



## ASC2010 SCIENTIFIC PROGRAM

### Preamble

The ASC Bureau has decided to adopt a program framework, which is based on linking together into the following sessions:

### Plenary;

- Seismological Observation and Interpretation;
- Nature of Seismic Sources and Prediction of Earthquakes;
- Strong Ground Motion, Earthquake Hazard and Risk;
- Earth Structure and Geodynamics;
- Seismotectonics;
- Physics and Chemistry of Earth Materials; and Thermal Studies;
- Education and Outreach.

For each theme a program group, including where possible a member of the ASC Executive Committee as chair was assigned to develop theme scopes and suggested topics. After abstracts are submitted each program group also will act as a screening committee to assign submitted papers to invited lectures or report in the plenary sessions.

### S1. Plenary

1. Opening
2. Invited reports and lectures
3. Closing Ceremony

**Conveners:** - **Prof. Harsh Gupta** (India): [harshgupta@nic.in](mailto:harshgupta@nic.in);  
- **Prof. Kazuro Hirahara** (Japan) : [hirahara@kugi.kyoto-u.ac.jp](mailto:hirahara@kugi.kyoto-u.ac.jp);  
- **Prof. R.K. Chadha** (India) : [chadha@ngri.res.in](mailto:chadha@ngri.res.in);  
- **Prof. Cao Dinh Trieu** (Vietnam): [vag-sec@fpt.vn](mailto:vag-sec@fpt.vn)

### S2. Seismological Observation and Interpretation

The essence of seismology lies in the observation and interpretation of earthquake-generated ground motion, together with effective data distribution and analysis. We now have a worldwide system of seismograph station supplemented by diverse developments of portable instrumentation. There is a continuing need to improve mechanisms for the archiving, dissemination and analysis of these data for the benefit of all researchers and users of seismological information. The classes of information that are extracted from seismograms need to be reviewed and expanded so as to provide the best possible processing in as timely a fashion as possible. The real Earth varies in three -dimensions and is anisotropic in part. Thus methods for seismogram interpretation need to make account of the complexities which are revealed in the currently available high quality data. The development of seismic modeling and interpretation problems in complex, interrelated earth structures requires intensive computation and has benefited greatly from advances in computer technology. Methods for data inversion are increasingly escaping from the constraints of local linearization and also exploit the power of

parallel computer technology. Contributions are invited for all aspects of the collection, analysis and interpretation of seismological data including:

1. Developments in seismic networks and data centers-including land, ocean-bottom and planetary networks, multi-parameter observations, early warning system, large scale portable networks, international data exchange, management of massive data sets.
2. Comprehensive seismogram analysis at single stations, seismic networks and arrays-requirements, potentials and future developments.
3. Rapid and routine determination of earthquake parameters including location and source character, particularly in the context of verification and detection associated with the Comprehensive Nuclear-Test-Ban Treaty (CTBT).
4. Advances in wave propagation in heterogeneous media, including synthetic seismograms and waveform modeling in realistic Earth structures, theory and observations of scattering, attenuation and anisotropy.
5. Developments in seismological interpretation, including development of inversion techniques, seismic tomography and whole-earth analysis methods.

**Conveners:** - **Prof. Zhu Chuanzhen** (China): [zhucz@cea.igp.ac.cn](mailto:zhucz@cea.igp.ac.cn);  
- **Dr. Sumalee Prachuab** (Thailand): [sumalee\\_tmd@yahoo.com](mailto:sumalee_tmd@yahoo.com);  
- **Prof. Ding Zhifeng** (China): [ding@cdsn.org.cn](mailto:ding@cdsn.org.cn);

### **S3. Nature of Seismic Sources and Prediction of Earthquakes**

Recent theoretical work, laboratory experiments and seismological observations have brought us closer to the long term goal of understanding the nature of seismic sources and to the construction of a quantitative physical model for the entire earthquake process, including tectonic stress accumulation, nucleation of rupture, and the dynamics of the subsequent rupture propagation and cessation. At the same time, "earthquake prediction" is being discussed and examined critically; it seems that there is suitable data for the prediction of earthquakes, but only a few predictions have been correctly made. Therefore, questions have been raised whether earthquake prediction is at all possible. The aim of this session is to discuss these problems from an experimental and theoretical point of view in order to better understand the physics that govern faulting process and how it can interact with the ability of some regions to present some foreshock patterns.

Papers are invited for this session on several aspects of seismic sources and earthquake prediction. The following topics are of high interest:

1. Review of earthquake prediction research
2. The generation process for major earthquakes and precursory phenomena
3. Probability models for earthquake forecasting and their application to local and global catalogues
4. The physics of crustal transients and preparatory process to earthquake ruptures
5. Testing the performance of algorithms to predict earthquakes;
6. Tsunamis: Case studies, warning system and hazard assessment.

