

International Workshop

**Long-Period Ground Motion Simulation
and Velocity Structures**

Proceedings

November 14~15, 2006

at Earthquake Research Institute, University of Tokyo, Japan

Hosted by Strong Motion Seismology Group at ERI, Univ. Tokyo

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Scope

The long-period component of seismic ground motion generated by earthquakes causes damage in near-fault regions through source effects such as the directivity effect of rupture propagation and the near-field term of body wave radiation. In addition, the long-period ground motions attenuate slowly with distance due to some path effects, and site effects amplify them in distant basins, so that they can carry destruction to much greater range.

Large-scale structures such as tall buildings and big tanks can resonate with the long-period ground motions because their own natural periods are in the same frequency band. They can even be damaging in some circumstances; the worst example with over 20,000 fatalities in Mexico City at a distance of 400 km from the 1985 Michoacan earthquake. A further example was provided by the 2003 Tokachi-oki earthquake in Hokkaido, Japan (Koketsu *et al.*, *Seism. Res. Lett.*, 76, 67-73, 2005).

Therefore, the simulation of long-period ground motion is one of the most important parts of strong motion evaluation and prediction. The modeling of velocity structures along propagation path and within sedimentary basins also plays an important role. We would discuss these aspects of the long-period ground motion in the workshop. Topics include numerical simulation, velocity structures, source effect, path and site effects, damage and risk, and other related issues on the long-period ground motion.

*Kazuki Koketsu, Takashi Furumura, and Hiroe Miyake
Strong Motion Seismology Group
Earthquake Research Institute, University of Tokyo*

Invited Overseas Speakers

Brad T. Aagaard	(U.S. Geological Survey, Menlo Park, USA)
Thomas M. Brocher	(U.S. Geological Survey, Menlo Park, USA)
Robert W. Graves	(URS Corporation, Pasadena, USA)
Kim B. Olsen	(San Diego State University, USA)
Arben Pitarka	(URS Corporation, Pasadena, USA)

Invited Domestic Speakers

Shin Aoi	(NIED)
Hiroyuki Fujiwara	(NIED)
Nobuo Fukuwa	(Nagoya Univ.)
Takashi Furumura	(ERI, Univ. Tokyo)
Ken Hatayama	(NRIFD)
Sadanori Higashi	(CRIEPI)
Yoshiaki Hisada	(Kogakuin Univ.)
Muneo Hori	(ERI, Univ. Tokyo)
Yasushi Ikegami	(ERI, Univ. Tokyo)
Tomotaka Iwata	(DPRI, Kyoto Univ.)
Katsuhiko Kamae	(RRI, Kyoto Univ.)
Haruko Sekiguchi	(AIST)
Hiroshi Takenaka	(Kyushu Univ.)

Invited Panelists

Kojiro Irikura	(Aichi Inst. Tech.)
Hiroshi Kawase	(Kyushu Univ.)
Kazuki Koketsu	(ERI, Univ. Tokyo)
Kazuyoshi Kudo	(TEPSCO / Nihon Univ.)
Saburoh Midorikawa	(Tokyo Tech.)
Tsutomu Sasatani	(Hokkaido Univ.)
Paul G. Somerville	(URS Corporation, Pasadena, USA)

Program

November 14 (Tuesday)

12:30 - 13:00 Registration

13:00 - 13:15 Opening

Long-Period Ground Motion Simulation

13:15 - 13:40 Takashi Furumura and Toshihiko Hayakawa (ERI, Univ. Tokyo)
Developments of Long-Period Ground Motions in Central Tokyo from
Large Nearby Earthquakes

13:40 - 14:05 Kim Olsen (San Diego State Univ.) and James Brune (Univ. Nevada)
Constraints from Precariously Balanced Rocks on Preferred Rupture
Directions for Large Earthquakes on the Southern San Andreas Fault

14:05 - 14:30 Shin Aoi (NIED), Ryou Honda (Hot Spring Res. Inst.),
Nobuyuki Morikawa (NIED), Haruko Sekiguchi (AIST),
Yuzuru Hayakawa, and Hiroyuki Fujiwara (NIED)
Long-Period Strong Motion Simulation for the 2003 Tokachi-Oki,
Japan, Earthquake (Mw 8.0)

14:30 - 15:00 *Coffee Break*

15:00 - 15:25 Yasushi Ikegami, Kazuki Koketsu, Takeshi Kimura, and Hiroe Miyake
(ERI, Univ. Tokyo)
Finite-Element Simulation of Long-Period Ground Motions in
California and Japan

