MEETING REPORT

23rd General Assembly, IUGG
32nd General Assembly, IASPEI
Sapporo, Japan
30 June – 11 July 2003

The 23rd General Assembly of IUGG and the 32nd General Assembly of IASPEI were held at Sapporo, Japan, from 30 June through 11 July 2003.

4,151 scientific participants attended the IUGG General Assembly, 658 of who were affiliated with IASPEI. 7121 abstracts were submitted of which 5137 were presented.

Opening Plenary Session
30 June 2003

Present: Prof. Brian L.N. Kennett (President) in the Chair and about XXX delegates and guests.

The President opened the meeting at 0830 and welcomed participants**.**

Presidential Report

"Many of you were present at the very successful Joint Assembly with IAGA in Hanoi in 2001. I would once again like to pass on our thanks to our Vietnamese hosts for the efforts that they expended to ensure the success of the meeting.

Since the 2001 Assembly the Bureau have sustained regular communication via e-mail and have made arrangements to meet in association with major scientific meetings. In 2002 the Bureau meeting was held before the EGS meeting in Nice and the Bureau again met (informally) at the EGU& AGU Joint meeting in Nice in April this year.

The Secretary General played a major role in an IASPEI sponsored Summer School in the Czech Republic in summer 2002 and we hope to see such Schools become a regular part of IASPEI activities. He was also able to take advantage of a vacation cruise to visit Santiago Chile in January and to provide very useful input to the local Organizing Committee for the 2005 Assembly.

Tragically Bob Engdahl suffered a major personal loss in May when his wife Eileen died whist they were visiting Norway. Despite this he has continued to work on behalf of the Association to ensure the smooth running of this Assembly. I would therefore like to express on behalf of the whole of IASPEI our condolences and thanks to Bob.

During our term this Bureau has worked to try to secure open release of waveform and other data from the International Monitoring System established under the Comprehensive Nuclear-Test-Ban Treaty. The President and First Vice-President made a presentation in Vienna in 2000 and we were pleased that Dr Gerardo Suarez the head of the IMS at CTBTO, Vienna was able to accept our invitation to give an IASPEI Association Lecture in Hanoi.

The First Vice-President - Prof Giardini – has recently become Chair of the Federation of Digital Seismograph Networks and has renewed the efforts on our behalf. The issue is in

many ways a political one and we would encourage you to lobby governments for access to this important resource.

Fortunately some progress has been made and there will be a special presentation following this Plenary by Dr Kebeasy, the head of the International Data Centre for CTBTO in Vienna on the release of IMS Bulletin information and its influence on location capability."

The President read aloud the following list of colleagues who have died since the last IASPEI General Assembly in 2001 and asked those present to take a few moments of silence in their memory.

Toshi Asada (Japan)
Aykut A. Barka (Turkey)
Guenter Bock (Germany)
Attia El-Sayed (Egypt)
John I. Ewing (USA)
Ronald W. Girdler (UK)
A.W. Brian Jacob (Ireland)
Thomas V. McEvilly (USA)
Gerhard Mueller (Germany)
Syun'ichir Omote (Japan)
Louis Pakiser, Jr. (USA)
Vladimir Ribaric (Slovenia)
Giuseppe Smriglio (Italy)
William Stauder (USA)

The President then announced the composition of the Nominations, Resolutions, and Audit Committees as follows:

Nominating Committee: Prof. C. Froidevaux (France, Co-Chair), Prof. B.L.N. Kennett (Australia, Co-Chair), Prof. T. Yagi (Japan), Prof. Chen, Yun-tai (China), Dr. G. Suarez (CTBO/Mexico) and Dr. K. Shedlock (USA)

Resolutions Committee: Prof. D. Giardini (Switzerland, Chair), Prof. T. Yagi (Japan) and Dr. R. Willemann (ISC/USA)

Proposed resolutions must be submitted to the Chairman of the Resolutions Committee no later than Monday afternoon of Week 2 (July 7)

Audit Committee: Dr. S. Gregersen (Denmark, Chair) and Prof. D. Jackson (USA)

Secretary-General's Statement

The Secretary-General welcomed the delegates and presented several business items.

The location of the Association office and facilities available were announced.

Conveners were informed of procedures to be used for updating their session schedules.

The availability of tickets for the IASPEI dinner on Wednesday evening of Week 2, immediately following the IASPEI Closing Plenary, was announced.

Opportunities to publish proceedings of IASPEI-led Symposia and Workshops were announced.

Procedures to be followed for obtaining grants were described.

Proposals for symposia and workshops at the 34th General Assembly of IASPEI to be held in Santiago, Chile, during October 2005 were invited. Commission chairs will meet with the Executive Committee and representatives of SEDI and SCL/ILP to develop a scientific program for the general assembly and the workshop to be held during the following week.

The Secretary-General announced the availability of free copies of the IASPEI Handbook and Manual of Observatory Practice to seismological institutions in developing countries.

The President closed the Opening Plenary at 0900.

Presidential Address

The Secretary General introduced the IASPEI President, Prof. Brian Kennett, who gave a 45-minute Presidential Address entitled "Integration of Source Modelling and Wave Propagation in the Understanding of Ground Motion".

Special Presentation

The Secretary General introduced Dr. R. Kebeasy who gave a 15-minute presentation on behalf of the IDC entitled "First Release of CTBO PrepCom Seismoacoustic Bulletins".

