications of AS1170.4 in 2005.

Young Hong Kong academic won award to visit Australia for six months

Mr Hing Ho Tsang, aged 24, has been awarded the 2005 Endeavour Australia Cheung Kong Award to visit University of Melbourne for six months to undertake earthquake engineering research. The highly competitive award (valued up to $25k) is administered by the Department of Education, Science and Training of the Australian Government, is aimed at attracting high performing scholars, and particularly research proposals which will benefit the further development of social and economic environment of Asia and Australia. High profile receptions by the Federal Minister of Education and the Governor of Victoria were given to Hing Ho Tsang upon his arrival in Australia in June. Hing Ho is currently in his final year of his PhD candidature at the University of Hong Kong under the supervision of Professor Adrian Chandler. During his visit to Australia, he is supervised by Nelson Lam who is Associate Professor and Reader at the University of Melbourne.

Photo : Hing Ho Tsang meeting with Minister for Education, Science and Training – The Hon Dr Brendan Nelson MP at Parliament House, Canberra on 21st June 2005

ARC Research Network for a secure Australia

The Australian Research Council (ARC) Network for a secure Australia (RNSA) held the 2005 Science, Engineering and Technology (SET) Summit in Canberra on the 14th of July, 2005. The summit is an annual event aimed to bring together both researchers and practitioners in fields relating to the national research priority entitled Safeguarding Australia. It is a forum for the exchange of ideas and research findings between core groups and individuals interested in the protection of infrastructure and counter-terrorism technology. The organisers of the 2005 summit were A/Prof Priyan Mendis, Prof Joseph Lai and Prof Ed Dawson.
Web address for details : http://www.secureaustralia.org

EGU General Assembly 2005

Report by Dr C.Sinadinovski of Geoscience Australia

The General Assembly of the European Geosciences Union (EGU) was held this year in Vienna, Austria, from 24th to 29th of April. The assembly is the largest gathering of European scientists in the order of a few thousand. The scientific programme included Union Symposia, oral and poster sessions on disciplinary and interdisciplinary topics covering the full spectrum of the geosciences and the space and planetary sciences. There were also great debates, short courses and workshops, keynote presentations and splinter meetings.!

The following Union Symposia were presented:

US1!!!!!!!!!!! Neutrons at the Frontier of Earth Sciences & Environment
US2!!!!!!!!!!! Austria's contribution to geophysics in the 20th century
US3!!!!!!!!!!! Mega-initiatives in Geosciences New International Opportunities
US4!!!!!!!!!!! EUROMARGINS dynamic processes - keynote lecture session
US5!!!!!!!!!!! The International Polar Year 2007-2008

US6!!!!!!!!!!! Putting Geosciences back on the European Agenda
US7!!!!!!!!!!! The Sumatra earthquake and the Indian Ocean tsunami
US8!!!!!!!!!!! Young Talents in Geosciences Symposium
US10!!!!!!!!! Great Debates in the Geosciences

The event of 26th of December 2004 was covered from a variety of aspects in the symposium. A special issue of the whole US7 session addressing the Indian Ocean tsunamis has been planned for the Bulletin of Earthquake Engineering journal.

More presentations and discussions on earthquakes and Tsunami's in southeast Asia

