

AEES NEWSLETTER



November 2012

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President's Report

Many of you probably have already known that we lost our bid in Lisbon to host the 16th WCEE in 2016 in Melbourne. Seven countries, including Australia, Chile, Indonesia, Japan, Macedonia, Turkey and the



USA, bid to host the next conference. Chile won the bid and the next WCEE will be held in Santiago, Chile in 2016. Please refer to the article prepared by Gary Gibson, Australian Representative in the International Association of Earthquake Engineering (IAEE), for detailed information regarding the voting process.

With supports from the Melbourne Convention and Visitors Bureau (MCVB) and the Professional Conference Organizer, Arinex, we

prepared a strong bid document which was submitted to the IAEE Secretary General, Prof. Manabu Yoshimura on 15 August, and distributed to the IAEE country reps in Lisbon. We also set up an Australian booth to promote AEES, Melbourne and Australia, and to persuade people to vote for Australia (see photo below). The booth was attended by Mr. Giles Handford from MCVB, Roslyn McLeod from Arinex and AEES members who went to the conference (Kaiming Bi, Nawawi Chouw, James Daniell, Gary Gibson, Helen Goldsworthy, Mike Griffith, Hong Hao, Tariq Maqsood, Kevin McCue, Lisa Moon, Timothy Mote, and Paul Somerville). Unfortunately despite the wonderful effort put up by AEES, especially the excellent presentation to IAEE country reps by Mike Griffith, we lost the bid, even though a few country reps commented privately that Australia was the best prepared. However, it was a very good experience for many of us. In fact we did reasonably well. We were knocked out only in the fourth round of voting.



I would like to thank all of those who contributed to this effort. In addition to those listed above, John Wilson and Nelson Lam served in the bid committee, Jackie Caldwell of Arinex initiated this idea with us, and Peter Clark and Karine Bulger of Arinex prepared the budget of hosting the conference. I would like to especially thank Mr. David McCarthy of MCVB, who coordinated the preparation of the bidding materials. Although our bid was not successful, AEES is now a lot more prominent in the world earthquake engineering community.



I would like to share with everybody the good news that Mike Griffith was elected to the Board of Directors of IAEE in Lisbon. This is a very well deserved recognition of Mike's continued excellent work and contributions to the earthquake engineering research. This is not only Mike's personal achievement, but also recognition of Australian's strength in earthquake engineering research and contribution to the worldwide community. His election into the IAEE Board of Directors will increase our representation in IAEE.

On 22nd October 2012, seven members of the Italian National Commission for the Forecast and Prevention of Major Risks in 2009 were convicted of manslaughter and each of them was sentenced to six years in jail for giving "incomplete, imprecise and contradictory" information on the dangers locals faced before the 2009 l'Aquila earthquake, which killed 309 people. The case of prosecuting and convicting the scientists has attracted significant attentions among earthquake engineering communities around the world. The IAEE executive has prepared a declaration regarding the conviction. AEES committee members had a thorough discussion and decided to endorse the declaration. Please visit the AEES webpage for

the IAEE declaration and statements prepared by Paul Somerville.

The AEES annual conference is less than three weeks away.

Thanks to Sharon Anderson and Russell Cuthbertson, the planning for the conference is well underway. 49 papers have been submitted to the conference. Kevin McCue and Nelson Lam are coordinating the paper reviews. In this conference, we invited Prof. Ikuo Towhata from the University of Tokyo to give a keynote presentation on the Japan earthquake and tsunami in 2011; Associate Prof. Stefano Pampanin, President of NZSEE, to talk about the Christchurch Earthquake; Dr Aleksander J. Mendecki, Chairman & Head of Research of the Institute of Mine Seismology to present on mining induced seismicity and ground vibration; and Dr. William Twycross to reflect the life of his great uncle, Prof. John Milne. I am sure it will be an exciting conference as usual. I am looking forward to meeting many of you at Twee Heads in December.

Bill Boyce, an ex-President of AEES, contacted me regarding the possibility of offering scholarships to encourage and support students to present papers in the annual AEES conferences. After discussions among the AEES committee members and the past presidents Mike Griffith and John Wilson, we decided to put aside a total of \$1500 each year to support students attending AEES conference and presenting papers. Each student could receive up to \$500. This year 6 students have applied for support. We will waive the registration fees for all 6 of them.

Hong Hao

President AEES

One view of the 15th WCEE in Lisbon



More than 3100 delegates descended on Lisbon over the weekend of 22-23 September to participate in the 15th World Conference on Earthquake Engineering for the following 5 days.