Scientific Program

Union Symposia

U5: Structure and Dynamics of the Earth's Interior (Conveners: B.L.N. Kennett and D. Gubbins)

This Union session on the Structure and Dynamics of the Earth's Interior was developed as an initiative between IASPEI and IAGA through SEDI. The session was well attended and the talks provided coverage of the Earth from the core outwards. The session began with a Union Lecture by Gary Glatzmaier on Modelling of the Earth's Dynamo and this was followed by David Price on The development of ab initio models for the properties of the Earth's Core. The next scheduled speaker, Bruce Buffet, was unable to leave the US because of visa problems and Brian Kennett provided a substitute paper on patterns of mantle heterogeneity. The original schedule was resumed with Thorne Lay's presentation of the nature of the structure and processes at the core mantle boundary. The last two talks addressed the issues of flow patterns in the mantle. Yoshio Fukao discussed the fate of subducted material pointing out the tendency for near horizontal structures in the transition zone or the upper part of the lower mantle. The final talk by Yanick Ricard provided a link to geochemical information through joint thermal and chemical convection models.

Inter-Association Symposia

JSS01: Hagiwara Symposium on Monitoring and Modeling of Earthquake and Volcanic Processes for Prediction (IASPEI, IAVCEI, IAG, IAGA)

This symposium reviewed the progress made in the earthquake and volcano prediction research in the past and address the promising directions in the future. In view of the broad

recognition, particularly in Japan, that not only monitoring but also modeling of the processes are essential for a sound development of the prediction research on a solid scientific foundation.

Ohtake presented what late Professor Hagiwara has accomplished for an earthquake prediction program in Japan. Most monitoring systems that he initiated have been almost completed recently with modern technologies. Current status of seismic and geodetic observational networks in Japan has been presented by three papers to give an idea of how the islands are densely covered by the state-of-art instrument in Japan. Studies based on the empirical relationships between background seismicity and a large earthquake, geochemical contents of ground water and a large earthquake were discussed. Ishihara and Ratdomopurbo discussed volcanic process based on monitoring data, and possibility and uncertainty in eruption forecasting at Sakurajima in Japan and Merap in Indonesia, respectively. Okada reviewed forecasting and evacuation in the 2000 Usu eruption and stressed the importance of communication among scientist, officials, mass media and local people in mitigation of volcanic hazards. Ishibashi discussed seismotectonic analysis of large earthquakes near Odawara, central Japan, for setting a target area of prediction research. Recent development of understanding of an earthquake cycle at subducting plate boundary and inland area of Japan was discussed with new seismic and GPS observations. Rundle demonstrated statistical mechanics approaches to modeling earthquake physics and dynamics. Weatherley presented results of numerical simulation of crustal faulting to discuss from a statistical point of view. Matsuura presented a physics-based predictive simulation model for crustal activity in and around Japan. Hirata summarized past and current earthquake prediction researches in Japan and suggested that a numerical simulation study would be an important ingredient of future prediction studies.

The leading convener, Kei Aki, summarized the symposium emphasizing that
(1) Close coupling of **monitoring** (observation) and **modeling** (theory) is essential for a sound scientific development.
(2) **Many models** that can generate a variety of scenarios are deeded to cope with the future course of complex nature.
(3) The concept of **master model** is useful for synthesizing the total view of the scientific community as well as for relaxing the social impact of individual models.

N. Hirata

JSS02: Recent Destructive Earthquakes (IASPEI, IAG)

A symposium on Recent Destructive Earthquakes was structured to have 20 oral and 9 poster presentations.

Studies were presented related to:
1. Chi Chi Earthquake, 1999, Taiwan,
2. Uglegorsk Earthquake, 2000, Sakhalin, Russia,
3. Bhuj Earthquke, 2001, India,
4. Mindinao Earthquake, 2002, Philippine Is.,
5. Changoureh/Avaj Earthquake,2002, Iran, and
6. Denali Fault Earthquake, 2002, U S A.

The Bhuj Earthquake of January 26, 2001 in western India was the deadliest, with over 20000 human lives lost. A variety of issues investigated included source parameters, aftershock studies, intensity surveys, gravity, geodetic, electrical conductivity, multifractal and wavelet approach to study aftershocks etc. Marine archaeological discoveries in

Cambay , dated 7500BC Are inferred to be related to sea level rise and past tectonic events like Jan 26 2001 earthquake.

Other important presentations dealt with tectonic loading of paleo-sutures and their relation with Stable Continental Region Earthquake ground coupled airwaves generated by destructive earthquakes, and cascading seismic activity as an approach to forecasting great earthquakes.

Harsh Gupta convened the symposium and M. Ghetanchi, and Harsh Gupta chaired the sessions.

H. Gupta

JSS03: Long-term In-Situ Ocean Observatories and Observations (IASPEI, IAG, IAGA, IAPSO, ION)

No report.

JSS04: Thermally Controlled Processes Within the Earth (IASPEI, IAVCEI, IAGA, IAPSO, IAMAS, IAHS)

The release of heat and thermally controlled processes are major driving forces of many processes, such as plate tectonics, mantle convection or generation of the magnetic field. Interactions with internal and external processes produce coupling between volcanism, atmosphere, hydrosphere and climate. Altogether 18 papers were presented in the session. Many interesting new results were presented, such as regional heat flow, heat production and rheological lithosphere analyses from several continents, a new heat flow data set measured in the immediate vicinity of the Kola super-deep well, application of mantle xenolith data for deep lithosphere studies, applying thermal isostasy for continental topography analysis, modelling of the density structure of Earth's core, application of the magnetic Curie depth calculations for temperature estimation in the crust, laboratory experiments and theoretical studies of thermal and seismic transport properties of rocks, and several studies on using subsurface thermal borehole logs and conductivity data for tracking fluid flow in the formation as well as using subsurface temperature data for revealing past ground temperature history. The session was organized under the auspices of the International Heat Flow Commission of IASPEI and the participants were partly supported by participation fee and travel grants by IUGG. A proceedings issue is planned together with the session JWS04.