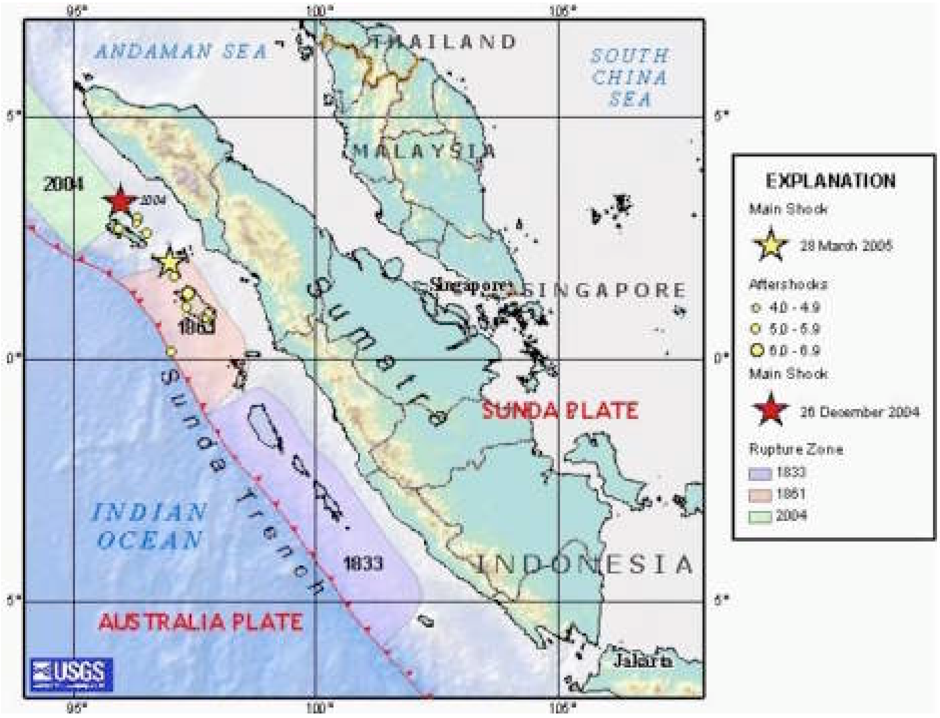
The 28 March 2005 Northern Sumatra Earthquake (M_w 8.7)

Kusnowidjaja Megawati, University of Hong Kong

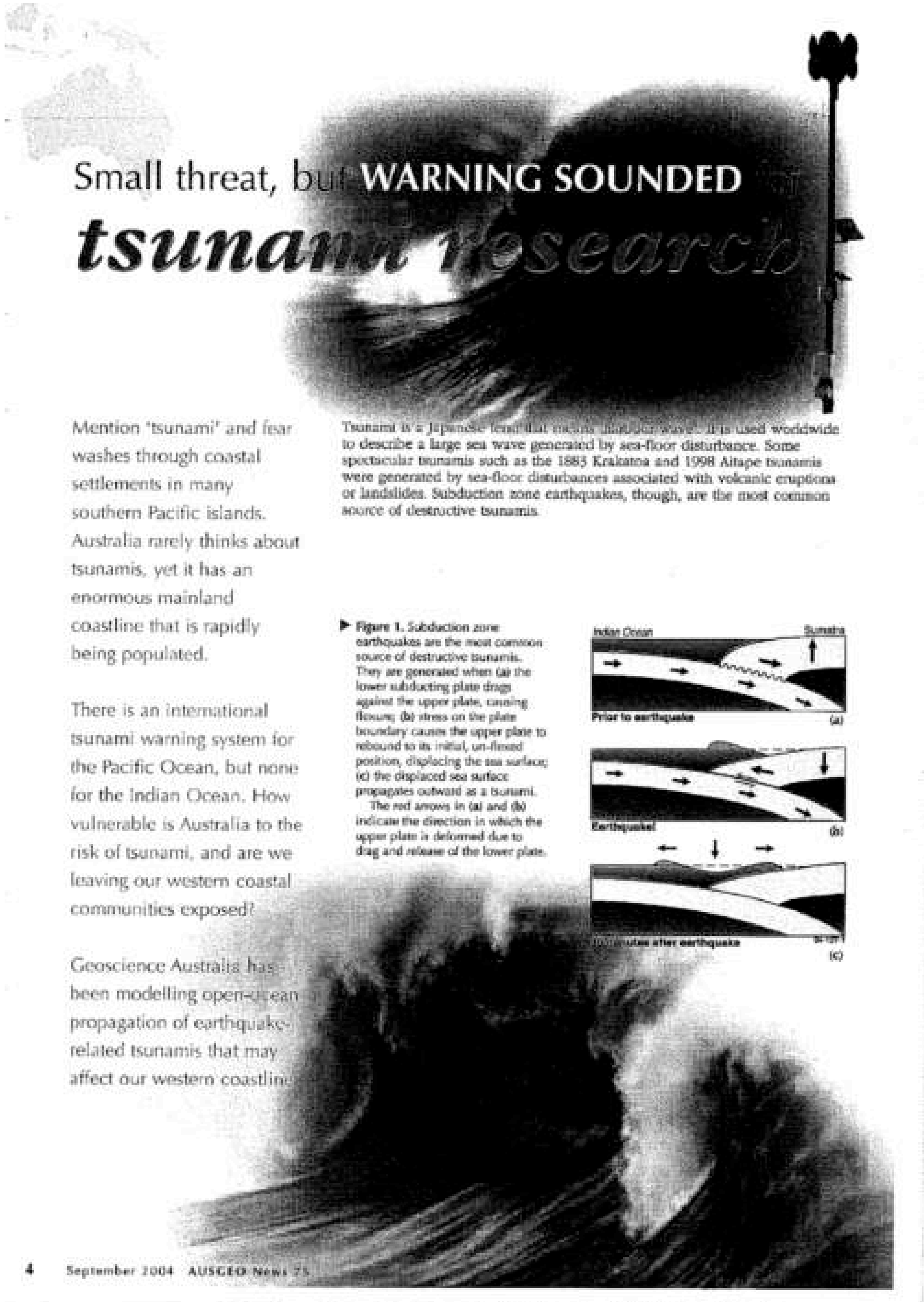
A great earthquake with M_w 8.7 struck Nias Island, off the west coast of northern Sumatra, Indonesia, on 28 March 2005 at 16:09:36 UTC (23:09:36 local time). This earthquake occurred only about three months after the 26 December 2004 Sumatra-Andaman earthquake (M_w 9.0), which caused massive loss of lives in the Indian Ocean basin due to tsunami. The epicentre of the 28 March earthquake (2.074^{0}N, 97.013^{0}E) was only 150 km southeast of the epicentre of the 26 December earthquake. This shallow-dipping thrust earthquake was generated by the subduction of the Indian-Australian Plate beneath the Eurasian Plate.

