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AEES is a Technical Society of  
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**3/2003**

# AEES Newsletter

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**AEES Annual Conference  
Melbourne University  
27 & 28 November 2003  
see you there!**

## ***President's Column***

In this, the last newsletter for 2003 I would like to first remind members of the upcoming annual technical seminar and AGM which is being held at the University of Melbourne. (Further details are given later in this newsletter.) I just want to encourage as many of you as possible to come along this year and support the Society.

Since the last newsletter, several matters have arisen that I wish to highlight here. First of all, the state and national executive committee has reviewed applications for the AEES research scholarships and I am pleased to announce that three awards have been made for 2003. The winners have already been notified and will be recognized at our meeting in November, but I would like to also congratulate the winners here. I look forward to hearing them present results of their research in the future.

Members that are interested in the merits of earthquake engineering and seismology research might like to visit the following website:

(<http://www.seismo.nrcan.gc.ca/hazards/OF3764/OF3764abs.php>)

where the report "Benefits from Expenditures on Earthquake Research at Natural Resources Canada", by Dr. Neil Swan is posted.

This report was brought to my attention after receiving an email from John Adams in Canada who happened to read a copy of my paper, delivered at the Pacific Earthquake Engineering Conference in Canterbury earlier this year, where I discussed the accomplishments, challenges and obstacles to earthquake engineering in Australia. John was intrigued in particular by my discussion of the difficulties in justifying with cost/benefit ratios the decision to proceed, or not, with seismic rehabilitation work. He alerted me to an investigation in Canada where a cost/benefit analysis was conducted to see whether it was justifiable to spend tax dollars funding earthquake engineering and seismology research in Canada. Given that their overall level of earthquake hazard and standard of building construction is not too dissimilar to ours here, I took some time to scan through this report. I found it quite interesting – even considering the possibility of "free-loading" off the Americans, the authors concluded that the benefits of funding their own research outweighed the costs by roughly 10 to 1. My impression at the moment is that this "enlightened" view is not widely held in Australia; perhaps only a handful of individuals in the insurance industry recognise the real value of investing in this research. I encourage members to have a read of this report and if similarly motivated, help us spread the word so that we can convince key individuals (national, state and local government plus industry) to support activities in this area.

Finally, you will all be aware that the Society is conducting a survey of members seeking their views on a number of matters. If you have not

responded yet to that survey, could I urge you to please take ten minutes and get it back to us. We will present the results at our AGM in November and publish it in the next newsletter. Since that will not come out until 2004, I encourage you again to get along to this year's technical conference and AGM. Which brings me to the end. I hope to see a strong showing of members in attendance in November. If you require more information, please contact Barb Butler at: [b.butler@civenv.unimelb.edu.au](mailto:b.butler@civenv.unimelb.edu.au)

Mike Griffith

## AEES Executive

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## Earthquakes in Australia

### Jun – Oct 2003

The following list of earthquakes was compiled and extracted from the Geoscience Australia website. It uses information from ES&S and PIRSA.

Several events were felt but no damage was reported. The largest earthquake was the magnitude 6.0 event west of Macquarie Island in August and just hours before it the largest earthquake onshore, near Ingham in Queensland (see note below in News).

Date	Time (UTC)	Lat S	Long E	ML	Location
Jun					
23	06 45 59	33.466	139.005	2.3	Clare SA
24	16 27 20	32.131	149.741	2.6	Ulan NSW
24	16 07 32	27.458	152.133	2.7	Toowoomba Qld
28	02 20 46	25.653	151.511	3.2	W Gayndah Qld
Jul					
2	20 59 23	21.258	132.939	2.4	W Barrow Ck NT
2	14 24 14	31.203	116.638	2.2	Calingiri WA
2	07 11 59	31.222	116.611	2.0	Calingiri WA
3	12 25 58	36.354	148.771	2.7	Berridale NSW
3	05 36 57	25.795	120.149	3.6	Carnarvon R WA

