ISSN 0967-859X
THE SOCIETY FOR EARTHQUAKE AND CIVIL ENGINEERING DYNAMICS

NEWSLETTER

Volume 14 No 3
December 2000

Millennium Launch Conference of the UK Natural Disaster Reduction Committee

On 13th December 2000, a one-day Conference was held at the Institution of Civil Engineers in London to launch the UK Natural Disaster Reduction Committee (UKNDRC). The Committee, which will operate in partnership with the Hazards Forum, will continue the work on the UK national committee for the International Decade for Natural Disaster Reduction (IDNDR) that finished in 1999.

The Conference was opened and introduced by Professor Brian Lee of the University of Portsmouth, who is the Chair of UKNDRC. The morning was dedicated to the theme of "What are the international needs?". The first speaker was Dennis Benn, Director of the UN International Strategy for Disaster Reduction (ISDR), which has been adopted by the UN to continue the work begun by the IDNDR. Mr. Benn spoke of the success of the IDNDR in beginning to shift the focus from spending on disaster response to investing in disaster prevention, although 90% of resources dedicated to disasters is still spent on emergency response.

The concept of the ISDR was formulated at the concluding forum of the IDNDR held in Geneva in July 1999. Almost as if Nature wished to illustrate the need to continue the work begun during the Decade, in the five closing months of the Decade following the forum in Geneva, destructive earthquakes hit Turkey, Greece and Taiwan. The second speaker in the Conference, Professor Nuray Aydinoglu, of Bogazici University, Istanbul, presented a talk on rehabilitation, recovery and preparedness following the Kocaeli and Düzce earthquakes in Turkey. Professor Aydinoglu presented statistics on the damage caused by the two earthquakes and also explored the reasons for the very high vulnerability of the exposed areas. These included the fact that the earthquakes struck a region of accelerated urbanisation and industrialisation that had created a need for inexpensive housing, coupled with rampant violation of the seismic design code. In addition to the physical vulnerability, the population was economically vulnerable since as a result of high inflation in Turkey in recent years there has been a relatively low take-up of mortgages and the attendant earthquake insurance. This was aggravated by the fact that the Turkish government has effectively been a free insurer of earthquake risk, covering all losses from federal funds. Professor Aydinoglu explained how all of these factors were being addressed, supported in part by a programme for national recovery and preparedness funded by US$ 2 billion from the World Bank and European Union. This programme includes many initiatives, including the creation of emergency management agencies at national and municipal level. Another key element of the programme is the creation of a compulsory earthquake insurance scheme, the Turkish Catastrophic Insurance Pool (TCIP), which will relieve the government from the burden of replacing all earthquake-damaged housing.

The third speaker, Dr. Andrew Lord of Ove Arup & Partners, spoke on the role of the civil engineer in reducing the impact of natural disasters, drawing on more than 15 years of

experience in infrastructure projects in Turkey. Dr. Lord also described the work of the British Earthquake Consortium for Turkey (BECT) set up by a protocol between the British and Turkish governments in February 2000. BECT is made up of Arups, Balfour Beatty, Thames Water, Laing, Bovis and Hyder, and their work was funded by the UK government DETR and by contributions from the companies themselves. The main objectives of BECT were to identify principal needs for redevelopment of Yalova province and recommend priorities for redevelopment and identify sources of funding. BECT was also charged with identifying the location and distribution of geo-seismic hazards and quantifying associated risks, recommending risk mitigation measures and communicating these to local government.