The venue was a modern conference centre on the banks of the wide Rio Tejo and almost underneath a massive steel double-decker suspension bridge, a look-alike of the Golden Gate bridge in San Francisco (same design engineering company).

Professors Polat Gülkan, President of IAEE (top) and Carlos Sousa Oliveria, President of the 15th WCEE opened the conference on Monday morning and then we were introduced to Fado, a wonderful Portuguese performance of emotional 'folk music' by a lone female singer and accompanying guitarists (bottom).

The many themes of earthquake engineering were addressed in 16 parallel sessions with 2 keynote lectures each day, and oral and poster sessions. The organisers introduced e-posters which are here to stay and will probably replace normal posters at future conferences. At the end of the normal sessions, if you weren't already brain-dead, there were special sessions to

learn even more, topics included the Global Earthquake Model, Seismic retrofit of Masonry Structures and the Tohoku Earthquake. Surprisingly there was very little discussion during the conference of the 1755 earthquake and tsunami that devastated Lisbon and caused widespread damage in North Africa and SW Europe.

More than 40 exhibitors, including the Melbourne Convention Centre, manned booths to advertise their products or lobby for votes to host the 16th WCEE in 2016. The IAEE held its four-yearly meeting to review the last 4 years, elect a new committee and choose the venue for the 16th WCEE (see report by Gary Gibson).

Obviously it is impossible to do more than get a feel for progress in the fields of earthquake engineering, meet as many like minds as possible, catch up with old colleagues and fellow former students, then go home and

digest the proceedings, now mercifully distributed on a tiny portable hard drive. Proceedings of past WCEEs have been digitised and are now available on the IAEE website.

A large percentage of the participants were students (~40%) and a majority were Hispanic language speakers though English was the conference language.

The AEEES - Melbourne Convention Centre desk was centrally placed and became a great meeting point, members taking it in turns to man the desk, hand out how-to-vote material and discuss progress in earthquake engineering with delegates from all over the world. AEEES members who travelled to Lisbon, led by President Hong Hao included Mike Griffith (AEEES2016 bid presenter), Gary Gibson (IAEE rep), Helen Goldsworthy, Paul Somerville, Kaiming Bi, James Daniell, Lisa Moon, Nawawi Chouh, Timothy Mote, Tariq Maqsood and Kevin McCue. There were more delegates from New Zealand including the President Stefano Pampanin and past-President Graeme Beattie but disappointingly few, if any, from the Southwest Pacific. Christchurch was the topic of several papers.

A welcome reception was held on the Monday evening in the Exhibitor Hall. On Thursday evening delegates and their accompanying partners walked 10 minutes along the banks of the Rio Tejo towards Belem for

the conference dinner, held in a long narrow building originally used for rope-making by the Portuguese navy. Fortunately the rain held off until after the dinner which was short on speeches and punctuated by superb renditions from well-known Portuguese operatic singers.

We all came away enriched in more ways than one, the justly famous Portuguese tarts adding kilos to our take home baggage. It was a huge undertaking for our Portuguese colleagues and we thank them deeply for their very worthwhile efforts. We have 4 years to think about the next WCEE, prepare papers and perhaps take another tilt at hosting a future WCEE.

Kevin McCue



Congratulations to Professor Michael Griffith who was elected a member of the Board of Directors of IAEE at the recent WCEE in Lisbon.

Report on the IAEE Meeting, Lisbon, 27 September 2012 - Gary Gibson, National Delegate

The main role of the International Association of Earthquake Engineering (IAEE) is to hold the World Conference on Earthquake Engineering. This occurs every four years, and covers all aspects of earthquake engineering. IAEE also publishes the journal "Earthquake Engineering & Structural Dynamics".

The 15th WCEE was held in Lisbon, Portugal, from 24 to 28 September 2012, and included the 2012 General Assembly of National Delegates on 27 September. National delegates from 38 countries attended the day long meeting, plus support staff from the IAEE Central Office in Japan.

During the morning the committee received reports from the President (Dr Polat Gülkan), General Secretary (Manabu Yoshimura) and others on a range of administrative matters.

One of the major achievements reported was the conversion of all past WCEE proceedings to electronic versions. The WCEE proceedings are an invaluable guide to developments in all aspects of earthquake engineering. They were originally published in book form, with up to 11 volumes requiring up to 450 mm of shelf space. From the 11th WCEE during 1996 in Acapulco, Mexico, the proceedings have been published on CD or DVD.