15:25 - 15:50 Brad Aagaard, Tom Brocher, and Mary Lou Zoback (USGS)
Ground Motion Modeling of the 1906 M7.9 San Francisco Earthquake
and Other Large Events on the Northern San Andreas fault

15:50 - 16:05 *Break*

- 16:05 - 16:30 Haruko Sekiguchi, Masayuki Yoshimi, Haruo Horikawa,
Kunikazu Yoshida, Sunao Kunimatsu, and Kenji Satake (AIST)
Ground Motion Prediction in Large Sedimentary Basins caused by
Great Interplate Earthquakes
- 16:30 - 16:55 Katsuhiro Kamae and Hidenori Kawabe (RRI, Kyoto Univ.)
Long Period Ground Motion Prediction in Osaka and Nagoya during
Hypothetical Tonankai and Nankai Earthquakes
- Are Tall Buildings in Mega-Cities Safe ?-
- 16:55 - 17:20 Yoshiaki Hisada (Kogakuin Univ.)
An Efficient Method for Simulating Near-Fault Strong Motions at
Broadband Frequencies in Layered Half-Spaces
- 18:00 - 21:00 Reception

November 15 (Wednesday)

Modeling of Velocity Structure

- 09:10 - 09:35 Hiroshi Takenaka (Kyushu Univ.) and Yushiro Fujii (BRI)
A Compact Representation of Spatio-Temporal Slip Distribution on a
Rupturing Fault: An Efficient Scheme for FDM Simulation of Seismic
Motion for a Large Earthquake
- 09:35 - 10:00 Arben Pitarka (URS Corp.)
Development of a 3D Velocity Model for the Puget Sound Region and
its Validation Using Recorded Long Period Ground Motion
- 10:00 - 10:15 *Coffee Break*
- 10:15 - 10:40 Tomotaka Iwata (DPRI, Kyoto Univ.),
Takao Kagawa, Anatoly Petukhin, and Yoshihiro Onishi (GRI)
Basin and Crustal Structure Model in Kinki Area and Long-Period
Ground Motions

- 10:40 - 11:05 Rob Graves (URS Corp.)
Testing the Frequency Limits of 3D Deterministic Waveform Simulations
- 11:05 - 11:30 Sadanori Higashi and Hiroaki Sato (CRIEPI)
Modeling of Kanto Basin Using Phase Velocity Inversion and H/V Spectral Ratio Fitting
- 11:30 - 13:00 *Lunch*
- 13:00 - 13:25 Hiroyuki Fujiwara and J-map Project (NIED)
Modeling of Velocity Structure of Whole of Japan for Strong Motion Evaluation
- 13:25 - 13:50 Tom Brocher (USGS)
Key Elements of Regional Seismic Velocity Models for Ground Motion Simulations
- 13:50 - 14:00 *Break*

Application to Earthquake Engineering

- 14:00 - 14:25 Muneo Hori (ERI, Univ. Tokyo), Tsuyoshi Ichimura (Tokyo Tech.),
and Kenji Oguni (ERI, Univ. Tokyo)
Integral Earthquake Simulation and its Application to Long-Period Ground Motion Simulation
- 14:25 - 14:50 Ken Hatayama (National Res. Inst. Fire and Disaster)
Long-Period Strong Ground Motion and Damage to Oil Storage Tanks due to the 2003 Tokachi-Oki Earthquake
- 14:50 - 15:15 Nobuo Fukuwa and Jun Tobita (Nagoya Univ.)
Key Parameters Governing Dynamic Response of Long-Period Structures
- 15:15 - 15:30 *Coffee Break*

Panel Discussion

- 15:30 - 17:00 Kazuyoshi Kudo (TEPSCO / Nihon Univ.)
A Short Historical Sketch on the Studies/Topics and Some Current
Issues of the Long-Period Ground Motion
- Tsutomu Sasatani (Hokkaido Univ.)
Long-Period Ground Motions from the 2003 Tokachi-oki Earthquake
- Saburoh Midorikawa (Tokyo Tech.)
Effects of Long-Period Ground Motion to Super High-Rise Buildings
in Tokyo
- Kojiro Irikura (Aichi Inst. Tech.)
Some Problems for Strong Motion Prediction from Great
Subduction-Zone Earthquakes
- Hiroshi Kawase (Kyushu Univ.)
Damage Estimate based on Predicted Strong Motions:
Activities in Architectural Institute of Japan
- Paul Somerville (URS Corp.)
Long Period Ground Motions in the PEER-NGA Models
- Kazuki Koketsu (ERI, Univ. Tokyo)
Long-Period Ground Motions in the Circum-Pacific Region

November 16 (Thursday)

Excursion to The Earth Simulator Center and Kamakura

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