The final speaker to address the issue of international needs was Dr. Ian Davis of Cranfield University. Dr. Davis opened his presentation with a rallying call made by the UN Secretary in 1999: "*We must, above all, shift from a culture of reaction to a culture of prevention. Prevention is not only more humane than cure; it is also much cheaper…. Above all, let us not forget that disaster prevention is a moral imperative, no less than reducing the risks of war*". Dr. Davis then went on to address ten priority concerns related to disaster prevention: leadership, global programme links, international exchanges, innovative approaches to risk reduction, developing partnerships, community level protection, information technology, education and training, social learning, and building a safety culture. Characteristically, Dr. Davis' presentation went to the core of these issues and touched on controversial, but vital, aspects of improving disaster mitigation. One of these issues is the necessity of establishing accountability in disaster mitigation programmes, so that there is effective audit of the use made of the funds directed towards disaster prevention. Dr. Davis affirmed that demonstration of greater accountability could assist in persuading governments to contribute more generously to efforts to prevent rather than relieve the effects of disasters. He also pointed out the dilemma in this field that success in disaster prevention is a non-event and often difficult to prove.

The discussion that followed the presentations focused on several of the issues raised, including the opportunities for promoting and effecting disaster prevention that are opened up by recent technological developments. In particular, the application of satellite imagery to hazard and risk mapping was highlighted. The Internet was also mentioned by many as a key tool, as had been highlighted by Dr. Ian Davis in his talk when he quoted from the report on the IDNDR Global Forum held in Geneva: "*Advances in information technology in recent years provide enormous resources for decision-makers. However, efforts are needed to distil this information into products that are tailored for the specific needs and delivered in a timely manner. Advances in communications technology make possible integration of real-time and archival data for emergency situations*".

Perhaps the most important message to come out of the Conference is that the global work of disaster prevention, whether the focus is on Turkish earthquakes or UK floods, is still a major challenge to many sectors and agencies to solve through effective collaborative efforts. It is clear that the IDNDR was nothing more than the beginning of a very long-term effort that the ISDR aims to push forward. Further information regarding the work of the UK Natural Disaster Committee can be obtained from the Chairman, Professor Brian Lee (brian.lee@port.ac.uk) or the Committee Secretary, Christine Davidson (christine.Davidson@port.ac.uk). Further information about the Hazards Forum

SECED Newsletter Special Issue

Following on from the interest generated by the half day seminar on "Seismic Effects on Buried Structures" held on the 29 November last year, a special issue of the SECED newsletter is being produced that will provide a more comprehensive report of the meeting.

The special issue will include information on underground motion and the effect of cavities; definition of soil and rock properties for seismic analysis; the effect of ground motion on tunnels, immersed tunnels and caverns; water distribution pipelines; and a review of the observed damage to buried structures from seismic loading. This special issue will be circulated later this year.

is available at www.hazardsforum.co.uk. ***Julian Bommer***

"Zone-Free Hazard Modelling"

David Mallard reports the SECED half-day meeting held on January 19th 2000

In the overall process of attempting to build an environment safe from the effects of earthquakes, we make use of all sorts of models. Through habitual usage, there can be a risk that the distinction between such models and the realities they are supposed to represent gets blurred. Also, even widely used models can become out-of-date, or, in the limit, discredited. The recommended treatment to guard against such ailments is a regular cold shower in the form of a bracing disputation on the subject of model versus reality. Accordingly, the idea in setting-up this meeting was that it might be the first of these "afternoons of wrath" (to borrow a phrase from polite society in Edwardian Dublin). The model under review was the zonal seismic source, much-used (and abused) by practitioners of the Comell-McGuire method of hazard assessment.

Your reporter opened the meeting with reminders of some of the principles involved in accepting and using such representations and some of their problems, starting with the fact that zonal seismic sources are constructs for modelling volumes of crust where the seismogenicity appears to be, or is taken to be, homogeneous. Mostly, they are used to represent earthquakes which actually occur on active faults which have not been identified as being active, and on active faults which have not even been recognised as being faults. They are, therefore, simplifications, born of ignorance.

