



SPECIAL THEME SESSION ON:

THE EFFECTS OF SURFACE GEOLOGY ON STRONG GROUND MOTION

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OBJECTIVES

One of the goals of the field of earthquake engineering is to make quantitative predictions of strong motions at a particular site. This involves an understanding not only of the seismicity and source characteristics but also of the effects of local geology on seismic waves.

The IASPEI/IAEE Joint Working Group on the Effects of Surface Geology (ESG) was formed in 1986. It has conducted two international experiments: one at Turkey Flat in California and one at Ashigara Valley in Japan. These two experiments have provided important knowledge on the effects of surface geology. The last international symposium on ESG was held in Odawara, Japan in 1992. Many damaging earthquakes have occurred since this symposium, including the Off Kushiro, Japan earthquake of 1993, the Northridge, California earthquake of 1994, and the Great Hanshin earthquake in Japan in 1995. These earthquakes underlined the importance of quantitative estimation of ESG on strong motion. In particular, the increase of both amplitude and duration of shaking, with respect to that recorded at nearby stations, are among the prominent effects in alluvial basins. On the tenth anniversary of the formation of the IASPEI/IAEE Joint Working Group on ESG it is appropriate to evaluate progress in the prediction of the effects of surface geology and map a new strategy for future investigations in this field.

Recent progress in computational science and recording techniques have permitted to model and observe seismic ground motion in realistic problems and to evince three-dimensional effects, rather than simple one-dimensional or two-dimensional effects as done in the past. However, modeling still lags behind reality due to incomplete knowledge of geometry and mechanical properties of basins as well as computational limitations. There clearly is need for further progress in theoretical and observational studies on ESG.

This Session provides selected information on the recent progress of specific studies in ESG such as: nonlinear effects of soil response, two and three dimensional responses of actual basins, and practical exploration methods. The Special Theme Session also covers new findings related to ESG as revealed by recent earthquakes. The Special Theme Session brings together researchers in this field from all over the world to exchange ideas and experiences, and to discuss problems that remain to be solved.

ORGANIZATION

The Session consists of two sections of about two hours each devoted to the presentation of recent developments followed by a panel that will seek to identify remaining ESG problems and to discuss possible strategies for solving them. We are honored to have K. Aki, a key contributor to the study of ESG, open the session with a Perspective View. Questions addressed during the session are listed below:

EARTHQUAKE AND SITE SPECIFIC ISSUES

- Evidence of ESG on strong ground motion during recent earthquakes?
- Variation in amplitude and duration of shaking with respect to that of nearby stations and stations outside basin?
- Observed nonlinear effects of soil response?
- Difference and similarities in ESG for different earthquakes/sites?
- Reasons for this behavior?
- Relationship between damage distribution and ESG on ground motion?

MODELING AND SIMULATION and NEEDS AND ROADMAP

- Progress in quantitative prediction of ESG?
- Reliability of simulations?
- How can we detect underground structures? How much information do we need?
- When are 1D models sufficient and when does the use of 2D or 3D models become necessary? Are observations to date sufficient to answer this question?
- Limitations of current simulation and field techniques? Adequacy of models and deployed instrumentation?
- What are greatest needs consonant with practical implementation?
- Plan of action? Map strategy for future investigations?

The papers that follow represent most of the contributions presented at the Special Theme Session.

PANEL

K. Aki
P.-Y. Bard
J. Bielak
L. Esteva
E. Faccioli
W. D. Iwan
H. Kawase
K. Kudo
F. J. Sanchez-Sesma

**CONVENERS FOR THE SPECIAL THEME SESSION ON EFFECTS OF
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