I.T. Kukkonen

JSS05: Physics and Chemistry of Earth Materials (IASPEI, IAVCEI, IAGA, SEDI)

The program group (I. Jackson, T. Yagi and D. Dingwell) constructed a broadly inclusive call for papers for this symposium rather than attempting to prescribe any particular focus. There were no invited contributions. 37 abstracts were accepted for presentation and arranged into a one-and-a-half day program (3-4 July) comprising 23 scheduled 20 minute oral presentations and 14 posters. The papers selected for oral presentation were grouped into four ~ 2 hr sessions around each of the following unifying themes:

General mineralogy, mineral and rock physics
Mantle/core mineralogy and petrology
Elasticity and anelasticity
Deformation and viscous rheology

Before the program was finalised, confirmation of intention to attend the meeting was sought and received of each potential contributor to the oral program. However, during the month of June three speakers advised the Program Group and/or Local Organising Committee of their need to withdraw. Two of these withdrawn oral papers were replaced with papers previously intended for poster presentation. The last-notified withdrawal and two no-shows (Crampin and Mehrabian) left just three gaps in the schedule for the oral sessions – largely filled with overflow discussion. In addition two of the papers scheduled for poster presentation failed to materialise (Nakamura, Sharma).

Room 4 in venue A (Royton Sapporo Hotel) with a seating capacity of 80-100 accommodated the small but appreciative audience of 20-40 very comfortably and the support from local staff in the use of the projection facilities, microphones, lighting etc. was excellent.

The presentations were generally of a high standard and covered a broader disciplinary spread than would usually be encountered, for example, at an AGU meeting. Many participants commented favorably on the wider than normal disciplinary spread. It was also felt however, that given the scope and quality of the symposium, the audience was disappointingly small. Many potential participants, including junior staff and students from many Japanese Universities, cited the high cost of registration, accommodation and airfares as factors restricting attendance.

Finally, it is noted that there was a dismal attendance (2) at the meeting of the IASPEI/IAVCEI Commission on Physics and Chemistry of Earth Materials scheduled for Wednesday 2 July – prior to the commencement of the eponymous symposium. The main business of this Commission is the organization of suitable symposia at IUGG and IASPEI/IAVCEI meetings. It is therefore strongly recommended that future meetings of the Commission be scheduled within the scientific program of the most relevant symposium in order to capture more interest.

I. Jackson

JSS06: Earth Structure and Geodynamics (IASPEI, IAVCEI, IAG, IAGA, SEDI, ILP)

The JSS06 Symposium covered the general topic of "Earth Structure and Dynamics" and attracted a total of 101 accepted abstracts. It was divided into 5 oral sessions (53 presentations) and two poster sessions (48 posters). The sessions were organized according to the not always clear distinction between deep structure and dynamics (transition, deep mantle and core, 3 oral sessions and one poster session) and lithospheric structure and dynamics (2 oral sessions and one poster session).

The oral sessions were well attended, with, on average 30-50 people present. The size of the room was appropriate and there was no problem with any of the audio/visual equipment. Several talks were cancelled within two weeks before the meeting -we were able to replace most of those with scheduled oral presentations by moving poster presentations to oral. There were two instances of last minute "no show", one in the tuesday morning session and the other in the Thursday morning session. In the Thursday poster session, only half of the scheduled posters were presented, presumably because of the timing of this session towards the end of the conference and at the end of the JSS06 symposium. With few exceptions, the level of contributions to the JSS06 symposium was of more uniform quality than at the 2001 IASPEI meeting in Hanoi.

The transition and deep mantle structure sessions featured contributions from observational seismologists and geodynamicists (numerical modellers). Many seismological studies were presented on the lateral variations of structure in the upper mantle (including slabs), the mantle transition zone, the D" layer, and the outer core, using a variety of techniques: body wave travel times, surface waveforms, and converted and reflected body waves. Another focus was geodynamic modelling of mantle structures from the global to the regional scale. An emerging theme is that of large-scale electromagnetic mapping of mantle structures, with still relatively low resolution, but an indication of compatibility with seismic results. A recurring theme in both oral and poster presentations was the role of chemical versus thermal heterogeneity in characterizing the seismically observed upper mantle (as well as some lower mantle) discontinuities, in particular their depth variations, and the structure of flow in the mantle at the global scale. Another recurring theme was that of seismic anisotropy in the upper mantle and its relation to lithospheric structure. In this part of the symposium, there was more emphasis on subduction zone processes than on upwellings (i.e. plumes). Overall, there were only three presentations on inner core topics, of which two on inner core structure and one observation of Schlichter modes.

The lithospheric structure and dynamics sessions focused primarily on regional studies, using seismological modelling and observations as well as geodynamical modelling (rheology, with various constraints from geoid height, topography, GPS, heat flow and style of faulting) in several areas of the world: Uzbekistan, Afar region, Vrancea (Romania), W. Antarctica, Philippine Sea, Indonesia, Japan Islands and Tibet/China. Several presentations addressed the issue of thermal and anisotropic structure of the lithosphere and its relation to geological units. Interpretations of heterogeneities in terms of mantle plumes on the one hand and structure of subduction zones on the other were proposed.

B. Romanowicz

This part of the session covered geodynamical modeling and seismic and electromagnetic mapping of mantle structures from the global to the regional scale.