**Conveners:** - **Prof. Gary Gibson** (Australia): [garyg@esands.com](mailto:garyg@esands.com), [gary@seis.com.au](mailto:gary@seis.com.au);  
- **Prof. D. Rhoades** (New-Zealand): [d.rhoades@gns.cri.nz](mailto:d.rhoades@gns.cri.nz);  
- **Prof. Kunihiko Shimazaki** (Japan): [nikosh@eri.u-tokyo.ac.jp](mailto:nikosh@eri.u-tokyo.ac.jp);

## **S4. Strong Ground Motion, Earthquake Hazard and Risk**

(for Regional scales and for Mega cities)

The advancement of methods to estimate seismic hazard or risk and the evaluation of proposed methodologies are being pursued actively in many countries that experience damaging earthquakes. This effort has resulted in a significant expansion of fundamental knowledge in hazard analysis, the behavior of structural systems during earthquakes, and the socio-economic impacts and countermeasures. Hazard analysis requires characterization of the seismic sources that can be expected to affect a selected place in terms of locations, magnitudes, and frequency of occurrence of potentially damaging earthquake. Knowledge of the attenuation of ground motion or seismic intensity with distance from the source to the site, integrated whenever possible with realistic modeling of seismic wave propagation, and knowledge of the local geology for site-specific assessment will promote this analysis to much extent. Risk analysis yields probabilistic estimates of the losses of property and lives from earthquakes to be expected at a site. It is essentially a convolution of the hazard estimates and vulnerabilities of structures, facilities, and people distributed over the site. Among the tasks is the development of new correlation functions between ground motion parameters and structural damage. The ultimate goal is to develop seismic hazard, structural vulnerability, and damage cost functions expressed in terms of instrument measures of ground motion, such as peak accelerations, velocities or values of response spectra at selected frequencies, or to make clear the seismological reasons that make such a goal inaccessible. Attenuation versus distance relations vary strongly from region to region, making on-site observation and deterministic modeling justification necessary in the assessment of seismic hazard. Current work also includes estimating both linear and nonlinear site-response effects, determining spatial variations from array data, and using realistic numerical simulation to take action, whenever possible, before an earthquake. Advanced geo-information technologies such as GIS and remote sensing are also being exploited for earthquake hazard and risk assessment. In recent years observation of strong ground motion, especially broadband digital observation has been providing valuable data leading to some new understanding of the nature of ground motion and seismic disaster. Input of paleo-seismological information into seismic hazard assessment and introduction of quantitative seismological modeling into seismic zonation have obtained interesting results with significant potential of application. Comparative study of seismic hazard between different cities plays an important role in the reduction of seismic disasters in urban area. Lessons and experiences from recent earthquakes such as the 1999 Izmit, (Turkey), 1999 Chi-Chi (Taiwan) and the 2007 in China earthquake enriched the phenomenology and theory of seismic risk and seismic loss, questioning some of the conventional concepts.

The provisional topics under this theme include but not limited to:

1. Standardization of earthquake hazard and seismic risk assessment (Examine procedures allowing hazard and risk calculation to be harmonized and standardized, with special attention given to both the theoretical background of recently applied procedures and their practical applications in the calculations);
2. Measurement and prediction of strong ground motion;
3. Input of archeo-and paleo-seismology to seismic hazard assessment;
4. Comparative studies on the effects of earthquakes on great Asian Mega cities;
5. Lessons and experiences from recent earthquake;
6. Method for the estimation of seismic risk for urban areas;
7. Recent Destructive Earthquakes.

**Conveners** - Prof. M. R. Gheitanchi (Iran): [mrghchee@chamran.ut.ac.ir](mailto:mrghchee@chamran.ut.ac.ir);  
[zera-gh@rose.ipm.ac.ir](mailto:zera-gh@rose.ipm.ac.ir)

- Prof. Nguyen Hong Phuong (Vietnam): [phuong\\_dongdat@yahoo.com](mailto:phuong_dongdat@yahoo.com);

- Prof. Andrew King (New-Zealand): [a.king@gns.cri.nz](mailto:a.king@gns.cri.nz);

## S5. Earth Structure and Geodynamics

In order to advance the understanding of the dynamics of our planet, theoretical, observational and experimental studies in fields such as seismology, geodynamics and geomagnetism must be integrated. With a concerted effort, we can address such questions as the deep sources of surface tectonics and lithosphere processes, the fate of subducted slabs, the origin of plumes, layering of the mantle, structure and composition of the core-mantle boundary layer, the interaction of core and mantle processes, and the structure and role of the inner core in core dynamics. Through imaging as well as forward modeling of travel times, waveforms, and normal modes, seismology provides constraints on the structure and amplitude of heterogeneity in elastic properties and density and on elastic anisotropy at various scales from local to global. Through numerical modeling and laboratory experiments, geodynamics provides insights on the thermo-chemical character of mantle convection, the nature of lithosphere deformation processes, and their mutual interaction. The close interaction of these two fields, together with constraints from mineral physics and geomagnetism, is essential for better understanding of how planet works. The following non-exclusive list of topics is provided to solicit contributions to this broad multidisciplinary theme:

1. Exploration geophysics;
2. The crust, lithosphere and upper mantle;
3. Seismic attenuation in the crust and upper mantle;
4. Global Earth structure and dynamics (Deep subduction and chemical heterogeneity of the lower mantle, Hot spots, plumes, and surface effect of deep processes; Anisotropy).