5	17 09 35	31.619	139.428	2.7	E Hawker SA
5	03 48 24	35.195	149.258	2.4	Sutton NSW
7	21 41 18	31.15	138.605	3.0	EParachilna SA
7	20 31 42	37.713	146.246	2.3	Mansfield Vic
7	09 35 45	38.099	148.128	3.2	Off Lakes Entrance Vic
8	16 41 46	34.107	147.443	2.0	West Wyalong NSW
10	08 56 02	19.973	134.263	3.2	Tennant Ck NT
10	08 55 43	19.839	134.046	2.6	Tennant Ck NT
11	08 18 34	34.611	147.859	3.3	Cootamundra NSW
11	03 02 18	34.606	147.865	2.5	Cootamundra NSW
15	14 14 18	34.036	148.87	2.8	Wyangala Dam NSW
17	17 36 24	31.179	116.552	2.1	Bolgart WA
18	20 08 32	31.172	116.547	2.8	Bolgart WA
18	13 19 21	34.372	119.609	2.9	Hood Point WA
20	11 27 00	31.217	116.562	2.2	Bolgart WA
25	15 58 34	30.756	117.109	2.3	Cadoux WA
27	22 57 17	19.012	125.142	3.1	Great Sandy Desert WA
27	22 50 43	34.224	149.751	3.1	NE Crookwell NSW
29	21 16 11	34.198	149.709	2.1	Porters Retreat NSW
31	19 49 36	24.186	137.598	2.3	Simpson Desert NT
Aug					
7	05 10 30	23.343	129.882	3.2	Haasts Bluff NT
11	06 34 10	31.981	117.157	2.5	Beverley WA
11	07 04 29	18.436	147.114	4.8	E Ingham Qld
11	13 40 19	56.97	147.44	6.0	W Macquarie Isl
13	14 19 26	33.139	138.427	3.0	Port Pirie, SA
16	14 38 40	30.462	117.128	2.0	Burakin WA
16	14 20 41	30.508	117.108	2.0	Burakin WA
16	14 07 43	30.519	117.115	2.3	Burakin WA
18	17 56 18	30.479	117.129	2.8	Burakin WA
19	16 30 00	42.1	145.5	2.5	Queenstown, Tasmania
19	13 32 58	19.87	134.004	2.6	Tennant Ck NT
19	08 46 31	30.453	117.174	2.4	Burakin WA
19	03 58 22	30.538	117.102	2.6	Burakin WA
24	09 19 12	19.805	133.893	2.7	Tennant Ck NT
29	04 21 28	32.777	138.314	2.6	Booleeroo Centre SA
Sep					
4	19 42 29	19.74	133.88	2.6	Tennant Ck NT
11	07 49 18	19.883	133.988	2.2	Tennant Ck, NT
15	21 23 58	19.589	133.931	2.7	Tennant Ck NT
16	16 16 15	22.676	130.389	3.2	Nirrippi NT
20	00 38 05	22.652	130.396	3.1	Nirrippi NT
21	19 09 11	22.807	130.274	3.0	Nirrippi NT
21	00 01 01	19.906	134.012	3.0	Tennant Ck NT
22	08 49 15	35.543	138.365	2.7	Aldinga Bay SA
23	22 39 07	30.468	116.868	2.1	Ballidu WA
23	04 03 13	37.218	147.705	2.7	Swifts Ck Vic
24	03 03 13	30.472	116.869	2.2	Ballidu WA
26	01 24 12	36.663	148.048	3.0	Snowy Mts Vic
27	15 08 48	30.416	117.687	2.0	Beacon WA
27	13 17 48	34.046	117.86	2.1	Gnowangerup WA
Oct					
4	01 45 40	13.731	122.465	3.1	Scott Reef WA
5	20 25 08	31.884	138.704	2.9	Oraparinna SA
11	00 08 52	19.856	134.029	2.3	Tennant Ck NT
18	18 45 33	30.527	117.035	2.5	Burakin WA
18	10 31 27	37.369	146.258	2.0	Jamieson Vic
19	08 42 34	25.006	112.283	3.4	W Carnarvon WA
20	02 01 23	29.341	137.423	3.4	Lake Eyre SA
21	09 35 14	30.445	117.106	2.0	S Kalannie WA

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*The AEES subscription year is the fiscal year. It is expensive to send each member an individual reminder that fees are due so please help us by sending your subscription for 2001/2002 to AEES if you haven't already done so (attn: Barbara Butler, Civil and Environmental Engineering Dept, Melbourne University Parkville Vic 3052) or renew through IEAust's annual subscription system by marking AEES your preferred Society. If you change address or if you know a member who is not receiving the newsletter please advise the Secretary or Barbara.*

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## **News!**

### **Queensland Earthquake**

The ML 4.8 earthquake near Ingham on 11 August was the largest in Qld since 1960. It caused no damage but was widely felt. An accelerograph at Charters Towers some 270 km from the epicenter was triggered.