Tackley and Xie presented mantle convection models incorporating chemical differentiation and evolution of isotopic systems. The models tend to overestimate the lead isotopic model age and Tackley discussed various possible reasons for this. Steinberger and O'Connell used a simple model of conduit-type plumes imbedded into a global mantle circulation model driven by plate motion and tomographically inferred density anomalies. In order to explain the shape of the Hawaii-Emperor chain, relative motion between East and West Antarctica must be taken into account. Greff-Lefftz has studied the influence of mass redistributions in the mantle due to plume ascend on True Polar Wander. While the ascent of diapiric plumes causes only little polar wander, oscillatory motions of a mid-mantle compositional boundary ("super-plumes") would explain the magnitude of polar motion. Osmaston suggested that electromagnetic torques at the core-mantle boundary play a significant role for driving plate motion. Ismail-Zadeh et al. have modeled the Vrancea subduction region (Romania) based on seismic tomography results and show that the stress distribution in the model explains the pattern of intermediate-depth seismicity. Weidle and Widiyantoro used results from the Vrancea seismic array, imbedded into a global seismic tomography model, to enhance the regional resolution and find that the can resolve the Vrancea slab to 280 km depth. Utilizing submarine cables, Koyama et al. have calculated a 3-D model of the electrical conductivity structure in the North Pacific. They find a moderate correlation of conductivity anomalies and seismic anomalies and explain the conductivity structure by temperature contrast on the order of 200° and variation in water content. Seismic anisotropy was addressed in four talks. Panning and Romanowicz modeled waveforms of S-multiples using a normal mode approach to determine the degree of radial anisotropy in the mantle. Anisotropy in D" in particular is correlated with superplume

structures. Gung and Romanowicz calculated a global S-velocity model including radial anisotropy based on waveform inversion. They find that differences between published S-models in the upper mantle are due to anisotropy. S_H anomalies under continental shield extend deeper than S_V anomalies and high S_H-velocities below 300 km are interpreted as shear-induced preferred orientation rather than a deep tectosphere. Debayle et al. used an automated waveform analysis of Rayleigh waves for mapping upper mantle S-wave structure. Including overtones is important to resolve structure down to 400 km. They find good correlation with structures determined by regional body-wave tomography, for example for the Eifel region. Azimuthal anisotropy is strong near 100 km depth but becomes weak at 200 km. Plomerova and Babuska discussed seismic results on lithospheric structure in Europe. From the TOR experiment different pattern of anisotropy are found for the Baltic shield and Central Europe. Here dipping anisotropic structures with sharp boundaries are interpreted as frozen-in fabric that predates the collection of terranes that formed Europe.

U. Christensen

JSS07: Tsunamis: Their Science, Engineering and Hazard Mitigation (IASPEI, IAVCEI, IAPSO),

The Inter-Association Symposium JSS07 "Tsunami Science, Engineering and Hazard Mitigation" was held on July 8 and 9, 2003 in the Room 2 of Site A (Royton Hotel). All together 55 participants from 10 countries presented 68 papers in four oral and two poster sessions. All sessions were well attended with about 60-70 people on average in the room.

Presentations covered the wide spectrum of tsunami research and investigations conducting in different countries. They can be divided into the following thematic groups:

Study of Historical Cases of Tsunamis (15 papers)
Tsunami Generation and Seismotectonics (15 papers)
Physical and Numerical Modeling of Tsunamis (8 papers)
Geological Methods of Tracing Paleotsunamis (10 papers)
New Instrumentation for Tsunami Monitoring (7 papers)
Tsunami Mitigation and Hazard Reduction (8 papers)
Problems of Operational Tsunami Warning (5 papers)

In the first day one of the key papers was presented by E. Bernard (USA) who summarized activities of the US tsunami mitigation program during the past two years. Bernard reported that the program had received a $2M increase in funding in 2003 to accelerate the production of inundation maps, to sustain tsunami mitigation programs in the states of Alaska, California, Hawaii, Oregon, and Washington, and to increase the number of deep ocean detection buoys in the Pacific. He also reported that Chile had purchased a deep ocean buoy for deployment off the Chilean coast.

One of the most interesting papers was presented by E. Okal (USA) who reported on discriminants allowing the identification of tsunami sources as seismic dislocations or underwater landslides, based on robust observables: in the far-field, the existence of narrow lobes of strong azimuthal directivity is characteristic of generation by a dislocation, whereas in the near field, the aspect ratio of the distribution of run-up along the coast requires generation by a landslide when it exceeds a value related to the maximum strain allowable in crustal rocks.

Three papers (presented by V. Gusiakov, Russia, G. Downes, New Zealand and by P. Dunbar, USA) reported the recent progress in historical tsunami database compilation. Availability of the comprehensive historical catalogs is very important for correct

assessment of the long-term tsunami hazard for any costal location and for elaboration of mitigation strategy.

Among the papers related to numerical tsunami modeling, we should highlight the presentation by V.Titov (USA) where supreme numerical models and state-of-the-art animation technique were used for the modeling of trans-Pacific propagation of Alaskian tsunamis. This numerical study was conducted in an effort to develop tsunami-forecasting tools complementing the DART (deep ocean tsunami detection) project of PMEL. A set of tsunami simulation scenarios was designed to form a model-result database that can be used for the offshore tsunami forecasting.

Several papers presented by Japanese, Russian and Portuguese researches were devoted to the study of geological traces of paleotsunamis. This is a powerful method allowing to extend the observational data set beyond the relatively short historical period and thus provide more reliable estimates for the long-term tsunami risk for particular sites on the Pacific and the Mediterranean coast. Paper presented by K.Satake (Japan) reported Holocene tsunami deposits along the Kuril trench that show characteristic features very different from historic earthquakes. The recurrence interval is about 500 years and inundation is about 4 km from the coastline, both are much larger than those of regular interplate earthquakes. Their modeling indicates that multi-segment rupture of interplate earthquake reproduces such unusual tsunamis on the Pacific coast of Hokkaido.

V. Gusiakov

Inter-Association Workshops

JWS01: Is Short-Term Earthquake Prediction Possible? (IASPEI, IAG, IAGA, IAVCEI)

No report.