Defining distinct zones of uniform seismicity for hazard models requires that the boundaries between those zones should represent some change (preferably, one that can be demonstrated statistically) in the characteristics of seismicity such as activity rate, depth distribution, focal mechanism, etc. In an environment like the UK, only rarely will unequivocal tectonic controls be encountered which can be invoked in the zonation for any seismic hazard model. Therefore, in defining model zone boundaries there is an inevitable reliance on the evidence provided by the earthquakes themselves. However, in conventional practice, the inclusion of an earthquake in one zone means its exclusion from all other zones and, in principle, it is just as important that there is uniform seismicity with consistent seismological characteristics across zones where there are not many earthquakes as it is for zones where there are. In the drawing of zone boundaries, therefore, it is important that methodological procedures tailored to the local seismotectonic environment are followed, and followed consistently: otherwise, such boundaries are likely to be based on arbitrary decisions.

For site-specific hazard assessments, there are options available for addressing the uncertainties associated with zone boundaries. (Such uncertainties can include not just the precise location of a boundary but whether there is a boundary at all and, in the case of the zones closest to the site, such decisions can be very significant for the outcome.) It is possible, for example, to allow for several appropriately weighted alternative zonations rather than a single set of zone boundaries.

In parts of the world like Britain, there will always be concern that even apparently tested zonations based on the patterns revealed by moderate magnitude earthquakes may give a false impression as to the likely whereabouts of the larger events which are so much rarer in the historical record, i.e. zonations, when we understand them better, may need effectively to be magnitude-dependent.

Given these issues, the main purpose of the meeting was to look at alternative approaches and Gordon Woo (EQE International), the principal speaker, then delivered his lecture. He introduced the kernel method for seismic source modelling by explaining the general use of kernel smoothing methods in statistical analysis. These methods provide a non-parametric approach to smoothing data, which brings out the underlying structure in the data. The simplest application of kernel methods is in smoothing histograms, which may convey different visual impressions according to the width and location of the individual bins. Analogously, the Comell-McGuire polygons drawn to represent seismic zones may also convey differing senses of seismic hazard according to the size and position of the zones.

Having illustrated examples of the multiplicity of alternative zonations in various countries, he then examined the basic issues in source definition. It was pointed out that zonations produced by Belgian and Dutch seismologists could hardly be expected to be compatible, given the disagreement about the length of their common frontier. The latter conundrum is resolved by reference to fractal geometry, which departs from the simple Euclidean geometry used to define Comell-McGuire zones. The fractal geometry of earthquake epicentres is replicated within the kernel method by a power-law fall-off with epicentral distance of the kernel function. As a specific example of use of the kernel method, a study of El Salvador was quoted.

Dr. Woo concluded his talk by summarizing the mix-and-match options now available to seismic hazard analysts. According to the geographical pattern of regional seismotectonics, various combinations of fault, zonal and zoneless seismic sources may be considered within a single seismic source model.

In the first of two prepared contributions from the floor, J Bommer (Imperial College) argued that each method for probabilistic seismic hazard assessment has its own merits and an appropriate method should be chosen for any particular application. For a region

like the UK, where there is not a clear defined association of the seismicity with the tectonics, then zone-free methods such as the kernel approach proposed by Dr. Woo provide a useful tool. For areas where there is a very clear association between the seismicity and extensive and well-defined tectonic structures, such as the North Anatolian Fault, then the use of the Comell-McGuire approach will result in the desired result of approximately uniform hazard along the entire length of the fault, which may not be the case using zone-free methods. On the other hand, if there is clear association of earthquakes with small structures, such as the coincidence of destructive shallow-focus earthquakes with volcanic centres in Central America, then the spatial distribution of the hazard can only be realistically reflected by employing zone-free methods.

Dr. Bommer went on to argue that even more important than these considerations is the fundamental issue of the purpose of the seismic hazard assessment as the main criterion by which the method of analysis is chosen. For regional hazard mapping to define seismic actions in terms of peak ground-motion parameters or response spectra, probabilistic hazard assessment provide a useful tool and an appropriate method can be chosen accordingly. However, for site-specific assessments for critical structures, for which acceleration time-histories are required, then there are many serious problems encountered with using probabilistic approaches, especially when return periods of the order of 10,000 years are defined. At these hazard levels, it will generally be found that the hazard is almost dominated by the scatter in the attenuation relationships. Furthermore, these figures are rather arbitrary: why not use a return period of 7,500 years or 12,500 years? The shape of the hazard curve at these low probability levels is usually such that these changes in return period would result in very large changes in design values of peak ground acceleration.