*The peak acceleration was in the EW direction and was .00225 meters/sec/sec, or .000228g. The frequency of the surface waves that contained the peak acceleration was around 5 Hz. I doubt if anyone in Charters Towers would have been able to feel it.*

Bob Hutt ASL, USGS

### **The Joint Australian/NZ Loading Code**

#### **AS/NZS 1170 Structural Design Actions - Part 4 Earthquake Actions**

*Part 1* A meeting of members of the Australian working group WG20 was held at Melbourne University on Tuesday 29 July to sign off on the road test of the draft Part 4 (version 8).

That's not quite what happened! Prof John Wilson chaired the meeting and Prof Graham Hutchinson soon got to the point: the draft was unacceptable, its philosophy was wrong, it was too complex and difficult to teach and a new start would have to be made. The ABCB representative confirmed that the draft would not be accepted by the board in its present state. More importantly he emphasized the need for the Code committee to justify the economic consequences of the changes – implying that unless the case for the changes was satisfactorily made ABCB was unlikely to adopt the new Standard.

Gerhard Horoschun made the point that the first earthquake standard essentially sat on a shelf because few if any jurisdictions chose to implement it. As a consequence he was loath to proceed with work on a standard that had little chance of being adopted. It was difficult to assess the economic consequences of changes to a standard when wholesale changes occurred – it was much easier to assess their implications when

only a limited number of incremental changes occurred. In view of this he would prefer that the committee develop the code by modifying AS1170.4 to the least extent necessary – even if that meant having essentially two different earthquake codes bound under the same cover.!

After much discussion this path was adopted and the delegates proceeded to discuss the upgrade of the 1993 Loading Code.

In just a few minutes the work of WG20 and a paid NZ consultant earthquake engineer over the past 5 years had been tossed out.

It was agreed that the new spectra would be incorporated and also the R factors, to convert the acceleration coefficient from the nominal 500 year value to a range of return periods up to 2500 years.

A long discussion was held on whether to revert to ductility (as in AS2121 –1979) rather than stay with a force reduction factor (as in AS1170.4) but that was finally not resolved. The issue of materials was again raised, several members including the ABCB representative failing to realize that in an earthquake damage is an integral function of ground shaking and type, building material and type. They could not fathom that it was not good enough to hope the materials codes would pick up this fact.

The meeting broke up at about 5 pm as many of the interstate members left for the airport. A lot had been resolved, everything had changed from morning to night. The notion of a joint Loading Standard lies somewhere in the ditch.

What a pity this decision had not been made five years ago!

Kevin McCue and Gerhard Horoschun

*Part 2* Since that meeting a subset of the group met again in Melbourne for two days to draft the changes to AS1170.4 as agreed at the previous meeting. How successful that effort will be will await comments from the main group.

ps Following a recent vote by Australian members of the loading code committee, the joint code is no more, a majority of members decided to go it alone.

### **22 AUGUST 2003 - FIORDLAND NZ QUAKE BIGGEST FOR MANY YEARS**

The magnitude 7.1 earthquake in Fiordland ranks as one of the largest "on-land" earthquakes in New Zealand for many years, the Institute of Geological and Nuclear Sciences Ltd (GNS) said.

It occurred at 12.12am and has a provisional location of about 70km

northwest of Te Anau and about 12km deep. This is close to Secretary Island, at the entrance to Doubtful Sound.

It was felt strongly in Te Anau, where there were reports of goods shaken off shelves. Many people in the southern half of the South Island were woken abruptly when the quake struck. Heavy damage is not expected outside the Fiordland region because the epicentre was a long way from populated areas.

"Coastal Fiordland is one of the most seismically active parts of New Zealand," said GNS seismologist Warwick Smith.

"The Australian and Pacific tectonic plates are being forced together in the Fiordland area resulting in stress and strain building up in the earth's crust. Earthquakes are a stress relief mechanism," Dr Smith said.

"A magnitude 6.2 aftershock was recorded at 2.12am at the same location. Aftershocks are likely to be frequent for several days, and smaller aftershocks will continue for months.

"Anyone in the vicinity of the epicentre would have felt dozens of aftershocks within a few hours of the main shock."

The Secretary Island area experienced an earthquake of magnitude 6.7 in 1993, and two others of magnitude 6.1 in 1988 and 1989.