JWS04: Subsurface Thermal Signatures of Tectonics, Hydrogeology and Palaeoclimate (IASPEI, IAVCEI, IAGA, IAPSO, IAMAS, IAHS)

Understanding shallow thermal regimes can contribute to a variety of geophysical, geological, hydrogeological and environmental problems. The JWS04 session completed a number of disciplinary results obtained either from field experiments or modeling studies, which demonstrated practical use of precise temperature measurements in subsurface environments. The following fields of research were discussed

1. Studies of climate related changes in the subsurface temperature field;
2. Thermal signatures of tectonic processes such as subduction and associated processes;
3. Thermal signatures of subsurface fluid flow and methods to quantify their size; and
4. Temperature and groundwater level changes as indicators of stress field associated with earthquake events.

Conveners are;

Makoto Taniguchi (Research Institute for Humanity and Nature, Japan), Vladimir Cermak (Geophysical Inst., Czech Academy of Sciences, Czech Republic), and Christoph Clauser (Applied Geophysics, Aachen Univ. of Technology (RWTH), Germany)

Thirteen oral presentations and twenty-two poster presentations were delivered and widely discussed on July 4, 2003. Many useful discussion and comments were made through both

oral and poster sessions. We plan to prepare a special issue of the international journal together with JSS04.

M. Taniguchi

Association Symposia

SS01: Seismological Observation and Interpretation

The SS01 sessions had 179 contributions of which 6 were cancelled before the start of the meeting and 67 did not show up. There were 123 posters and 56 talks. Of the no-shows, 55 were posters, seems like poster presenters are less likely to show up? The general quality of the contributions was high with many interesting new results, particularly from Japan.

The contributions were grouped into various topics of which seismicity was by far the largest.

Seismicity and tectonics - Being in Japan, there were naturally many Japanese contributions, which almost entirely focused on problems related to subduction zones. It was well illustrated that Japan has one of the densest networks in the world, which obviously has opened many possibilities for advanced research. Several detailed seismicity studies showed very detailed mapping of the subduction zones.

Source parameters and source zones - Good sessions on the detailed study of the rupture processes illustrated through methods like detailed crustal structure, tomography, seismicity patterns and moment tensor solutions for small events. Some studies were working on the stress patterns in subduction zones. There were nice contributions showing the use of local dense arrays to study the detailed rupture processes.

Attenuation and scattering - Again the Japanese contributions were very strong with some interesting contributions showing how details in the coda decay curves can be used to determine localized scatters. There were also several borehole studies, which particularly looked into the high frequency nature of small events and which thereby could get a good estimation of near surface attenuation.

Magnitude - This session was mostly related to the WG dealing with magnitudes and dealt with several topics for magnitudes in the range –2 to 8. The main topic was how to standardize the measurement of magnitude parameters in order to get consistent magnitudes. However other magnitude topics were illustrated like a new method to use coda amplitudes to get a source radiation independent magnitude.

Earthquake location and processing - This sessions were also related to WG's working on location and standard phase names. It partly dealt with how to improve locations without using 3D models. New advances with double difference technique and the use of ground truth events demonstrated these possibilities. The WG on phase names have reached a conclusion and presented the new set of standardized phase names. The major data centers presented their processing methods and there were a few contributions comparing results from different centers using different processing methods.

Other topics - There were some presentations on new instrument development and a few on crustal studies, which mostly dealt with the structure fault zones. An interesting technique is the use of fault zone trapped waves to get the fault structure.

J. Havskov

SS02: Seismic Sources: Modeling and Prediction

This symposium was organized as part of the scientific mission of the Commission on Earthquake Sources: Prediction and Modeling. The earthquake process is governed by not only nonlinear physics of the constitutive law but also local properties of seismogenic environments, and there is some evidence that large earthquakes may be predictable though no clear methodology has been established. In the symposium, therefore, focus was placed primarily on understanding the generation process of earthquakes in terms of the underlying physics and geological fault structure/heterogeneity, and on building a comprehensive and integrated picture of the physical and chemical processes leading up to large earthquakes, the dynamic propagation, and arrest of ruptures. We thereby aimed at constructing physical models of the earthquake generation process with the long-term goal of developing a rational method of predicting large earthquakes as well as predicting the strong ground motion expected from such earthquakes. Multidisciplinary approaches are essential to this end, and this symposium was intended to provide a forum for this, where scientists in different disciplines such as seismology, crustal deformation dynamics, structural geology, and laboratory rock physics got together to discuss any aspects of earthquake generation, seismogenic zone property/structure, physical modeling, and prediction methodology. Response to the symposium was high and well received, though symposia/workshops on similar topics were concurrently organized. The total of 132 papers were submitted to this symposium. Of these, 55 papers were presented in oral session, and the rest of the papers were presented in poster session. The oral session was held on July 2 and 3 (full two days), and the poster session was held in the morning on July 4 (a half-day). The topics presented and discussed in the symposium were widely ranged from the constitutive law for earthquake ruptures and the physical scaling law, to analysis of the rupture history of large earthquakes, deformation modeling of seismogenic zones, evolution of seismicity and stress transfer, the effect of earth tides on seismicity, characterization of brittle-plastic transition zone, estimates of constitutive law parameters, fracture energy, seismic efficiency, frictional heat, fault zone structure, and to earthquake rupture simulation and forecasting models on earthquakes.

M. Ohnaka

SS03: Tectonophysics and Crustal Structure

Highlights (Monday AM session only):
- The 3-D fault zone structure can be inferred also with the help of deep borehole drilling into the fault zone, allowing to pinpoint exactly earthquake locations.
- Precise relocation of seismicity allows one to better relate it to active tectonics information.
- 3-D shear-wave velocity model of the Aegean from inversion of Rayleigh waves confirmed a LVL in the upper crust and a mantle wedge above the Aegean subduction zone.
- Offshore reflection studies using dense OBS linear arrays permit a detailed imaging of the thinned crust below important tectonic basins.
- Combined refraction and reflection data analysis of Hokkaido Hidaka collision zone led to the discovery of a deep crustal wedge above the subducting plate and the deformed Japan lithosphere.
- The crustal structure of central Japan around ISTL is better estimated using refraction and wide-angle reflection data
- Bulk-sound and shear wave-speed velocity provide different imaging of subducting slabs. This seems to be related to the age of the ocean lithosphere.
- Extensive international collaboration (e.g. French-Japanese-Turkish collaboration in the Marmara Sea) has led to much better crustal structure models, also by means of OBS sensors deployment.