At least 1300 people were killed, 300 were injured and 300 buildings were destroyed in Nias, Simeulue and Kepulauan Banyak, within the epicentral region. The tremors were felt widely in northern and central Sumatra and the Malay Peninsula. The reported intensities on the Modified Mercalli Intensity (MMI) scale were V in Medan (distance = 245 km, estimated PGA = 0.04 g, estimated PGV = 5 cm/s), IV in Kuala Lumpur (distance = 535 km, estimated PGA = 0.02 g, estimated PGV = 2 cm/s), and III in Singapore (distance = 700 km, estimated PGA = 0.01 g, estimated PGV = 1 cm/s). The tremors lasted for about three minutes. In Singapore and Kuala Lumpur, residents of high-rise buildings fled their homes and ran into the streets. The tremors were also felt, as far as, in the Andaman and Nicobar Islands, India, in Sri Lanka and in Maldives.
It is likely that the 28 March earthquake was triggered by stress changes caused by the earthquake on 26 December. When large earthquakes occur on one part of a fault zone, stress is transferred to another part of the fault zone that did not rupture at the time, or even to other nearby faults, and this can increase the probability of another large earthquake in the near future in these zones. The phenomenon of stress transfer has been widely observed by scientists, as for example in Turkey in 1999.

A 3-meter tsunami damaged the port and airport on Simeulue. Tsunami run-up heights as high as 2 metres were observed on the west coast of Nias and 1 meter at Singkil and Meulaboh, Sumatra. However, the 28 March 2005 earthquake did not trigger the widely expected destructive tsunami, although tide gauges in the Indian Ocean did show changes to the expected sea level. This fact is still puzzling given that the 28 March and 26 December earthquakes occurred under the seabed and were similar in size. Also the fault mechanism was similar, for both earthquakes caused by a low angle thrust.


ANDAMAN SEA
THAILAND
SOUTH CHINA SEA
MALAYSIA
EXPLANATION
Main Shock
28 March 2005
Aftershocks
4.0 - 4.9
5.0 - 5.9
6.0 - 6.9
Main Shock
26 December 2004
Rupture Zone
1833
1861
2004
Singapore
SINGAPORE
Sumatra
SUNDA PLATE
Sunda Trench
INDIAN OCEAN
1833
INDONESIA
AUSTRALIA PLATE
Jakarta
2004
1861

Small threats but warning sounded for Tsunami research
Source : AusGeo News 75



Small threat, but WARNING SOUNDED for

tsunami research

Mention 'tsunami' and fear washes through coastal settlements in many southern Pacific islands. Australia rarely thinks about tsunamis, yet it has an enormous mainland coastline that is rapidly being populated.