He argued that it is not advisable to extrapolate 100 years of instrumental data to return periods of 10,000 years, even if supplemented by a few centuries of historical data. When such low probabilities of exceedence are considered it is more rational and more useful to adopt a deterministic approach to the hazard assessment. If accelerograms are required then it is necessary to define a single earthquake scenario in terms of magnitude and distance. Although methods have been developed to identify such scenarios from the output of probabilistic seismic hazard assessment, Dr. Bommer asserted that, if several seismic sources have been considered, it is often physically impossible to define a single hazard-consistent earthquake.

The second prepared contribution from the floor was made by Roger Musson (BGS) who addressed the uses and limitations of zone-free hazard modelling. He noted that much of the current interest in zone-free seismic hazard modelling comes from the work in this area by Dave Perkins of USGS around 1993, although such methods had been used earlier. Perkins's initial inspiration was that, by applying "jitter" to a historical earthquake catalogue, one could arrive conveniently at a good first approximation to the hazard of an area.

Dr Musson felt that this rather encapsulates the advantages and disadvantages of the approach. It does allow one to assess hazard in a quick way from an earthquake catalogue without the need to research the tectonics of the area. On the other hand, by ignoring the tectonic dimension, one may miss important insights about the forces controlling the seismicity of an area which are extremely relevant to the hazard. And while it is possible to lament the subjectivity present in the "expert judgement" of traditional source zone models, the conventional approach is actually very powerful when used intelligently and imaginatively. Similarly, it is always possible to point to poorly constructed zone models and identify their inadequacy, but this is really a criticism of the practitioner, not the practice. Methods of validating seismic hazard models are in development, which should improve future results.

Dr Musson concluded by saying that zone-free modelling is another tool in the seismic hazard expert's armoury, which may be useful for some tasks, especially mapping exercises at a small scale where conservatism is not an issue. He doubted, however, whether it would be desirable to use such a method for sensitive site applications.

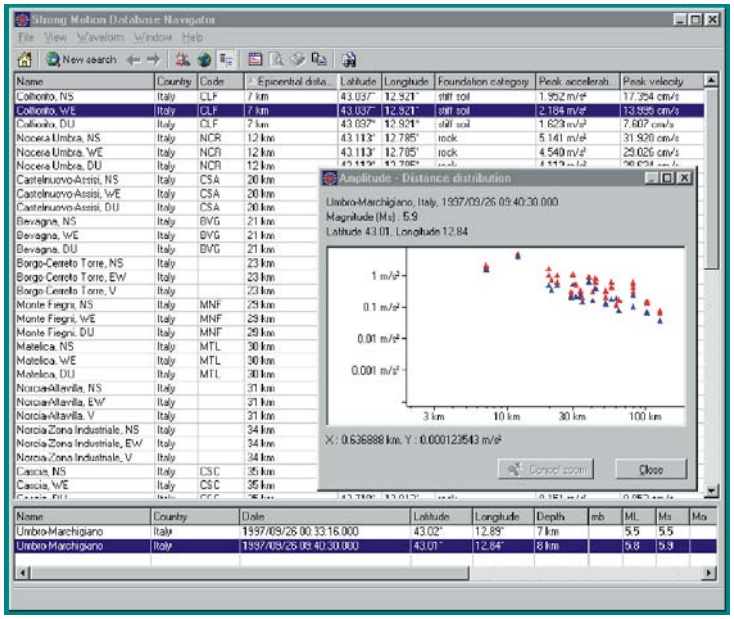
There followed a wide-ranging informal discussion on zone-free hazard modelling and other issues raised by the prepared contributions. Among the subjects touched upon were: the algorithm used in the kernel function method; the differences in the results derived from the conventional approach and from the kernel function method; the need for geological input to source models; comparisons between hazard assessment results and experience; the merits of the logic-tree formulation, and contrasting views on the best model to use for El Salvador. In addition to those who left without leaving their names, and the four speakers, the contributors to the discussion included Messrs. Whittaker; Skipp; Booth, and Merriman.