After a great deal of work by Sudhir K. Jain and the National Information Centre of Earthquake Engineering (NICEE, www.nicee.org, hosted at the Indian Institute of Technology Kanpur), PDF copies of all papers from the first 14 world conferences are available on their web site (www.nicee.org/wcee). The 15 WCEE papers will be added in the near future. Keyword searches cover all 14 conferences.

The Accounting and Budget Plan showed that despite the size and cost of running the WCEE, plus costs of the other activities of IAEE, the average annual budget is about US\$20,000. There is a heavy reliance on voluntary support.

There was discussion regarding the advantages and disadvantages of IAEE joining the International Council for Science (ICSU, with

the name being changed from the International Council of Scientific Unions during 1998, but retaining the existing acronym). Other members of ICSU with connections to earthquakes include the International Union of Geodesy and Geophysics (IUGG) and the International Union of Geological Sciences (IUGS).

This was followed by elections of new Officers and Directors. Sudhir K. Jain (India) was selected as President-elect, and Masayoshi Nakashima (Japan) as Executive Vice President. Among the eight Directors selected were Prof Mike Griffith (Adelaide University) and Andrew Charleson (New Zealand).

During the afternoon the proceedings were dominated by the selection of the venue for the 16th WCEE. The committee viewed presentations from an unprecedented number of seven countries (Australia, Chile, Indonesia, Japan, Macedonia, Turkey and USA). All presentations were innovative and attractive, with a range of emphasis from attractions of the region, facilities for the conference, to interesting changes in the way technical content would be included. The 38 national delegates each had one vote for one venue, and the after each vote the lowest scoring venue was eliminated, resulting in six separate votes before Santiago in Chile remained as the venue for 2016.

Conferences/Workshops

29 Nov 2012 Earthquake Loading (Actions) Workshop To AS1170 Part 4.
Melbourne Vic, Hotel Grand Chancellor.
Speakers Paul Uno and Professor John Wilson
info@seminarservices.com.au

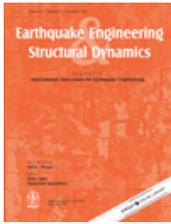
26- 28 April 2013. The NZSEE 2013 Conference will be held in Wellington at the Michael Fowler Centre.

Theme: *Same Risks – New Realities*

Abstract submission deadline – Monday 26th November 2012 - Submissions can be made online via the conference website
www.confer.co.nz/nzsee.

20 - 23 November 2013 the 19th NZGS Symposium "Hanging by a Thread – Lifelines, Infrastructure and Natural Disasters".
Queenstown, New Zealand.

<http://www.nzgs13.co.nz/>



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Trends in Earthquake Engineering

Short Report from the WCEE15 in Lisbon September 24th to 28th, 2012

This was the first time I had attended the World Conference on Earthquake Engineering. At first I was overwhelmed by the sheer numbers of attendees (about 3500 delegates), with specialisations in so many different areas. These were broken down by the conference organisers into the following categories: Assessment and Retrofitting of Existing Structures, Design of New Structures, Engineering Seismology, Geotechnical Earthquake Engineering, Infrastructure and Lifeline Systems, and Preparedness and Emergency Management of Large Earthquakes.

It was difficult to choose which presentations to attend, since there were 16 parallel sessions in total. Given that each speaker in these sessions had only 10 minutes to give their presentation, it was only possible to absorb the essence of their research, not the details. After several days, having given a presentation, and having had one of my students give a poster, I decided that the posters and e-posters were better value provided that the researcher was present to discuss the project in more depth. However, from the presentations, posters and e-posters I was unable to determine a general trend in thinking within the earthquake engineering community, although I did notice quite a few references to displacement-based design and/or assessment. There were some clever ideas; I was particularly

impressed with the various rocking systems that have been proposed and the tests that have been carried out on those. They often include simple ways of creating extra damping in the system, items that could be replaced after a major event without much trouble or expense.

It was in the keynote presentations that some discernible trends in thinking could be established. There were 17 keynotes, of which I will briefly discuss 6; those by Stefano Pampanin (University of Canterbury), Gail Atkinson (University of Western Ontario), G.M. Calvi (IUSS, Pavia), Sudhir Jain (IIT Gandhinagar), M.C. Comerio (University of California, Berkeley) and Mario Dolce (Italian Civil Protection Department, Rome). The others were by Ashtiany, Baitao, Cardona, Carvallo, Gazetas, Gulkan and Reitherman, Hayashi, Jordan, Okal, Orduz, and O'Rourke.