There is an international tsunami warning system for the Pacific Ocean, but none for the Indian Ocean. How vulnerable is Australia to the risk of tsunami, and are we leaving our western coastal communities exposed?

Geoscience Australia has been modelling open-ocean propagation of earthquake-related tsunamis that may affect our western coastline

Tsunami is a Japanese term that means 'harbour wave'. It is used worldwide to describe a large sea wave generated by sea-floor disturbance. Some spectacular tsunamis such as the 1883 Krakatoa and 1998 Aitape tsunamis were generated by sea-floor disturbances associated with volcanic eruptions or landslides. Subduction zone earthquakes, though, are the most common source of destructive tsunamis.

Figure 1. Subduction zone earthquakes are the most common source of destructive tsunamis. They are generated when (a) the lower subducting plate drags against the upper plate, causing flexure; (b) stress on the plate boundary causes the upper plate to rebound to its initial, un-flexed position, displacing the sea surface; (c) the displaced sea surface propagates outward as a tsunami.

The red arrows in (a) and (b) indicate the direction in which the upper plate is deformed due to drag and release of the lower plate.

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Plate convergence

A subduction zone is where two of the Earth's rigid tectonic plates are converging towards one another; and one plate, usually composed of heavier oceanic material, dives beneath the other generally lighter plate of continental material (figure 1). At the boundary where these plates rub past each other, the lower plate drags upon the upper, flexing it slightly downward (figure 1a). When the flexing increases to the point where the stress on the plate boundary exceeds the frictional strength of the interplate contact, the upper plate rebounds to its initial, un-flexed position. This causes sea-floor displacement, which happens so quickly that it is initially reflected on the ocean's surface (figure 1b). This disturbance to the sea surface propagates outward as a tsunami (figure 1c).

In the deep ocean this wave travels at speeds of 300–500 kilometres/hour and may be only a few tens of centimetres to a metre or so in height. As it approaches shallow water, the wave speed slows dramatically and the height may increase to 10 metres or more.

Australian region

The Pacific Tsunami Warning Centre was established because several earthquake zones around the Pacific Rim generate earthquakes so massive that the associated tsunamis can affect the entire Pacific basin. Even the 1960 Chilean earthquake caused a one-metre high tsunami in Sydney. Australia, though, is not thought to be at high risk from tsunamis because most accounts relate to trans-Pacific tsunamis such as the Chilean event.

The most direct threat to Australia is to the north-west off Indonesia, where the Australian plate subducts beneath the Eurasian plate. This subduction zone is called the Sunda Arc.