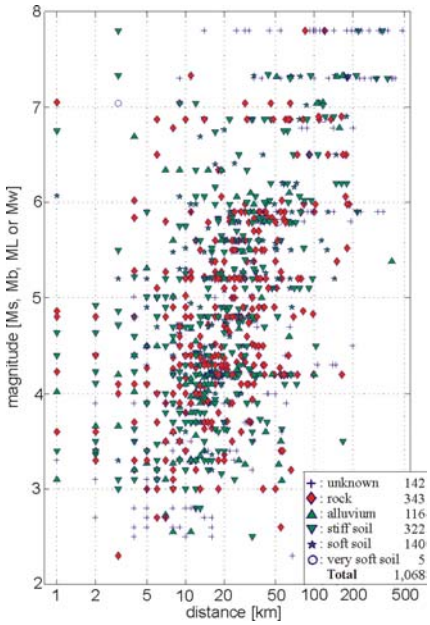
In conclusion, it seems that flexibility is now felt to be the key to the adequate modelling of seismic sources: slavish adherence, everywhere, to a single approach is not recommended.

David Mallard

Dissemination of European Strong-Motion Data

Strong-motion instrumentation and recording in Europe and in the Middle East started much later than in United States and Japan, and developed slowly. With the advent of digital recorders in recent years, this development increased rapidly, particularly because of the need to instrument major engineering works and public buildings and to comply with the requirements of hazard assessment and earthquake resistant design stipulated in Eurocode-8. The present state of strong-motion recording capabilities in Europe shows that, although the total number of all stations is difficult to estimate, the number of ground response instruments is about 3000. The number of individual three component ground response records made by European earthquakes of all magnitudes during the last 30 years exceeds a conservative estimate of 5000. This does not include data from the former USSR and a few other European countries, or from the European nuclear and oil industries. However full use of larger body of these data remains un-exploited so far due to problems of access and, as a result, relatively little research is generated. In the frame of a project granted by the European Commission, Directorate General XII, Science, Research and Development, Environment and Climate Programme more than 1000 uncorrected strong-motion acceleration records from shallow earthquakes in Europe, the Mediterranean area and Middle East





were acquired from different networks, agencies and data centres operated by a multitude of private, academic or governmental establishments. This dataset contains digital strong-motion records that we were able to acquire and which were recorded at permanent, ground level recording stations. Records from temporary stations were also included, if they are of engineering importance. All time histories have been recorded with instruments described as "free-field" or "ground response" recordings. The records have been disseminated in different formats and the associated parameters were, quite often, incomplete, inaccurate or wrong. In order to be able to analyse and use effectively the data it was necessary to process the records and to determine a number of parameters relating to the earthquake and the recording site using consistent procedures. Another important task was to present for dissemination the records and the associated parameters in a uniform format. All records have therefore been uniformly pre-processed and corrected and all time histories and spectra have been transferred into a uniform file format, with one file for each component of the recording station. It has been decided to develop a database system and to support a data-format, which is tailored to the specific requirement for the dissemination of the records and associated parameters. The records are identified by the origin time of the earthquake and the location of the recording station and are properly associated with the earthquake and recording station to which they have been attributed in the original sources. They all are archived in a databank both in uncorrected and corrected form and response spectra, which is linked to a database with associated earthquake-, station- and waveform-parameters. The associated parameters have been culled from special studies, re-assessed or adopted from bulletin, publications or data-centres. The primary benefit of this relational structure is that it significantly standardises the strong-motion data and associated parameters to be presented and, therefore, simplifies the process of searching and extracting of design input data. The database, databank and browser-program are designed for IBM compatible PCs with Microsoft Windows 9x, ME, NT or 2000 operating system, and includes 620MB of data. This comprehensive dataset with 1068 "ground response" records from Europe and adjacent area are now published on a CD-ROM together with a browser for interactive selection and extraction of design input data and documentation.