P. Suhadolc

SS04: Strong Ground Motion, Earthquake Hazard and Risk

The study on earthquake hazard and risk is not only an important research topic in seismology but also a critical issue in the preparedness, mitigation and management of earthquake disasters that could be fruitfully used by decision-makers for the social community. Since recent years, the studies related to earthquake hazard, risk and strong ground motion have attracted increasing attention among seismologists and earthquake engineers. Before the Assembly, some 150 abstracts were submitted to SS04 session. After the exchange with SW04 as well as other sessions, 100 poster presentations and 61 oral presentations were arranged within the SS04 framework. Unfortunately, the sudden outbreak of SARS in some countries/regions after the final determination of the session schedule caused quite a few unexpected absences and some inconveniences in the organization. As a result, 35 oral presentations and 66 posters were presented during the oral sessions from July 7 a.m. to July 9 a.m. and the poster sessions of July 9 p.m. and July 10 p.m., respectively. Y. T. Chen, Z.-F. Ding, K. Kudo, K. Irikura, I. Parvez, V. Rastogi, F. Romanelli, P. Suhadolc, and Z. L. Wu chaired the session discussions.

The presentations and discussions focused on three topics: (1) Observation, simulation and prediction of strong ground motion; (2) Study of seismic source, structure, and effects of site geology; (3) Earthquake zonation, seismic activity, engineering, and other related topics. Two invited presentations were arranged during the meeting. The invited talk by Prof. K. Kudo from Tokyo University introduced to the detection of shallow-layer S-wave velocity structure by array observations of micro-tremors, a prospective technique with significant potentials for detecting blind faults and increasing the spatial resolution of seismic zonation. The invited presentation by Prof. G. F. Panza and his colleagues in University of Trieste, Italy, presented by Dr. F. Romanelli, gave a comprehensive review of the relation between deterministic modeling of strong ground motion and probabilistic estimation of earthquake hazard, and the relation between seismological studies and engineering applications (e.g., the importance of realistic seismic input definition for dynamical analyses).

Observation, simulation and prediction of strong ground motions played the central part in the discussions. It was widely accepted among the participants that dynamic source process, structure heterogeneity, and site response are critical factors to be considered in the simulation and prediction of strong ground motions. Such characteristics are site dependent and need detailed studies oriented to specific regions. During the 4 days meeting, rich results were reported, dealing with a variety of regions including Alps-Mediterranean, Beijing, California, Canada, Greece, India and Himalayas, Iran, Italy, Japan, South Africa, Syria, Taiwan, and Turkey, among others. New zonation maps for several regions based on either probabilistic approach or deterministic modeling were presented. Algorithms for 3-D simulation of strong ground motions based on scenario earthquakes attracted much attention among the participants. Japanese colleagues from Tokyo University reported the simulation results using ‘Earth Simulator’, a high performance parallel computational system aimed at the simulation of Earth processes including seismic strong ground motion. The K-net and KiK-net, densely deployed seismological and/or strong motion network over the whole territory of Japan, have obtained impressive observational results. Comparison between synthetic results and observational data shows promise in this research field. The H/V method has long been a practical and meanwhile a controversial issue in engineering seismology. Using finite-difference algorithm, seismic noise was simulated, shedding light onto the effect of source types and of surface wave modes on the result of H/V estimation, showing the potential of seismological studies for solving practical engineering problems. Investigation into the interaction between city constructions and underground Earth-

structures provides a new look at seismic strong motions and earthquake disasters. French colleagues reported new results of site-city interaction, using numerical computation and laboratory experiment to listen to the 'dialogue' between underground Earth structure and city constructions through seismic waves.

To encourage the participation of young scientists and students in the study of seismic hazard and risk, a student session is organized, with 8 presentations arranged before the meeting, and two students, one from India and one from Japan, invited to be the session convenors. This student session is regarded as being useful for attracting young people to the study of earthquake and engineering seismology, although the unexpected outbreak of SARS prevented 5 participants from coming to the meeting, and in turn prevented the session from being conducted as successfully as expected.

As a sister session of SS04, SW04 (Earthquakes and Mega-cities) had 23 submissions before the Assembly. After transferring 8 poster presentations to SS04, 15 oral presentations were arranged, with 9 presentations shown up during the workshop. Studies of recent devastating earthquakes were reported, which includes the 2001 Gujarat, India and the 2001 Kunlunshan, China, ones. D. Benouar showed to the audience a set of pictures, illustrating the damages to buildings occurred in Algiers, due to the very recent 2003 Algeria event. Studies on the micro-zonations dealt with several cities, such as Damascus, Istanbul, and Osaka. Y. T. Chen, K. Irikura and F. Romanelli chaired the workshop.

After discussions with President Prof. Bob Engdahl and Secretary General Prof. Peter Suhadolc after the meeting, proceedings of the session will be organized and published by the Seismological Press in Beijing. The deadline for submitting full papers is December 1, 2003 and with finalized publication planned before July 2004. The volume could be distributed at the IASPEI-related meetings, as for example the ASC Assembly in Yerevan in 2004.