The last on-land earthquake of comparable size to last night's main shock was at Inangahua on the West Coast on 24 May 1968. In February 1995 there was a magnitude 7.0 quake off East Cape, but little damage resulted because of its great distance offshore.

"On average, New Zealand can expect an earthquake of magnitude 7 or greater about once a decade and a magnitude 8 once every century."

GNS recorded the earthquake on the GeoNet national monitoring network. Its development has been funded by the Earthquake Commission and the

Foundation for Research Science & Technology.

Duty seismologist Brian Ferris made the information available via the GeoNet website within 30 minutes of the earthquake.

A group of GNS seismologists travelled to Fiordland to deploy up to eight portable seismographs near the epicentre to record aftershocks.

Aftershocks are a rich source of information for seismologists. They provide information on the extent of the "fault break" in the crust and provide insights into what is likely to have caused the earthquake and its impact on any nearby faults.

Two years ago after a slightly smaller earthquake near Jackson Bay on the West Coast, GNS seismologists recorded 2000 aftershocks on their portable instruments over a three week period. Most were small – between magnitude 1 and 3. About 400 were useable for further analysis.

### **27 AUGUST 2003 FIORDLAND NZ QUAKE TRIGGERS OVER 200 LANDSLIDES**

The earthquake in Fiordland triggered more than 200 landslides in Fiordland National Park, geologists said.

It's inevitable that an impressively big shake and steep country will combine to produce landsliding on a large scale," said geologist Ian Turnbull of the Institute of Geological and Nuclear Sciences Ltd (GNS).

<http://www.gns.cri.nz/news/release/200landslides.html>

[http://www.gns.cri.nz/news/release/milfordquake\\_diagram.html](http://www.gns.cri.nz/news/release/milfordquake_diagram.html)

<http://www.gns.cri.nz/news/release/milfordslipphoto.html>

### **Magnitude 7.3 RUSSIA-XINJIANG BORDER REGION**

#### **2003 September 27 11:33:24 UTC**

#### **Preliminary Earthquake Report**

U.S. Geological Survey, National Earthquake Information Center, Denver

**Magnitude** 7.3  
**Date-Time** Saturday, September 27, 2003  
at 06:33:24 PM local time at epicenter  
**Location** 50.00N, 87.85E  
**Depth** 16.0 kilometers  
**Region** **RUSSIA-XINJIANG BORDER  
REGION**  
**Reference** 35 km (20 miles) WSW of  
**Chaganuzun, Russia**, 240 km N of **Altay,  
Xinjiang, China**, 300 km W of **Ulaangom,  
Mongolia**, 3360 km E of **Moscow, Russia**

**Remarks** Unconfirmed reports of 3 people who died from heart attacks, more than 5 injured, 1,800 homeless, 300 houses destroyed (X); 1,942 buildings damaged, infrastructure damaged and landslides occurred in the Kosh-Agach and Ust-Ulagan area. Significant damage also reported at Ongudai and Shebalino. Damage estimated at 10.6 million U.S. dollars. Ground subsidence occurred in the Chaganuzun area which created a flood of the Chuya River. Felt (VI) at Prokop'yevsk and Tashtagol; (V) at Novosibirsk; (IV) at Abakan; (III) at Barnaul, Kemerovo, Krasnoyarsk and Zaysan. Felt throughout southern Siberia. Also felt (IV) at Ust'-Kamenogorsk and Semipalatinsk; (III) at Alma-ata, Astana, and Taldyqorghan, Kazakhstan.

#### **Tectonic Summary**

This earthquake resulted from stresses originating with the collision of the Indian plate against the Eurasian plate. The collision of the two major plates has generated the Himalayan mountains, far to the south of the epicenter of this earthquake, and produces deformation of the earth's crust over a broad region of central and eastern Asia. In the epicentral region of southern Russia, northwestern China, eastern Kazakhstan, and western Mongolia, earthquakes of past decades have been caused by strike-slip faulting (as with this earthquake) and reverse faulting.

This earthquake is the largest in this region since an earthquake on December 20, 1761 that is thought to have had a magnitude of about 7.7.