Copies of this CD-ROM are available on request (http://www.isesd.cv.ic.ac.uk).

Patrick Smit

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Seismic Design & Retrofit of Bridges

Plans are now underway for a follow up meeting to the seminar on the Seismic Design & Retrofit of Bridges held mid 2000.

Following on from the successful seminar in June 2000 on the seismic design & retrofit of bridges, which was hosted by the Institution of Structural Engineers, and held jointly with SECED, the American Concrete Institute and the French Association for Earthquake Engineering (AFPS) plans are currently proceeding for a follow up further collaborative meeting to be held in 2003.

The London presentation followed a similar event held in Paris on 21/22 June 2000. The programme included lessons learnt by EEFIT (UK Earthquake Engineering Field Investigation Team) from recent field visits to Turkey, Taiwan and elsewhere.

The picture shows some of the actors from the successful seminar in London.

Back row (Left to right**):** David Sanders (University of Nevada, Reno), Nigel Priestley (University of California, San Diego), Jo Barr (Rendel Palmer & Tritton)
Middle row: Frieder Seible (University of California, San Diego), Darius Amir Mazaheri (president AFPS), Edmund Booth (SECED), William Tolley (Secretary, ACI)
Front row: Jo Coke (president, ACI)

Website for the 12ECEE

The website for the 12ECEE is now up and running and can be found at http://www.12ecee.org.uk/

The site contains general information about the conference, including all the conference deadlines and topics as well as details for submission of papers. Everyone is encouraged to keep an eye on the site for latest information.

SECED Working Party on Seismic Research

A consultation exercise has been carried out with individual practitioners in seismic engineering and with UK universities, to establish both future needs for seismic engineering and current UK research capabilities. The consultation took the form of two questionnaires, which can be viewed from http://www.seced.org.uk/RWG/

15 responses were received from individuals and 22 from university departments. A summary of the return has been posted on the above website.

The Working Party is now preparing its draft report, which will be published by April 2001. Although the deadline for responses to the questionnaires has passed, it may be possible to include information from further returns of the two questionnaires. In particular, the Working Party would be pleased to hear from any university department actively involved in seismic research which has not yet contacted them. Please reply by completing the questionnaire and returning to the SECED secretary, Liz Marwood at the Institution of Civil Engineers (Marwood_L@ice.org.uk).

PEER Center Newsletter

The Pacific Earthquake Engineering Research Center is no longer able to continue sending copies of the PEER Center News for distribution to SECED members. The Newsletter is however available on-line at www.eerc.berkeley.edu/ or via links on the SECED website SECED website at: http://www.seced.org.uk

If any SECED members would still like to receive a printed copy of the Newsletter they can submit their request to the publications department by fax on (510) 231-9471.

Field Observations and Analysis of the Recent Earthquakes in El Salvador and India

All SECED members are invited to a meeting to be held at Imperial College at **4:30pm on Wednesday 7th March 2001**, Room 207.

The seminar will be reporting on recent visits to El Salvador and India and will discuss:

Field reconnaissance and progress in earthquake engineering (Prof. A.S. Elnashai),

Engineering seismology and geotechnical aspects of the El Salvador earthquake of 13 January 2001 (Dr. J. Bommer),

The seismicity of the state of Gujarat (Prof. N.N. Ambraseys) and

The structural and geotechnical aspects of the Bhuj Earthquake of 26 January 2001 (T. Rossetto).