Mary Comerio, in her keynote on "Resilience, Recovery and Community Renewal", analysed the results of studies into the effectiveness of different recovery programs that have been adopted after major earthquake events. The careful study of the effectiveness of recovery programs, policies and interventions in China, Italy, Haiti, Chile, New Zealand and Japan have led her to conclude that "the capacity for renewal, reorganisation and development are critical for going beyond recovery to community resilience". According to Mary "It is important to get beyond the engineering metrics (buildings replaced, money spent and rubble removed) and use social metrics for resilience and recovery". In her paper she quotes from the psychiatrist Dr. Craig Van Dyke, who writes: "...the grief literature describes the endpoint of successful mourning as a point when the individual is capable of making new emotional investments in the future. It is not defined by happiness or even well being. Rather it is an acknowledgement that one is forever changed, but it is time to get on with life and make new investments and not have one's personal development permanently arrested." Mary thinks that "similarly, we can measure disaster recovery through understanding whether programs for physical reconstruction will enhance community resilience, develop community engagement, and lead to optimism about the future for those who suffered losses."

Public sector actions that limit future risk are said, in Mary Comerio's paper, to be essential to enable a community to develop true resilience

after a disaster. In Stefano Pampanin's keynote on "Reality-check and Renewed challenges in Earthquake Engineering: Implementing Low-damage Structural Systems - from theory to practice", he suggests a radical change in fundamental seismic design philosophy and advocates that this be built into Building Acts and design codes. He issues a wake-up call to the international community based on his observations of the aftermath of the Christchurch earthquakes in 2010 and 2011, noting that a high number of modern multistorey reinforced concrete buildings have had to be demolished. These buildings were designed in accordance with traditional philosophies using the basic principles of capacity design, and they performed largely as intended under the very rare earthquake experienced in Christchurch on February 22nd, 2011. Although the plastic hinge regions in these buildings performed their required function, that of acting as fuses within the ductile side-sway mechanisms, the extent of structural damage that rendered the buildings unusable after the earthquake, highlights the weakness of the traditional design philosophy which is mainly focused on collapse prevention and life-safety, and does not embrace a damage-control objective. Stefano is concerned about the mismatch between "societal expectations and the reality of engineered building's seismic performance." He would like to raise the bar in the targeted performance objectives corresponding to a rare or very rare earthquake level from Life Safety or Collapse Prevention to a "more appropriate and needed" Damage Control objective. Technologies developed in New Zealand and elsewhere that strive to achieve this goal are summarised in Stefano's paper. If this radical change in design philosophy is to be adopted worldwide, then the Holy Grail of earthquake resistant design will become that of developing building systems, including both the structure, the foundation and the non-structural components, that are capable of withstanding a severe earthquake virtually unscathed. This would be made even holier if there were a further aim to ensure that this type of construction was not significantly more expensive than those constructed within the current design paradigm.

The problems faced in a developed country such as New Zealand in establishing a new way forward were shown by another keynote speaker, Sudhir Jain, to be very different to those in developing countries such as India. Sudhir gave a sobering presentation on "The Road to Seismic Safety with Particular Reference to the

Developing Countries" in which he lamented the huge number of fatalities and economic losses caused by earthquakes in developing countries, where they often lack a systematic approach to the construction of a safe building. He emphasised the importance of changing the mindset of engineers and others in the building industry; he urged them to go beyond the narrow focus on what he called "earthquake engineering" (research activities, reports, microzonation, maps and codes) and to ensure that suitable buildings are ACTUALLY BEING CONSTRUCTED.

"Non-engineered construction" and buildings that are not safe and do not comply with codes, despite having been constructed under engineering supervision, are identified by Sudhir as presenting the biggest problems. He lists the key actions for moving a developing country towards seismic safety as follows:

- Community awareness about earthquake problem and its implications.
- Legal framework that identifies responsibilities and liabilities of different players in the construction industry towards safe constructions.
- Technical competence of engineers and others concerned with the delivery mechanism.
- Professional ambience (regulation to ensure competence and ethics amongst the professionals).
- Enforcement of codal provisions by local jurisdictions.
- Appropriate housing typologies (which are inherently better for seismic performance).
- A vigorous research and development initiative towards engineering of safe constructions.

The keynote by Calvi on "Alternative Choices and Criteria for Seismic Strengthening" and that by Dolce on "The Italian National Seismic Prevention Program" are related in that Calvi discusses "structure driven" strengthening criteria based on a logical use of resources and Dolce outlines a seismic retrofitting program that was instigated at a cost of one billion euros over 7 years after the L'Aquila earthquake. Dolce states that this amount is only a small fraction of what is actually needed. In this Italian initiative, actions are being taken primarily in areas of high hazard and high risk since the focus is on the prevention of the loss of human life. Calvi remarks that "Resources

are actually the absent guest in all tables where the issue is to define the safety level to be met when design and constructing new structures, and much more so when the issue is reducing vulnerability in existing constructions." He not only considers that there is a need for prioritization schemes in which the achievement of a given performance level within a certain time period is consistent with the available resources, but also emphasises the cost differential between different strengthening schemes for a given structure that are designed to achieve the same risk rating.