#### **Magnitude 8.0 HOKKAIDO, JAPAN REGION**

**2003 September 25 19:50:07 UTC  
Preliminary Earthquake Report**

U.S. Geological Survey, National Earthquake Information Center, Denver  
**Magnitude** 8.0  
**Date-Time** Friday, September 26, 2003 at  
04:50:07 AM local time at epicentre  
**Location** 41.85N, 143.77E  
**Depth** 33.0 kilometers  
**Region** **HOKKAIDO, JAPAN REGION**  
**Reference** 135 km SSW of **Kushiro,  
Hokkaido**, 770 km NNE of **TOKYO, Japan**

**Remarks** At least 589 people injured, extensive damage, landslides and power outages occurred and many roads damaged in southeastern Hokkaido. A tsunami generated with an estimated wave height of 4.0 meters along the southeastern coast of Hokkaido. Felt strongly in much of Hokkaido. Also felt in northern and much of central Honshu as far south as Tokyo. Recorded (6L JMA) in southern Hokkaido, (5L JMA) in central Hokkaido and (4 JMA) in parts of northern and southwestern Hokkaido. Also recorded (4 JMA) in northern Honshu and (2 JMA) as far south as Shizuoka Prefecture, Honshu. Recorded (1 JMA) on Hachijo-jima, Miyaki-jima and Sadoga-shima.

#### **Tectonic Summary**

The preliminary location and focal-mechanism of this earthquake imply that it occurred as the result of thrust-faulting on the plate interface between the overriding [North American plate](#) (which extends into the northeast corner of the Eurasian landmass) and the subducting Pacific plate. The Pacific plate is moving west-northwest at a rate of about 8.2 cm per year relative to the North American plate. In addition to experiencing great thrust earthquakes that originate on the interface between the plates, eastern Hokkaido experiences great earthquakes that originate from the interior of subducted Pacific plate. The earthquakes of March 4, 1952, and May 16, 1968 (cited below) were interface-thrust earthquakes, whereas the earthquake of January 15, 1993 (cited below) occurred within the interior of the subducted Pacific plate. The recent earthquake appears to have involved rupture of the same section of the plate interface that ruptured in 1952.

Magnitude 8 and greater earthquakes are capable of devastating large areas. The shallow September 25 Hokkaido earthquake occurred about 60 km offshore. If the earthquake had occurred directly beneath a

populated region, damage would have been more severe.

### **Previous Deadly Earthquakes in this Region**

1952 March 4Mag 8.1,31 killed, 72 injured; 713 houses destroyed, 5,980 damaged. 28 killed and warehouses destroyed at Kushiro. 3 killed and 309 houses destroyed at Kiratapu. 1,000 houses destroyed or damaged at Shiranuka and 400 schools collapsed at Sapporo. 10-foot tsunami.

1968 May 16, Mag 7.9, 48 killed, Damage estimate at 25 million USD.

1993 January 15, Mag 7.6, 2 killed, 614 injured and substantial damage (VI JMA) at Kushiro, Hokkaido and Hachinohe, Honshu. Felt (III JMA) at Tokyo and Yokohama, Honshu. Landslides and subsidence occurred in the epicentral area.

The last great earthquake (magnitude 8 or greater) in the world was a magnitude 8.4 event that occurred on [June 23, 2001 near the coast of Peru](#). This earthquake killed at least 75, including 26 killed by the associated tsunami.

### ***Earthquake sequence in Bangladesh***

**DHAKA**, August 7 – Fears of a massive earthquake have gripped Bangladesh's southeastern Rangamati and Chittagong hill districts, with geologists advising the immediate relocation of thousands of residents hit by over 50 tremors since July 27.

Geologists visiting the worst affected Barkal area of Rangamati district, 200 miles south east of the capital Dhaka, are urging the government to relocate 40,000 residents of this region, many of them indigenous communities.

According to them, seismographs are still recording tremors in the region located 160 miles to 250 miles southeast of Dhaka.

A team of specialists of the Bangladesh Power Development Board is investigating whether the country's biggest dam and hydropower plant located in Kaptai town near Rangamati runs the risk of collapsing.

Geologists warn that if the dam has been weakened by the quakes, it may burst open, rendering tens of thousands of families homeless in this region.

Rangamati's Barkal area, identified as the quake's epicenter, has developed six-mile cracks, which

could cause a large number of landslides here.

Geology professor at Dhaka University, Aftab Alam Khan observes that innumerable aftershocks are continuing at the epicenter.

"There will be a medium range tremor soon that might trigger landslides," predicts Khan. Two rounds of mild tremors occurred in Barkal Wednesday.