Wu, Zhongliang

SS05: Education and Outreach (SS05)

Association Workshops

SW03: Lithospheric Structure of a Supercontinent: Gondwana

The SW03 oral session was held on Thursday, July 10, as one of the special workshops of IASPEI. There were eleven oral presentations related to the field of lithospheric structure and tectonics of the past supercontinent: Gondwana. Exploration of the continental lithosphere by deep seismic profiling has been limited largely to the northern hemisphere. Most of the other unexplored continental segments in the southern hemisphere that once were the fragments of the Gondwana, such as Africa, South America, India and Antarctica, however, remain terra incognita in terms of high resolution imaging with the exception of Australia. During the discussions in the SW03 session, we were able to identify the outstanding scientific targets that have direct relevance to LEGENDS initiative.

Our session was focused on the lithospheric structure of the continental fragments of Gondwanaland in relation to amalgamation/break-up. The session was well organized in spite of the absence of one of the four presiding chairs.

The first talk was an invited one. Dr. R. Clowes from BCU, Canada, as former director of Canadian deep seismic program (LITHOPROBE), has presented a talk entitled "Proterozoic prism arrests suspect terranes: Insights into the ancient Cordilleran margin of Canada from

seismic reflection profiling". He gave an excellent exposition of interesting results involving continental evolution of the Laurentia shield from the Archaean age to the present.

There were six contributions from Indian scientists on the deep structure and tectonics of Indian continent by deep seismics (DSS) and other geophysical studies. As for East Antarctica, there was one talk on deep seismic surveys in the Enderby Land (SEAL) by Japanese. There was also a talk relating to the deformation process of the Pan-African lithosphere. As for East Africa, there was a contribution on seismicity around Uganda. There were two interesting presentations relating to passive teleseismic receiver function studies around the Kaapvaal craton, South Africa and geophysical/geological approaches to delineate the architecture and evolution of lithosphere.

At the end of the session detailed discussions were carried out about the future plans for the deep seismic profiling crossing the Southern India, Sri Lanka, Madagascar, East Africa and East Antarctica (LEGENDS). We had fruitful discussions about the survey lines, logistic constraints and strategies for implementing project programs.

In addition to the oral session, in the morning of July 10, a related poster session was held. Nine posters from Japanese Antarctic program, Indian deep surveys researchers and from other places have been displayed. Fruitful discussions between participants have helped in strengthening the scientific bondage.

M. Kanao

SW04: Effects of Earthquakes on Megacities (ILP)

See SS04 report.

SW05: New Technologies and Geophysical Data Challenges

14 oral reports and 6 posters were presented on the Workshop. Key problems discussed included

- Management of data collections;
- Tools for geodata analysis and modeling of non-linear Earth processes;
- Multidisciplinary monitoring of seismicity;
- Software for seismo-engineering applications.

The summary of presentations is the following.

Technologies of remote data management developed intensively. These technologies include tools for effective search of information in the INTERNET, GIS-oriented data management and GIS-oriented data interpretation. Nevertheless most of reported solutions strongly depend on the progress in communication facilities and follow the progress in this field.

Cosmic geodesy data in combination with data on seismicity, source mechanisms, faults, etc. are required by researchers today. GIS-oriented information system managing these data sets started developing.

A new strategy of geophysical monitoring in seismoactive areas directed toward medium-term earthquake prediction has advanced and information technologies are an important component of this strategy. In particular, the technique based on the interactive evolutionary computations provides the inclusion of qualitative expertise within a rigorous mathematical inversion scheme. The approach is particularly effective in the case of highly non-linear interactions between model parameters. The tools for analysis of seismicity variations based on RTL algorithm were developed and applied to the intermediate-term

prediction of large Kamchatka earthquakes. A real-time seismic information system is developed in Japan for the purpose of providing estimated seismic parameters to prescribed users concerned with seismic risk reduction. Contents of information to be issued include seismic focal parameters (several seconds after seismic signal detection to the nearest site), seismic fault plane solutions (about 10 – 20 seconds), and aftershock activity (several minutes – a few days). The parameters are revised successively as seismic signals are received at a large number of sites.

Y. Tyupkin

Other Meetings

Union & Inter-Association Commissions, Committees and Working Groups

Committee for Studies of the Earth's Deep Interior (SEDI)

International Lithosphere Program (SCL/ILP)

SCL/ILP Global Earthquake Potential Project

IASPEI/IAVCEI Commission on Volcano Seismology

IASPEI/IAVCEI Commission on Physics and Chemistry of Earth Materials

IASPEI/IAPSO/IAVCEI Commission on Tsunamis

IASPEI/IAVCEI Working Group on Subduction Zones Located in Developing Countries

International Heat Flow Commission

Association Commissions

Commission on Earthquake Sources - Prediction and Modelling

Commission on Seismological Observation and Interpretation (CoSOI)

Commission on Tectonophysics and Crustal Structure

Commission on Earth Structure and Geodynamics

Commission on Earthquake Hazard, Risk and Strong Ground Motion (SHR)

Commission on Education and Outreach

European Seismological Commission (ESC)

Asian Seismological Commission (ASC)

Federation of Digital broadband Seismograph Networks (FDSN)

International Ocean Network (ION)

Association Task Groups and Working Groups

Task Group for Seismic Imaging of the Lithosphere

Task Group on Scattering and Heterogeneity

Working Group on Magnitude Measurements

Working Group on Standard Phase Names

IASPEI/IIEES Joint Working Group on the Effects of Surface Geology

Closing Plenary Session
9 July 2003

Present: Prof. Brian L.N. Kennett (President) in the Chair and about XXX delegates and guests.

The President opened the meeting at 1800 and welcomed participants.

President's Report

"Ladies and Gentlemen, thank you for coming to Sapporo and welcome to the Closing Plenary of IASPEI. In order to catch the buses to the IASPEI Dinner we have to be brief, but I hope that the Plenary will not be rushed.