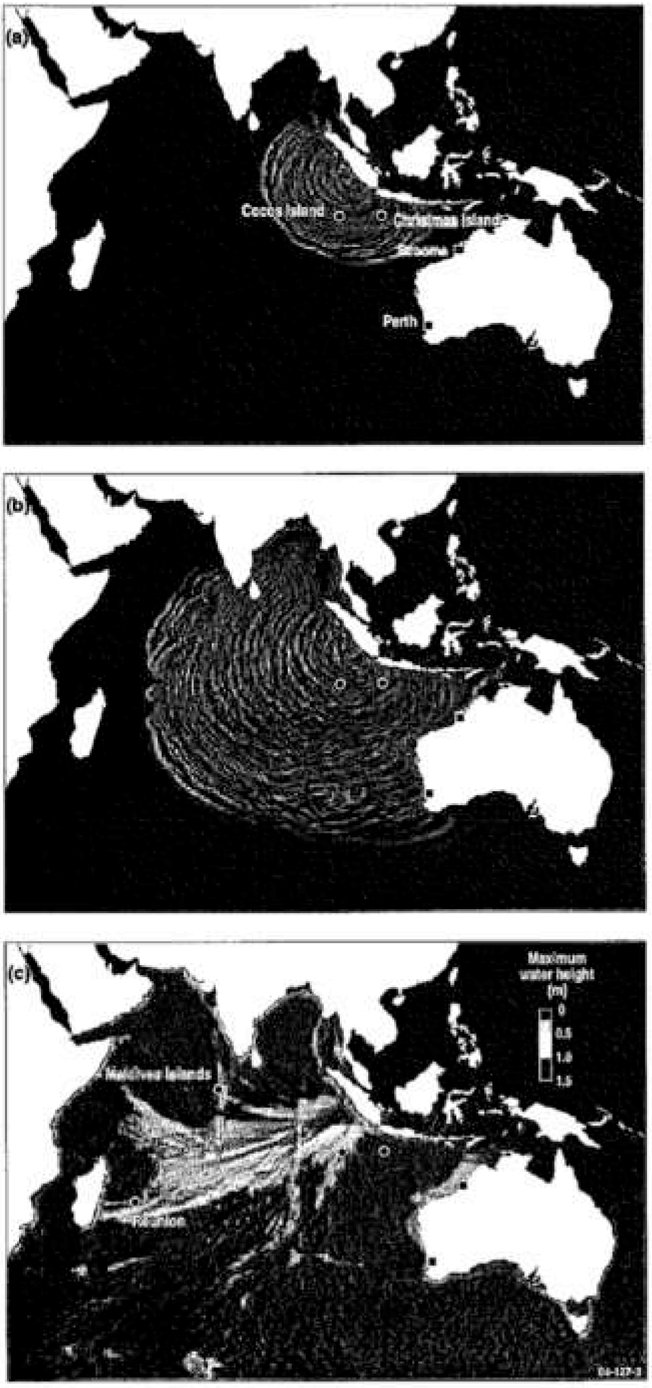
Earthquakes off Java have caused large tsunamis which reached heights of four to six metres on Australia's north-west coast (the 1994 Java and 1977 Sumbawa earthquakes, respectively, see figure 2). These events caused little damage in Australia and no lives were lost. But population increases in north-western Australia and the substantial investment in oil and gas infrastructure along the Northwest Shelf (figure 2) suggest that the potential risk of tsunami merits further consideration.

Western Australia's economy would feel the impact if a tsunami affected Northwest Shelf oil and gas production.

Sunda Arc

There are two distinct zones for earthquake activity in the Sunda Arc. The 1977 and 1994 events mentioned above occurred in the eastern part of the arc, where relatively old (approximately 100 million years) oceanic lithosphere subducts offshore Java. Very few of the classical subduction zone earthquakes illustrated in figure 1 occur in this part of the arc—1994 being the only confirmed event of this type. The largest earthquake-generated tsunamis in the eastern Sunda Arc are actually normal faulting events in the Australian plate, in the 'outer rise' where the subducting plate bends prior to diving beneath Indonesia.

◀ **Figure 2.** Tsunami-generated events off West Australia are colour-coded to match run-up observations. Mw is a logarithmic measure of earthquake size, similar to the Richter scale. VEI is the Volcanic Explosivity Index; Krakatoa with a score of six is one of the largest in recorded history. There are no recorded observations in Australia of the tsunami events of 1833 and 1861. Important areas of oil and gas production along the Northwest Shelf are shown.



▲ **Figure 3.** Results of numerical modelling of the open-ocean propagation of the tsunami associated with the 1833 Sumatra earthquake: **(a)** illustrates the tsunami's propagation in the Indian Ocean after two hours, and **(b)** after five hours; **(c)** shows the distribution of maximum tsunami wave height throughout the Indian Ocean.

Farther to the north-west in the Sunda Arc, relatively young (40 million years) oceanic lithosphere subducts offshore Sumatra. The subduction of such young oceanic lithosphere in the Pacific Ocean is associated with most of the massive earthquakes that generate the huge tsunamis that pose a threat to the entire Pacific basin. Although there are no Australian observations on record of tsunamis excited by earthquakes off Sumatra, great thrust earthquakes occurred there in historic times. The most recent occurred in 1833 before widespread European settlement in Western Australia.