Worse, engineering professor from Bangladesh University of Engineering and Technology, Dr Tahmeed M Al-Hussaini reveals that a river in Barkal has also developed a one-kilometer crack, adding that, "locals reported seeing bubbles and smelling a strange odor in the river."

Husaini fears the existence of a major fracture under the river, which probably formed the quake's epicenter.

Bangladesh's Geophysical Observatory recorded a total of 51 tremors in Chittagong between July 27 and August 6. Most of the damage was effected by a 20 second quake of 5.6 magnitude followed by a series of aftershocks on July 27. The tremors also hit the Cox's Bazar district 250 miles from Dhaka, near the Myanmar border.

Two persons were killed and more than three dozen injured, with deep cracks appearing in hundreds of buildings and mud houses here. The series of quakes submerged paddy fields, damaged the power grid station and snapped power lines. Sporadic heavy rainfall has increased the risk of landslides in these districts.

Fearing further quakes, 200 families of Kolabunia village have fled their homes to camp in the grounds of a government primary school. Unfazed by the warnings, the government has done little to relocate residents or provide them safe refuge.

Remarked minister for disaster management, Chowdhury Kamal Ibne Yusuf, "We are aware of the danger and are taking preparations to handle the worst case scenario."

From 1996 till July 2003, the Chittagong region, close to the Myanmar border, has experienced more than 200 light and moderate earthquakes.

Strangely, despite its seismic vulnerability, authorities here are not trained to handle calamities. Admits the Earthquake Research Cell's Professor Jahangir Alam, "The Chittagong region is classified as a high risk zone for earthquakes, but though a disaster appears imminent, we are totally unprepared to deal with it."

### **The Society website/email list**

Dear AEES Members,

The AEES web site is at [www.aees.org.au](http://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 [vaughan@seis.com.au](mailto:vaughan@seis.com.au)

Vaughan Wesson

## Skopje Earthquake – 40 Years of European Earthquake Engineering

Earthquake risk minimisation was the expressed theme of the recent International Conference on Earthquake Engineering held in Skopje, capital of the Former Yugoslav Republic of Macedonia, and in the lakeside town of Ochrid near the border with Albania and Greece. It was more of a lest-we-forget than a heavy technical conference, one of rekindling old relationships and reestablishing old synergies.

The conference opened at the Academy of Science in Skopje on Tuesday 26 August 2003 and then registrants were bussed to the Institute of Earthquake Engineering and Engineering Seismology (IZIIS) about 2 km from town. Researchers demonstrated on their large 3-D shake table the effectiveness of post-strengthening of a brick-infilled concrete frame (Photo 1). After a convivial late barbeque we re-boarded the buses for a 3-hr drive south to Ochrid, a beautiful setting on the shore of Lake Ochrid, after Lake Baikal the 2<sup>nd</sup> largest lake in Europe.

The occasion attracted such luminaries as Prof Esteva (Mexico) President of IAEE, Prof Suchadel (Italy), President of IASPEI and Dr Arvi Shapiro (Israel), President-elect of the ISC. Academician Ambraseys, one of the 3 member UNESCO mission (with Professors Karnik and Medvedev) sent to Skopje just days after the earthquake addressed the opening Ceremony and gave the first keynote speech at the Conference.

Academician Ambraseys reported on the situation that confronted them flying into Skopje for a long investigation of the earthquake's effects. The destruction was hardly apparent from their DC3 yet more than 1000 people died and 2500 were injured. The cost of restoration was about 15% of the GNP of the then Yugoslavia. From an exhaustive study of both damaged and undamaged buildings the mission concluded that the earthquake had been a short, pulse-like shock with a pga of about 0.4g and noted that the damage

correlated strongly with the downtown region flooded only a month earlier. They recommended rebuilding Skopje in-situ rather than attempting to relocate the city (it had been badly damaged on at least two previous occasions in the last 1500 years). Ac Ambraseys exhorted young researchers to gather together to reanalyze the 1963 historical data using modern analytical methods, before the data are lost.

Professor Jakim Petrovski, 1<sup>st</sup> Director of IZIIS, was a vocal participant in the proceedings attended by about 250 delegates from around the World including Australia, Mexico, Japan, USA but mostly from Balkan states and Mediterranean Europe.