NOTABLE EARTHQUAKES APRIL - AUGUST 2000

Reported by British Geological Survey

YEAR	DAY	MON	TIME UTC	LAT	LON	DEP KM	MAGNITUDES ML	MB	MS	LOCATION
2000	07	APR	19:08	17.99S	65.36E	13			6.2	MAURITIUS
2000	23	APR	09:27	28.24S	62.91W	616			6.9	SANTIAGO
2000	24	APR	05:10	54.77N	2.81W	14	2.6			CALTHWAITE, CUMBRIA
			Felt in the Calthwaite area with intensities of 3 EMS.							
2000	04	MAY	04:21	0.90S	123.40E	33			7.3	MINAHASSA PENINSULA
			At least 20 people were killed and hundreds of homes and buildings were destroyed.							
2000	12	MAY	18:43	23.40S	66.40W	240			7.0	ARGENTINA
2000	04	JUN	16:28	4.73S	102.50E	33			7.9	SOUTHERN SUMATERA
			At least 60 people were killed and hundreds injured. Hundreds of homes and buildings were destroyed or damaged.							
2000	06	JUN	02:41	40.62N	32.97E	33			6.1	TURKEY
			At least one person was killed and approximately 30 people were injured.							
2000	17	JUN	14:44	13.96S	97.47E	10		6.8	7.8	SOUTH INDIAN OCEAN
			Felt strongly in the Cocos Islands.							
2000	17	JUN	15:40	63.90N	20.30W	10			6.6	ICELAND
			At least one person was injured and at least 30 houses were destroyed or damaged.							
2000	21	JUN	00:51	63.90N	20.70W	10			6.6	ICELAND
			At least 12 houses were damaged or destroyed. Some roads and bridges were damaged and water and electricity supplies were cut off in some villages.							
2000	22	JUN	14:37	52.97N	4.39W	23	2.7			LLEYN PENINSULA
			Felt throughout the Dinorwic, Maentwrog, Llanberis and Caernarfon areas of North Wales.							
2000	28	JUN	07:09	56.61N	5.27W	7	1.6			APPIN, STRATHCLYDE
			Felt throughout the Appin and Glen Creran areas with intensities of 3 EMS.							
2000	01	JUL	07:01	34.21N	139.13	10		6.0	6.0	S COAST OF HONSHU
			At least one person was killed and several people were injured.							
2000	07	JUL	00:15	40.84N	29.22E	9		4.2	3.5	TURKEY
			One person was killed and approximately 30 people were injured.							
2000	15	JUL	01:30	34.36N	139.25E	10		5.5	5.9	S COAST OF HONSHU
			At least 8 people were injured and approximately 20 homes were damaged.							
2000	30	JUL	12:25	33.95N	139.44E	10		6.0	6.5	SE OF HONSHU
			At least one person was injured and damage occurred on Miyake-Jima.							
2000	04	AUG	21:13	48.75N	142.29E	10		6.3	7.1	SAKHALIN ISLAND, RUSSIA
			At least 8 people were injured and approximately 19,000 people were left homeless.							
2000	08	AUG	14:27	59.72N	5.42E	15	4.5			NORWEGIAN COAST
2000	09	AUG	19:16	56.24N	3.75W	5	2.1			BLACKFORD, TAYSIDE
			Felt throughout the Blackford area with maximum intensities of 4 EMS.							
2000	21	AUG	17:14	45.00N	8.42E	10		4.6		NORTHERN ITALY
			Minor damage occurred throughout the Asti-Solero area.							
2000	22	AUG	13:41	40.71N	30.76E	10		5.2	4.9	TURKEY
			At least 22 people were injured.							
2000	28	AUG	15:05	4.01S	127.46E	33		6.4	6.7	BANDA SEA