Gail Atkinson's keynote on "Integrating Advances in Ground-Motion and Seismic-Hazard Analyses" was the only one that I attended that was given by a seismologist. She explained the need to "deaggregate" the UHS (Uniform Hazard Spectrum) obtained from a Probabilistic Seismic Hazard Analyses (PSHA) in order to determine the magnitude-distance combinations that contribute most strongly to hazard, with the ultimate aim being the specification of suitable acceleration time histories for structural analyses. Gail gave an overview of the Monte Carlo approach to the PSHA and of developments in ground motion characterisation. She mooted the idea of "eliminating the need for GMPEs (Ground Motion Prediction Equations) by using a Monte Carlo approach to PSHA in combination with catalogues of real and simulated time histories." Rather than using deaggregation she would rather "draw or simulate records for the events directly." The question is, will this be the way of the future?

My world conference ended in a small restaurant in the Alfama district with its winding narrow streets and old buildings, one of the few districts that was not destroyed in the Lisbon earthquake of 1755. With a group of conference friends we enjoyed the ambience, and the melancholic laments of several Fado singers accompanied by a Portuguese guitar trio, the music of unrequited love, poetry and fate.

Helen Goldsworthy

The Canterbury earthquake sequence - WCEE15

This is a summary of the special session on the Canterbury Earthquake Sequence that was convened by Andrew King of GNS Science and moderated by Gregory McRae of the University of Canterbury. It provides a remarkably broad and comprehensive view of a disaster whose scope was almost unimaginable before the event, in a country that justifiably thought that it was fairly well prepared for earthquakes. It is taken from the summary of the session provided in the 15WCEE Programme.

Extensive damage to a modern western city is rare. An aftershock sequence more damaging than the main shock is unusual. A geographical setting where shaking damage is exceeded by damage from ground deformation is rare. The extent of insurance penetration in New Zealand is unequalled anywhere. Christchurch combines these rare characteristics and this special session provided a forum wherein the combination of these individually rare events come together to provide a unique insight of how a modern western city responds to an ongoing sequence of earthquake attacks. Topic areas discussed were:

Seismicity (the aftershock sequence): the unique tectonic setting the generated so many damaging aftershocks, the high stress drop, shallow focal depth and positive directivity have resulted in near field accelerations ($H=1.8g$, $V=2.2g$) much greater than expected for these magnitude events. The short and long-term risk implications of this were discussed.

Geotechnical (liquefaction, rockfall & slope failure): Severe widespread liquefaction occurred over much of the eastern half of the city 120,000 houses being affected, some on 5 occasions during the sequence. Locating and quantifying the severity and near-surface properties responsible has been challenging but essential in establishing the appropriate rebuild (or retreat) options. In the Port Hills just south of Christchurch, slope failure and boulder rockfall resulted in a risk-based land-use planning controls for rebuild in high hazard areas.

Buildings (safety evaluation & repairability): Damage to residential, commercial/industrial & heritage buildings was widespread, either from earthquake induced shaking or ground/foundation deformation or both. All 12500 commercial buildings in the city require Detailed Engineering Evaluations to evaluate

their residual capacity. 95% of the 150,000 residential properties are covered by insurance with over 350,000 claims lodged. These will combine to provide an extensive dataset of both damage and repair costs

Infrastructure (Buried networks): In liquefaction zones, buried networks such as water, waste water and electricity were badly damaged often on more than one occasion. Permanent repairs may require a complete change in design philosophy. This and the unique contracting framework being used for the reinstatement process were discussed.

Loss projections (insurance and risk transfer): The extraordinarily high level of insurance penetration in New Zealand resulted in unique damage, repair and loss datasets being formulated which are expected to rewrite existing building vulnerability functions.

Response (Socio-economic implications): The community impact of the Emergency Declaration, the complete (and ongoing) closure of the CBD and the decisions to retreat from high-risk areas were discussed.

Andrew King

44th Anniversary of the Meckering WA Earthquake

As I was compiling this Newsletter this important anniversary on 14th October passed without mention in the media. Hard to believe it was so long ago that this earthquake flattened the wheatbelt town of Meckering and caused considerable damage in Perth without causing fatalities.