The moment magnitude of the earthquake in 1833 is estimated to be 8.7–8.8, and 8.3–8.5 for the one in 1861.[1] However, the magnitude of the 1833 earthquake may have been as high as 9.2 based on a recent study that used the growth ring record of coral micro-atolls to estimate the uplift.[2] This massive earthquake would probably have affected the entire Indian Ocean basin, and the whole Western Australian coastline.

Tsunami modelling

Geoscience Australia has been modelling the open-ocean propagation of the tsunami associated with the 1833 Sumatra earthquake (figure 3). This modelling is accurate only for tsunami propagation in deep water, and does not account for shoreline run-up, where the amplitude will usually increase several fold.

The numerical simulation shows that although the waves are large enough to affect the entire Indian Ocean basin, most of the tsunami energy radiates out into the Indian Ocean and not towards Australia. Even though Western Australia is spared the largest tsunami waves generated by the earthquake, open-ocean tsunami wave heights all along the western coast are 15–25 centimetres, and the run-up from these may be one metre or more.

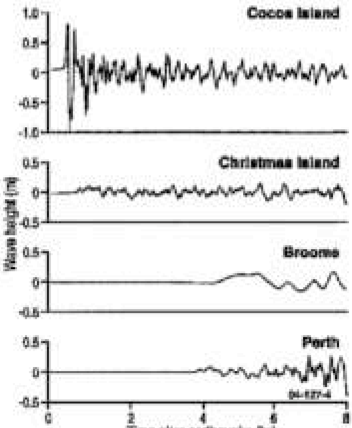
Tsunami alert

Geoscience Australia is involved in negotiations with the Bureau of Meteorology and Emergency Management Australia to establish an Australian Tsunami Alert Service.

One well-established method to warn the public about impending tsunamis is to rapidly locate and estimate the size of earthquakes which occur in a region, and estimate whether the detected event has the potential to produce a tsunami. However, the size of tsunamis often cannot be estimated with complete confidence based on earthquake data, because some of the details of the faulting mechanism are not easily resolved using seismic data alone.

Direct observations of the tsunami are necessary to establish with confidence whether or not a large tsunami has been excited by an earthquake or other event. This information is available from tide gauges.

In the Australian region, tide gauges on Cocos Island and Christmas Island will provide an early, direct indication of whether a tsunami has been excited off the Indonesian coast (figure 4). Tide gauges on these islands will record the tsunami just 15 and 40 minutes, respectively, after an earthquake. This could provide a tsunami warning three to four hours before it has an impact on the Australian coast (figure 4).



▲ Figure 4. Waveforms computed at hypothetical tide gauges in deep water off Christmas Island, Cocos Island, Broome and Perth. The tsunami's early arrival at the two islands may provide a basis for warning more distant areas. The tsunami reaches Broome at almost the same time as that travelling a much longer path to Perth, due to the shallow ocean between Indonesia and north-west Australia.

Research needs

The tsunami hazard for Australia is probably highest along the north-west coast. But the tsunami hazard along the coast near Perth may be higher than historical experience suggests because there were very few settlers in Western Australia prior to 1840 to make observations.

Historical accounts of tsunamis in the region need to be collated. Although Australian accounts of the massive 1833 earthquake are lacking, there are many Indonesian ones, and there should be evidence in historical documents from elsewhere in the Indian Ocean. Further research into tsunami hazard for the Western Australian coast should also include a systematic study that distinguishes between tsunami and storm deposits.[3]

More accurate tsunami run-up calculations are also needed, to identify places along the coast where tsunami energy may be focused (this would also be useful to narrow down the search for tsunami deposits). Finally, a warning capability should be established, using tide gauges on Cocos Island and Christmas Island to provide several hours' advance warning of a tsunami generated off Sumatra.