The past four years has seen a successful Joint Association Assembly with IAGA in Hanoi Vietnam and a reinforcement of seismological links with SEDI. The revised IASPEI Commission structure, aligned with the major themes used for planning our assemblies is now in place and I hope will flourish in the years ahead.

Our Opening Plenary was rather early in the program for this Assembly and since attendance was limited I will arrange for my Presidential Address to be posted on the IASPEI web site (www.iaspei.org). This site has been redesigned and we have tried to ensure that as much information as possible is available through this means.

This meeting marks the statutory limitation of 12 years on Bob Engdahl's term as Secretary General and I would ask every one to give him a round of applause for his unstinting efforts on behalf of IASPEI. The success of our meetings owe much to his efforts,

The science of IASPEI is your hands and can be clearly seen in the sessions here in Sapporo. Our specialties continue to develop, but there are increasing and encouraging signs of willingness for cooperative and interdisciplinary studies. I hope that such synthesis, e.g. in the links between studies of sources and 3-D structure, can be fostered and encouraged by IASPEI now and into the future."

Financial Statement and Discharge of Accounts

Dr. E.R. Engdahl (Treasurer) presented the Association's Accounts and Financial Report for the period 1999-2002. He noted that major sources of income during this period were IUGG Allocations (US$111K), Grants & Contracts (US$128K), and Sales of Publications (US$31K). Major expenditures were Administration (US$43K), as well as General Assemblies and other scientific meetings (US$222K). Investments and Reserves, as well as the Doornbos Fund that is managed by IASPEI, were maintained at recommended levels.

Dr. S. Gregersen, Chairman of the Audit Committee, then gave a brief report.

"We have examined the accounts presented by the treasurer for the period 1999 to 2002 and the statement by the professional auditor. We accept the auditor's statement that in her opinion the accounts represent fairly the transactions of IASPEI and its financial status. We have interviewed the treasurer about the oscillations in expenses following the 2-year cycle of IASPEI meetings, about several one-time income items, and about the Doornbos Fund. And we have found all the explanations fully satisfactory. We note that the operation of IASPEI is managed with a small percentage of the available funds, and that the dominating expenses are for assemblies and other scientific meetings with a large emphasis on travel grants. We consider the finances of IASPEI to be in a healthy state with a level of reserves of the order of one years expenses being satisfactory. We give the treasurer discharge for the accounts for the period 1999-2002."

Union Activities

The President reported on the results of the IUGG elections. The IUGG officers for the period 2003-2007 are President - Uri Shamir (Israel), Vice-President - Tom Beer (Australia), Secretary General - JoAnn Joselyn (USA) and Treasurer - Aksel Hansen (Denmark). The Bureau Members are Yun-tai Chen (China), Harsh Gupta (India) and Ali Abdel-Adim Ahmed Tealab (Egypt).

The venue for the next IUGG General Assembly will be Perugia, Italy.

Future Activities and Assemblies

SEDI 2004 (Garmisch-Partenkirchen, Germany)

IASPEI/IAG 2004 Workshop on Deformation Measurements and Understanding Natural Hazards in Developing Countries

IASPEI 2005 General Assembly (Santiago, Chile)

IASPEI/IAVCEI/IAG/IAGA 2006 Workshop on Volcano Geophysics

IUGG 2007 General Assembly (Perugia, Italy)

IASPEI 2009 General Assembly (Invitations will be accepted)

Election of Officers for 2003-2007

Prof. B.L.N. Kennett, Co-Chairman of the Nominating Committee, explained the criteria by which the Nominating Committee chose candidates, and proposed a slate of officers. There were no further nominations from the floor and the following officers were accepted by acclamation:

IASPEI Executive Committee:
President: E. Robert Engdahl (USA)
First Vice-President: Wu, Zhongliang (China)
Second Vice-President: Greg Houseman (UK)
Secretary-General/Treasurer: Peter Suhadolc (Italy)
Diana Comte (Chile)
Uli Christensen (Germany)
Ian Jackson (Australia)
Kiyoshi Suyehiro (Japan)

Past President: Brian L.N. Kennett (Australia)

Resolutions

Prof. B.L.N. Kennett, on behalf of Prof. D. Giardini, (Chairman of the Resolutions Committee) read aloud the proposed resolutions. The resolutions were unanimously adopted without change as given below.

The President closed the meeting at 1930

IASPEI Resolutions Adopted
32nd General Assembly
Sapporo, Japan
9 July 2003

1. IASPEI

   RECOGNIZING the increased detection capabilities of modern seismic networks and the new Earth models,

   ADOPTS the new list of standard seismic phase names approved by the Commission on Seismological Observation and Interpretation,

   RECOMMENDS that all scientists, seismic observatories and the seismological community adopt and use the new standard seismic phase names.

2. IASPEI

   RECOGNIZING the decision of the Preparatory Commission of the CTBT to share data from the Reviewed Event Bulleting (REB) with the International Seismological Centre (ISC).

   NOTES the utility of these data in improving the completeness of the global summary of earthquakes in the ISC Bulletin, especially in otherwise poorly monitored regions, and in providing quality control on other bulletins,

   ENCOURAGES the Preparatory Commission for the CTBT to continue and expedite the release of REB data and authorize the release of the accompanying waveform data.

3. IASPEI

   RECOGNIZING the need to accurately locate earthquakes and determine earthquake size, and compile complete earthquake bulletins,

   URGES all operators of seismic stations and networks to deposit unique station codes with the international registry maintained by the International Seismological Centre and by the World Data Centre for Seismology, Denver, and to freely share the coordinates of all seismic stations,

   URGES all operators of seismic stations and networks to keep accurate record of instrument response and performance.

4. APPRECIATION

   Recognizing the effort required to organize the General Assembly, IASPEI thanks and congratulates the members of the Local Organizing Committee for a successful and most memorable meeting.