At magnitude 6.8, this was nearly 0.5 of a magnitude unit greater than the destructive Christchurch NZ earthquake of February 2011.

A 35km long fault ruptured to the surface and in the process cut off the main east-west railway line and main highway and fractured the mains water pipe between Mundaring and Kalgoorlie.

The resulting damage led to Australia's first earthquake code AS2121-1979 and ultimately to the formation of the Australian Earthquake Engineering Society.

Aftershocks are still happening at Meckering, a magnitude 2 micro-earthquake occurred there on 8th September 2012, very close to the surface rupture.

Fallout from the April 2009 L'Aquila Earthquake

Six scientists/engineers and one government official have been sentenced to six years in prison for manslaughter, for making "falsely reassuring" comments before and after a meeting of the National Commission for the Prediction and Prevention of Major Risks held at L'Aquila a week before the earthquake.

But the scientists/engineers were not at the media conferences that preceded or followed the meeting, only the deputy civil protection chief who organised the meeting.

The meeting lasted one hour and its minutes show that Boschi said: "It is unlikely that an earthquake like the one in 1703 could occur in the short term, but the possibility cannot be totally excluded." Eva said that "in the seismically active area of L'Aquila, it is not possible to affirm that earthquakes will not occur," and Selvaggi pointed out that "although some recent earthquakes have been preceded by small shocks, it is also true that many recent sequences have not led to a strong earthquake."

According to Max Wyss, "at issue was the question of the possibility that the ongoing earthquake swarm of many hundred small events near L'Aquila could escalate into a main shock large enough to cause buildings to collapse; the three seismologists were the relevant experts. They are the ones who have spent their careers learning as much as possible about the earthquake hazard in their country. It is certain that they were aware of the scientific publications that estimated that the probability of a larger, damaging shock to follow an earthquake swarm or an aftershock sequence is in the range 2 to 5%"

It is often reported in the media that, "in L'Aquila after a swarm of tremors some residents would leave their houses and sleep in their cars, to avoid the danger of collapsing buildings. However on this occasion comments by the authorities prompted some of those people to change their usual response and stay inside."

Professor Paul Somerville put it this way: "On April 6, 2009, a magnitude 6.3 earthquake killed 309 people in the Italian city of L'Aquila, following an earthquake swarm that had produced earthquakes daily for four months. The case against the scientists was initially understood as relating to their failure to predict the earthquake (an error of omission), but is

now focused on their having provided "incomplete, imprecise and contradictory information" about earthquake risk (an error of commission).

Specifically, the local government's prosecution argument is that the reassuring information the scientists provided at a meeting held one week before the earthquake, to the effect that a major earthquake was not imminent, inhibited the citizens from taking precautions that would have saved lives, especially as two large foreshocks occurred the day before the early morning mainshock.

It appears that the government's objective in holding the meeting was to debunk unreliable but alarming earthquake predictions that were being made by L'Aquila resident Giampaolo Giuliani, who is not a seismologist, and that the scientists were distracted in this direction instead of focusing on information about earthquake risk that the citizens needed..."

"However, probabilistic forecasting has very low absolute probabilities, even when the increase in probability is high. For example, Italian seismologists estimated that the probability of a large earthquake in the next three days increased from 1 in 200,000 before the earthquake swarm began to 1 in 1,000 following the two large foreshocks of L'Aquila earthquake..."

"As pointed out by Professor Thomas Jordan in a recent Science article (12 October 2012), the best way to avoid such problems in the future is to clearly delineate the role of the scientists and that of authorities responsible for civil protection. Experts should provide carefully constructed probabilistic statements regarding the risk, which decision-makers would then use to choose the best course of action.

Ironically, the conviction of the scientists is likely to imperil the very need that this incident has highlighted: for open and clear communication between the scientists and the public. In a further irony, no action has yet been taken against the engineers who designed modern buildings that collapsed and caused fatalities, or the government officials who were responsible for enforcing building code compliance. It has occurred to some observers that the local government officials may be scapegoating the scientists to avoid prosecution themselves."

<http://www.earthmagazine.org/article/voices-judged-unfairly-laquila-roles-and-responsibilities-should-have-been-considered>

<http://www.smc.org.au/2012/10/rapid-reaction-earthquake-scientists-guilty-of-manslaughter-in-italy-experts-respond/>

2012-10-28 03:04:09 UTC

Canada's second largest historical earthquake, its magnitude 7.7, occurred in the Haida Gwaii region (formerly Queen Charlotte Islands) off Northwest Canada. According to *Earthquakes Canada*, it was felt across much of north-central British Columbia, including Haida Gwaii, Prince Rupert, Quesnel, and Houston. There were no reports of damage yet the *Earthquakes Canada* website indicates two reports of intensity MM7 on the island and MM6 everywhere on the island. These are so-called community internet intensities. The USGS however says the intensity was MM5 in the Masset-Queen Charlotte City area and MM4 at Fort Saint James, Kelowna, Kitimat, Prince Rupert and Revelstoke and that it was felt from Seattle, Washington to Juneau, Alaska and Calgary, Alberta (perhaps just in tall buildings?).