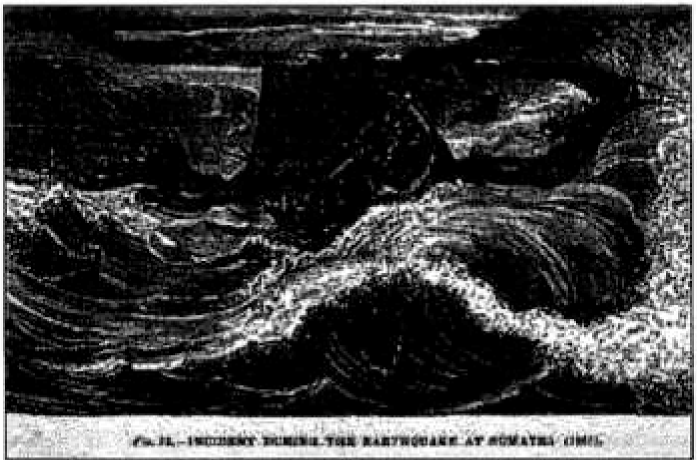


Image courtesy of National Information Service for Earthquake Engineering, University of California, Berkeley. Engraving by Edouard Riou, 1833-1900

References

1. Newcomb KR & McCann WR. 1987. Seismic history and seismotectonics of the Sunda Arc. Journal of Geophysical Research; 92:421–439.
2. Zachariasen M, Sieh K, Taylor FW, Edwards RL & Hantoro WS. 1999. Submergence and uplift associated with the giant 1833 Sumatran subduction earthquake: Evidence from coral micro-atolls. Journal of Geophysical Research; 104:895–919.
3. Nott J & Bryant E. Extreme marine inundations (Tsunamis?) of coastal Western Australia. Geology Journal; 11:691–706.

For more information phone Phil Cummins on +61 2 6249 9632 or e-mail phil.cummins@ga.gov.au

Discussion by Kevin McCue on the article (extract below) written by Prof. John Fenton and Dr Peter Baines published in the 1/2005 issue : "Why does the sea level usually fall before a Tsunami arrives?"

"It is a common experience that, in coastal regions that suffer the impact of tsunamis, the sea level initially falls, and remains suppressed for a period of up to many minutes, prior to the arrival of the tsunami waves that do all the damage. Why does this occur? There does not appear to be a common explanation in the literature, and we offer the most likely explanation here. In general, there are three main ways in which tsunamis are generated. The first is by a submarine avalanche, which occurred on the north coast of New Guinea on the 17 th July, 1998. The second is by the sudden volcanic eruption of submerged volcanoes, which occurred with Krakatoa on the 27 th August 1883, and the third is by submarine earthquakes, as occurred in the recent Boxing Day earthquake in 2004. For the last two types, the nett effect of the geophysical disturbance is to cause a depression of the ocean floor. In some regions the sea floor may rise (as in the Boxing Day earthquake), but on the largest length scales the sea floor may be expected to fall. In the cases that cause tsunamis, this effect is sufficiently rapid to cause the sea surface to fall with it."

In particular:

1. The focal mechanism of the 1988 PNG earthquake and that of the 2004 Sumatran earthquake are identical. Despite some claims to the contrary there is no scientific evidence that confirms that a landslide triggered either event and modelling demonstrates that the vertical movement across the fault is enough on its own to generate each tsunami. You can think of the Sumatran earthquake as being 40 PNG events end to end and magnified by perhaps 4 or so in slip.

2. The tsunami generated at Krakatoa in 1883 was probably initiated by caldera collapse after the explosive eruption, the eruption mostly occurred above the water level.

3. At Sumatra and PNG one side of the fault went up, the other down so a dilatation propagated one way, a compression the other. This first motion then got complicated in Thai waters by the topography of bays, inlets, straits and islands let alone the bathymetry. The sea floor is not depressed unilaterally.

Note from editor:
The above comments have been forwarded to the authors of the paper but no reply has been received.

Conferences and Seminars

Readers are pledged to provide information to the editor on upcoming conferences and seminars. The editor wishes to acknowledge Kevin McCue for providing the following information.