Notable Earthquakes September to December 2000 continued on back page

NOTABLE EARTHQUAKES SEPTEMBER - DECEMBER 2000

Reported by British Geological Survey

YEAR	DAY	MON	TIME UTC	LAT	LON	DEP KM	MAGNITUDES ML	MB	MS	LOCATION
2000	03	SEP	08:36	38.38N	122.41W	9		4.8	4.9	NORTHERN CALIFORNIA
			At least 72 people were injured and many homes were damaged in the Napa-Yountville area.							
2000	09	SEP	04:23	52.28N	1.61W	13	4.2			WARWICK, WARWICKSHIRE
			The highest observed intensity was 5 EMS at Warwick, where in a number of cases, objects such as ornaments, pictures or toys fell or were displaced, and in a few cases heavy objects were also said to have been displaced, including two washing machines, a cooker, a microwave and a sofa.							
2000	10	SEP	08:45	23.96N	121.44E	33		5.7	5.6	TAIWAN
			Roads were damaged and power outages occurred in east-central Taiwan.							
2000	20	SEP	08:37	1.91S	80.47W	33		5.5	4.8	COAST OF ECUADOR
			One person was killed and damage occurred throughout the Manabi Province.							
2000	02	OCT	02:25	7.99S	30.52E	10		6.1	6.7	LAKE TANGANYIKA REGION
			One person was killed and several people were injured in the Kipili – Sumbawanga area.							
2000	04	OCT	02:33	37.92N	29.05E	8		5.0		TURKEY
			Thirty one people were injured in the Denizli area.							
2000	06	OCT	04:30	35.39N	133.39E	10		5.9	6.7	WESTERN HONSHU
			At least 130 people were injured and approximately 2,200 homes were damaged.							
2000	08	NOV	06:59	7.05N	77.89W	17		5.8	6.3	PANAMA-COLOMBIA
			Two people were injured and 86 houses were damaged in the Jurado area.							
2000	10	NOV	20:10	36.61N	4.84E	33		5.8	5.5	NORTHERN ALGERIA
			Two people were killed and twelve people were injured.							
2000	16	NOV	04:54	3.96S	152.27E	33			8.1	NEW IRELAND, P.N.G
			A local tsunami was generated.							
2000	25	NOV	18:10	40.11N	49.96E	10		6.3	6.3	EASTERN CAUCASUS
			At least 26 people were killed.							
2000	05	DEC	17:11	39.69N	54.86E	33		6.7	7.4	TURKMENISTAN
2000	08	DEC	00:48	60.08N	4.94E	15	4.2			NORWEGIAN COAST
2000	08	DEC	05:54	59.94N	1.93E	10	4.6			NORTHERN NORTH SEA
2000	21	DEC	01:01	5.74S	151.13E	33		6.4	6.5	NEW BRITAIN, P.N.G

Issued by Bennett Simpson, British Geological Survey, January 2000

Forthcoming Events

7 March 2001
Probabilistic Safety Assessment in the Nuclear Industry,
4.30 pm Imperial College, Room 207.

28 March 2001
Probabilistic Safety Assessment in the Nuclear Industry,
Birchwood Conference Centre, Warrington, 9.30 am start.

25 April 2001
This Year's Earthquake

23 May 2001
The Mallet-Milne Lecture : James Jackson
"Living with Earthquakes: Know Your Faults"
5.30 pm ICE.

26 June 2001
Seismic Design and Composite Structures

31 October 2001
Soil Structure Interaction

28 November 2001
Human Excitation of Structures

30 January 2002
Seismic Qualification of Equipment by Experience Methods

Contents

SECED Newsletter

The SECED Newsletter is published quarterly. Contributions are welcome and manuscripts should be sent on a PC compatible disk or directly by Email. Copy typed on one side of the paper only is also acceptable.

Diagrams should be sharply defined and prepared in a form suitable for direct reproduction. Photographs should be high quality (black and white prints are preferred). Diagrams and photographs are only returned to the authors on request. Diagrams and pictures may also be sent by Email (GIF format is preferred).

Articles should be sent to:

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Queen's Building,
University Walk,
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SECED

SECED, The Society for Earthquake and Civil Engineering Dynamics, is the UK national section of the International and European Associations for Earthquake Engineering and is an affiliated society of the Institution of Civil Engineers.

It is also sponsored by the Institution of Mechanical Engineers, the Institution of Structural Engineers, and the Geophysical Society. The Society is also closely associated with the UK Earthquake Engineering Field Investigation Team. The objective of the Society is to promote co-operation in the advancement of knowledge in the fields of earthquake engineering and civil engineering dynamics including blast, impact and other vibration problems.

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