**Conveners:** - Prof. Kazuro Hirahara (Japan) : [hirahara@kugi.kyoto-u.ac.jp](mailto:hirahara@kugi.kyoto-u.ac.jp);  
- Prof. Mai Thanh Tan (Vietnam): [mttan@fpt.vn](mailto:mttan@fpt.vn);  
- Prof. Bui Cong Que (Vietnam):

## S6. Seismotectonics

Papers are invited for this theme on analyses of earthquake data that relate seismicity to geologic structures, to ongoing tectonic deformation, and to physical processes operative within the earth. Underlying all considerations of the structural and tectonic setting of earthquakes is the unifying theme of plate tectonics which has had remarkable success in explaining much of the seismicity of the globe. Plate tectonics does not, however, explain all aspects of crustal earthquakes, as most earthquakes in continental areas require an understanding of the distribution of seismicity and faults beyond that provided by rigid plate tectonics to explain why these earthquakes indeed provides the ideal setting for testing these hypotheses. How the structural and tectonic setting conditions earthquake occurrence may be sought in the synthesis of various kinds of geologic, geophysical and seismologic phenomena. The following topics are included as illustrations of the likely sessions into which regional seismotectonic discussions will be grouped:

1. Subduction zones.
2. Transform fault zones.
3. Zone of crustal extension.
4. Neotectonics and active faults.
5. Plate tectonics, continental tectonics and continental earthquakes,
6. Lower crust processes in continental areas.
7. The Tibetan Plateau and its deep dynamic processes.
8. Multidisciplinary mapping of crustal strain rates.

**Conveners:** - Prof. Tran Van Tri (Vietnam)

## **S7. Physics and Chemistry of Earth Materials; and Thermal Studies**

Knowledge of physical and chemical property of Earth materials is essential for understanding the information obtained from seismological, geochemical, geodynamic, geomagnetic, and other observations. Recent development of high pressure techniques made it possible to study the property of materials directly under the condition corresponding to the Earth's slower mantle and the core. Nonhydrostatic compression experiments provide us various new information on the elastic and plastic property of Earth materials. Theoretical studies predict behavior of materials under extreme condition difficult to achieve by laboratory experiments. When these new advances in materials science are combined with observations on the Earth, we can expect much better understanding of the Earth's deep interior. Papers on the physics and chemistry of Earth materials via laboratory experiments and theory are invited.

The Earth is a thermally-driven planet. Our understanding of the internal thermal regime of the Earth is derived from both direct geothermal observations as well as indirect conclusions based on different geological and the internal thermal conditions and thermally-driven processes of the Earth. On the other hand, subsurface temperatures are also directly influenced by many surface processes and changes, and borehole temperatures can be applied as a tracer for various phenomena such as past climatic changes or fluid circulation in the crust.

The following list of topics illustrates the fields covered by this theme:

1. Physical and chemical properties of materials under the conditions characteristic of the Earth's deep interior.
2. Rheology of mantle minerals and dynamics within the Earth.
3. Elastic and transport properties of rocks and magmas.
4. Theoretical studies of materials under extreme conditions.
5. Temperatures within the Earth – Measured, modeled and indicated.
6. Borehole temperatures as imprint of geological history, hydrogeology and changing climate.

**Conveners:** - Prof. Nguyen Hoang  
(Vietnam):

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## **S8. Education and Outreach**

The installation of modern digital seismological system in developing countries encounters a range of difficulties from technical issues to the availability of personnel. Seismologists need to meet the needs of diverse interest group with limited support. Experience from recent network installations and monitoring systems will be shared, particularly with respect suitable aims and objectives for new networks and the implementation of system changes.

This topic will examine the way in which web-base and other interactive tools can be used in educational and training programs, and in the dissemination of information on natural hazards and disaster mitigation. The aim is to bring together a wide range of available modules to promote exchange of information on methodology and design philosophy, and to discuss the acceptance of such modules by the diverse groups who may access them (educator, students, decision makers, managers and the general public).

The object of this topic is to stimulate discussions on the way in which stations and data centers should respond to the increasing shift toward digital broad band data. What classes of "improvements" are needed in processing and data management? Contributions from "pilot projects" are particularly welcome.

**Convener:** Prof. **Wu Zhongliang** (China): [wuzhl@gucas.ac.cn](mailto:wuzhl@gucas.ac.cn);  
[zhonglwu@163bj.com](mailto:zhonglwu@163bj.com);  
Prof. **Ian Jackson** (Australia): [Ian.Jackson@anu.edu.au](mailto:Ian.Jackson@anu.edu.au);  
Prof. **Yuzo Ishikawa** (Japan): [catfish@wa2.so-net.ne.jp](mailto:catfish@wa2.so-net.ne.jp);