- 2005/8/27-2005/9/1 **Institute of Earthquake Engineering and Engineering Seismology (IZIIS-Skopje) Earthquake Engineering in 21st Century (EE-212C)**
  Skopje, Republic of Macedonia
  http://www.iziis.edu.mk/EE-21C

- 2005/9/4-7 **Sixth European Conference on Structural Dynamics (EURODYN2005)**
  Paris, France
  Contact: EURODYN2005, Laboratoire de Mecanique, Universite de Marne-la-Valle, 5 Boulevard Descartes, 77454 Marne-la-Vallee Cedex 2, France
  eurodyn2005@univ-mlv.fr
  http://www.eurodyn2005.univ-mlv.fr

- 2005/9/11-14 **: Australian Structural Engineering Conference**
  Newcastle, New South Wales, Australia
  Contact : asec2005@tourhosts.com.au
  http://www.asec2005.com

- 2005/9/14-16 **: Structures and Extreme Events**
  Lisbon, Portugal
  IABSE Symposium.
  Contact: IABSE Lisbon 2005, Organising Committee, c/o LNEC, Av. Brasil, 101, P-1700-066 Lisbon, Portugal.
  http://www.iabse.ethz.ch/conferences/lisbon2005/

- 2005/12/7-9 **6th International Conference on Shock and Impact Loads on Structures**
  Perth, Western Australia
  Contact : cipremie@singnet.com.sg
  http://www.cipremier.com/announce/si05.htm

- 2006/4/18-22 **100th Anniversary Earthquake Conference: Commemorating the 1906 San Francisco Earthquake**
  San Francisco, California
  Contact: EERI, 499 14th Street, Suite 320, Oakland CA 94612-1934
  eeri@eeri.org
  http://www.1906eqconf.org or
  http://www.quake06.org/quake06.html

- 2006/5/23-26 **Canadian Society of Civil Engineers Conference : Towards a Sustainable Future**
  Hyatt Agency Hotel,Calgary, Alberta, Canada.
  Contact: Dr. Mamdouh El-Badry.
  2006 CSCE Annual Conference,
  University of Calgary, 2500 University Drive, Calgary ,AB , T2N 1N4.
  Tel: 403-220-5819; Fax: 403-282-7026
  Email: tech@CSCE2006.ca
  http://csce2006.ca

New Books and Journal Publications

Journal of Earthquake Engineering and Structural Dynamics Vol.34 (Issue 9)
Published July 2005 (published on line : March 2005)

Peak displacement demand of small to moderate magnitude earthquakes in stable continental regions

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[2]Centre for Earthquake Engineering Research, Department of Civil Engineering, The University of Hong Kong, Pokfulam Road, Hong Kong

KEYWORDS
earthquake • notional peak displacement demand • displacement-based approach • response spectrum • component attenuation model • seismic drift

ABSTRACT
A theoretical fault-slip model has been developed for predicting the notional peak displacement demand (PDD) of earthquakes based on a limiting natural period of 5 s, for application in stable continental regions (SCRs). The developed theoretical expression is simple and robust. Importantly, it envelops predictions arising from a number of existing empirical and seismological (stochastic) models included in the comparison. The notional PDD prediction has been made initially for hard rock crustal conditions and at a reference source-site distance of 30 km. Factors have accordingly been introduced to correct for different distances and geological conditions in completing the PDD prediction model. Assuming displacement-controlled behaviour, the predicted notional PDD may be compared with the displacement capacity of a structure, or component, for purposes of seismic stability assessment.

New books:

Aitken, J.J., 1999 (2004) Rocked and Ruptured - Geological Faults in New Zealand. Reed Books, Auckland.
The chapters in this book include 'The big picture', 'Plates and quakes', 'Faults and frailties', and 'Confess our faults', which gives you a flavour of the book. The colour photos are enough reason for anyone interested in earthquakes and faults to buy this book.

Coates, G., 2002 The rise and fall of the Southern Alps. Canterbury University Press, Christchurch.
The illustrations of faults, tectonic processes and NZ mountains by Geoffery Cox are spectacular, well worth having on your bookshelf.

The Society website/email list

Dear AEES Members,
The AEES web site is at www.aees.org.au. Any contribution from you on the following topics is most welcome:

- details of interesting recent publications
- significant research projects in earthquake engineering (in Australia?)
- links to other relevant Web sites

Please send me your contributions/suggestions via email.

The AEES email list is operated by the Seismology Research Centre, Melbourne. If you would like to register please notify me at VaughanW@rtunet.com

Vaughan Wesson