The unexpectedly large number of participants meant that talks were restricted to an almost meaningless 10 minutes including discussion! Many speakers had to drastically cull their 50+ slides, unfortunately during their talks so timetables were chaotic especially if you wanted to attend talks in parallel sessions. Speakers covered the whole gamut of Earthquake Engineering and Engineering Seismology from networks, seismicity and hazard estimation through base isolation to structural response, rehabilitation and retrofitting. There were papers on recent damaging earthquakes and no one seemed to tire of viewing photos of damage.



**Photo 1** Dr Cvetan Sinadinovski (left) and Kevin McCue in Skopje, Macedonia this year.

Having the conference and accommodation in the same isolated venue without email (the server was down for just about the whole conference) was, everyone agreed, a great bonus so the talking and networking went from 7am till late into the night. And that was the strength of the conference! That and the Conference Declaration that was to be presented the following day to an assembly of regional heads of State meeting nearby. The tenor of the declaration was that the regional cooperation existing prior to the breakup of former Yugoslavia should be rekindled to progress risk reduction throughout the Balkans.

This could be done by increasing funding of Earthquake Engineering and Engineering Seismology research in each partner state and by strengthening links between them through IZIIS (an Australian centre of excellence for earthquake engineering and engineering seismology research like IZIIS is something we could emulate).

PS The Skopje earthquake occurred at 5:17 am on 23 July 1963. It was very shallow though no surface faulting was found. Its magnitude was Ms 6.1, similar to the Cadoux WA earthquake on 2 June 1979 which did cause surface faulting.

### Notes arising from Skopje

- Professor Nick Ambraseys of Imperial College London recently accepted the honour of investiture as an Academician to the prestigious Athens Academy, There are only 22 other members. He and his wife will relocate to Athens for several months each year.

- A version of the talk presented by Dr Sinadinovski and myself at Skopje will be given at the November AEES conference.

- There were three speakers from Australia and as Cvetan Sinadinovski and I were joint authors I was intrigued as to the identity of the 3<sup>rd</sup>. Turns out he lectures in soil/structure interaction at UWA, has 2 post-grad students there, which he fits in between lectures in Japan (where he is based), IZIIS and Germany. Not only that but he gave me a flyer advertising the 18<sup>th</sup> Australasian Conference on the Mechanics of Structures and Materials which has Earthquake Loading as one of its many themes (see forthcoming Conferences).

- I thought the idea of sending a declaration from the conference to politicians a very positive idea that we should emulate.

- Things we should not emulate are parallel sessions and ten minute talks (and morning and afternoon teas without biscuits or muffins).

Kevin McCue

### ***Rumble theory jolts the quiet continent***

Deborah Smith, Science Writer, SMH

Our ancient land is stirring. New research challenges the accepted wisdom that Australia has been relatively earthquake-free for tens of millions of years and that disasters such as the 1989 Newcastle quake are a recent, unusual phenomenon.

Mike Sandiford, of the University of Melbourne, said the geological evidence showed the continent

had been under increased stress for several million years, with seismic activity doubling the height of some mountains, such as the Flinders Ranges in South Australia, during that period.

It probably also pushed up Mount Kosciuszko by about 200 metres. *We are a quiet continent, but not an inactive one* Dr Sandiford said. *We're seeing activity which started about 5 million years ago to reshape the landscape.*

The geological reason for earthquakes recorded in Australia had been unclear, because we sit in the middle of a very large tectonic plate.

Dr Sandiford said earthquakes recorded in the last 100 years and the many prior appeared to be driven by stresses in the continental crust as our plate crashed into neighbouring plates, *particularly as Australia moves north and ploughs into South-East Asia, which we're doing at 8 centimetres a year.*

The strains would continue to build over millions of years.

*The story we are reading in the rocks gives us some confidence that the sort of seismic activity measured over the past 100 years is pretty much the typical behaviour over the past millions of years.*

*Australia can expect several magnitude 6 earthquakes every hundred years and up to a magnitude 7 every thousand years.* (Ed: Prof Sandiford must have been misquoted as Australia experiences a magnitude 6 event every 5 years or so and a magnitude 7 event every 100 years or so on average).

Australia is an ancient continent, with parts of Western Australia formed 3.5 billion years ago. Most of the east was made between 300 million and 600 million years ago.

### ***New engineering standards for Kosciuszko resorts***

Resort developments within the Kosciuszko National Park will have to meet new engineering standards. The new geotechnical policy is in response to the coroner's recommendations on hillside building practices following the Thredbo landslide. NSW assistant planning minister Diane Meamer said the policy for Kosciuszko Alpine Resorts requires comprehensive assessment of slope stability and structural issues.