In the vicinity of Vancouver, about 600km away, the intensity varied from not felt to MM5 but most surrounding reports were only intensity MM2 to 3.

Figure 1 Mainshock location and Community Intensities (key below from Earthquakes Canada). See discussion at:

<http://www.earthquakescanada.nrcan.gc.ca/dyfi/about-eng.php>

Numerous aftershocks of M3 to 5 occurred in the hours following the mainshock. The strongest aftershock so far, magnitude 6.3, was at 11:54 am PDT on Sunday Oct 28. The aftershock sequence is expected to continue for weeks with the number and severity of earthquakes decreasing over time.

A very small non-destructive tsunami was generated.

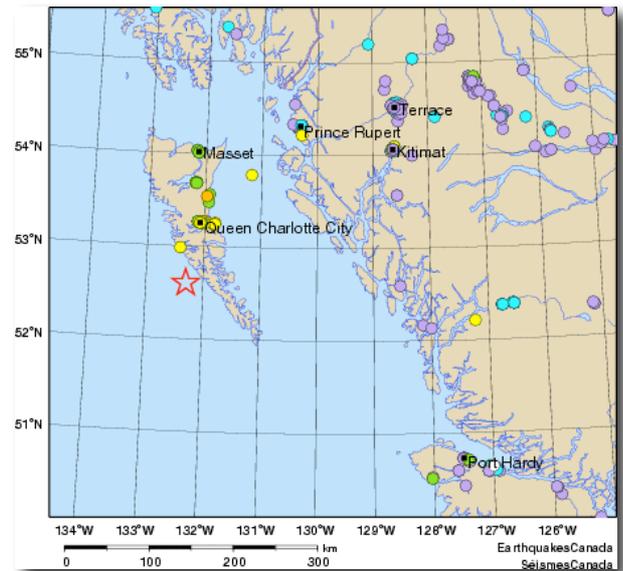
The USGS reports that the earthquake occurred as a result of oblique-thrust faulting near the plate boundary between the Pacific and North America Plates where the Pacific Plate moves approximately north-northwest with respect to the North America Plate at approximately 50 mm/yr.

This earthquake was probably on the Queen Charlotte fault system offshore British Columbia, Canada. The rupture extended approximately 100-150 km along strike. Computed slip reached approximately 5m, in a patch to the south of the epicentre.

Figure 2 Aftershocks to 4 November 2012 (from USGS). The red lines are the inferred plate boundaries.

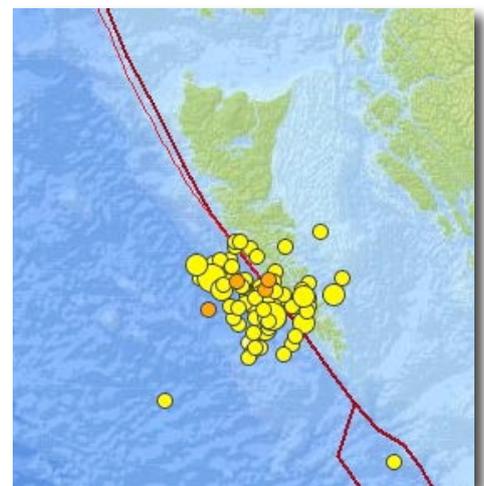
This region of the Pacific/North America plate boundary has hosted 7 earthquakes of magnitude 6 or greater over the past 40 years - the largest of which was a M 6.6 earthquake in 2009, 80 km to the south east of the 2012 earthquake. In 1949, a M 8.1 earthquake occurred closer to the Pacific/North America plate boundary, approximately 100 km northwest of the October 28th earthquake, near the northern extent of Haida Gwaii region (formerly Queen Charlotte Islands).

The interesting outcome of this earthquake is the low intensities observed, just as in 1949, which may lead to a downward revision of earthquake hazard estimates for cities like Vancouver.