*It requires developers to satisfy the government that they know the geotechnical and structural issues relating to their projects, and can address them, before their development applications can be considered.*



*Only qualified professionals with appropriate geotechnical engineering expertise may prepare site reports or issue certificates.*

Meamer said the geotechnical policy was released following consultation with ski resort operators, geotechnical engineers, the Australian Geomechanics Society and the National Parks and Wildlife Service.

## **FORTHCOMING CONFERENCES**

### **ASEG-PESA 17th Geophysical Conference 2004**

The SGSEG is going to be involved in the joint Australian Society of Exploration Geophysicists (ASEG) and Petroleum Exploration Society of Australia (PESA NSW) Conference, 'Integrated Exploration in a Changing World', in Sydney during August next year. For more information, please see <http://www.aseg-pesa2004.org.au/>

In particular, the SGSEG is organising a session called "From Solid Earth Geophysics to Exploration", as described below. We hope that you will be able to attend this conference, and contribute to the SGSEG session. Please note abstracts are due by 14 November 2003.

#### *From Solid Earth Geophysics to Exploration*

This session provides an opportunity for Solid Earth Geophysicists and Geodynamicists to present what they see as exploration implications of their work to industry. We would like to bring together experts in crustal and mantle seismology, potential fields, and geological and geodynamic modeling to assess where the blue-sky research of today might lead to applications tomorrow. Two of the most important issues we have to face are:

- (1) The development of a common understanding of the capabilities of modeling among data-oriented geophysicists and geologists and
- (2) The development of a common understanding of what types of data and data analysis methods are available that can feed back into modeling.

Topics of interest for this session may include:

- New methods for joint analysis of active source seismic reflection and refraction data; how a better understanding of crustal structure can aid exploration.
- New approaches in the analysis of magnetotelluric data and how they may be applied to shallow/sub-salt exploration problems.
- Textural analysis and artificial intelligence applications for image analysis (potential fields, downhole images such as FMS).
- What has the mantle been doing to the crust? Implications of seismic tomography and

geodynamic modeling for exploration.

- Tectonic reactivation through time: New methods for integrating large-scale geodynamic modeling, basin modeling, structural data analysis/inversion, and well-seismic data integration.
- Advances in simulation of geological processes on the computer. Modelling fluid dynamics and solid mechanics jointly, with reactive fluid flow in the crust which dissolves, precipitates and alters the rocks as they deform.

**27-28 November 2003 AEEES Annual Conference**, Melbourne University.

**8-12 December 2003 AGU FALL MEETING** San Francisco.

**8-13 February 2004 17<sup>th</sup> Australian Geological Convention** Wrest Point Convention Centre, Hobart Tasmania.

**16 - 20 August 2004 Western Pacific Meeting**

The 2004 Western Pacific Geophysics Meeting will take place in Hawaii. The session proposal deadline is 6 November 2003. More information will be available on the AGU web site.

[www.17thagc.gsa.org.au](http://www.17thagc.gsa.org.au)

**1 - 6 Aug 2004 13 WCEE** Vancouver Canada. Hosted by the Canadian Association for Earthquake Engineering (Chair Don Anderson).

[www.13WCEE.com](http://www.13WCEE.com)

**18-20 October 2004 4<sup>th</sup> International Conference on Dam Engineering** Nanjing, China.

**1 - 3 December 2004 The 18<sup>th</sup> Australasian Conference on the Mechanics of Structures & Materials.** Perth Western Australia.

Call for Papers

[www.civil.uwa.edu.au/conferences/acmsm18/](http://www.civil.uwa.edu.au/conferences/acmsm18/)

### **NEW BOOKS (& OLD) / REPORTS**

Series: Developments in Volcanology

Title: Introduction to Volcanic Seismology

By: V. Zobin, Observatorio Vulcanologico, Universidad de Colima, Mexico

Imprint: ELSEVIER, June 2003

Prices: 0-444-51340-X Hardbound EUR 115.00, USD 115.00

Website: <http://www.elsevier.com/locate/isbn/0-444-51340-X>

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International Handbook of Earthquake and Engineering Seismology (Parts A and B) 2002 and 2003 Eds Lee, Kanamori, Jennings and Kisslinger. Academic Press.

We may publish a review of Part B, the second volume of the International Handbook, next Newsletter.