INTENSITY	I	II - III	IV	V	VI	VII	VIII	IX	X+
SHAKING	Not felt	Weak	Light	Moderate	Strong	Very Strong	Severe	Violent	Extreme
DAMAGE	none	none	none	Very light	Light	Moderate	Moderate-Heavy	Heavy	Very Heavy

★ epicentre



Major World Earthquakes, Sep & Oct 2012

There were no great magnitude 8+ earthquakes since those listed in the last newsletter but 4 major magnitude 7+ events as listed below. The Canadian earthquake, the largest event, is described in more detail above.

August 27, 2012, Magnitude 7.3 OFFSHORE EL SALVADOR

August 31 2012, Magnitude 7.6 PHILIPPINE ISLANDS REGION

September 05 2012, Magnitude 7.6 COSTA RICA

October 28 2012, Magnitude 7.7 QUEEN CHARLOTTE ISLANDS REGION

Australian Earthquakes, Sep & Oct 2012

Table Earthquakes in the Australian region, magnitude 3.0 or greater, located by Geoscience Australia

UTC Date	UTC Time	Latitude	Longitude	Depth	ML	Approximate location
2012-09-09	08:41:56	-38.607	140.855	9	3.1	S Port Macdonnell SA
2012-09-09	09:23:52	-38.639	140.805	10	3.0	S Port Macdonnell SA
2012-09-10	06:23:52	-33.449	151.844	2	3.2	Offshore E Terrigal NSW
2012-09-11	07:13:29	-26.114	132.019	0	3.0	NW Ernabella SA
2012-09-14	17:10:04	-20.951	129.475	5	3.5	NE Lake Mackay NT
2012-09-16	15:57:17	-39.566	150.002	4	3.0	E Flinders Island
2012-09-26	05:22:35	-26.054	132.163	13	3.5	N Ernabella SA
2012-09-26	17:37:29	-30.996	121.072	10	3.0	Bullabulling WA
2012-10-07	03:20:28	-27.768	120.63	0	3.2	Near Leinster WA
2012-10-11	22:47:09	-37.893	143.591	10	3.1	Rokewood Vic
2012-10-12	19:27:14	-22.881	127.681	10	3.5	W Lake Mackay WA
2012-10-17	18:16:57	-30.648	141.877	15	3.5	N Broken Hill NSW
2012-10-27	04:43:14	-38.31	146.251	12	3.0	Near Moe Vic
<i>Other events listed by ES&S or DMITRE SA</i>						
2012-09-23	16:29	26.3	151.5	N	3.1	Boondooma Qld
2012-10-01	13:05	43.7	147.2	N	3.0	Bruny Island Tas
2012-10-08	10:28	33.50	138.54	N	3.0	Simpson Desert SA

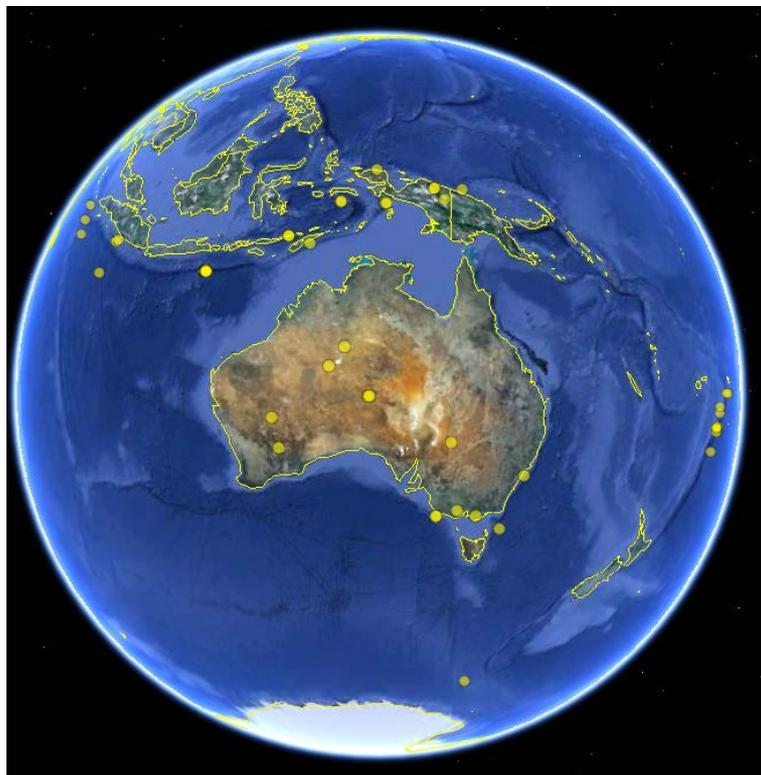


Figure Epicentres of earthquakes $M \geq 3$ in Australia and the region, September and October 2012, from Geoscience Australia