

The 2015 NIED-TEM workshop of Seismic Hazard Assessment

Places: National Research Institute for Earth Science and Disaster Prevention (NIED) and Geological Survey of Japan, AIST on 25-28 August 2015

Schedule:

25 August (Tue):

- 10:00 Pickup at public parking area of Tsukuba Bus center
(Okouchi, Esaki)
- 10:30-13:00 Welcome (President Okada)-Seminar Room at F1 of Exchange Building
Introduction and presentations (Chair Ken Hao)
Hiroyuki Fujiwara
Shin Aoi
Kuo-Fong Ma
Ruey-Juin Rau
Yu-Ju Wang
- 14:00-17:00 NIED tour I: (Okouchi, Esaki)
(1) NIED introduction DVD (20min)
(2) Heavy rain facility
(3) Shaking table
(4) Observation Networks K-NET, KiK-net, Hi-net, etc
(5) Potable shaking chair (Zabuton), <http://www.hakusan.co.jp/zabuton/>
- 17:30- 19:30 Reception-All guests, participants and related
(Okouchi, Esaki, K. Nakamura)

26 August (Wed):

- 08:30 Pickup at public parking area of Tsukuba Bus center
- 09:00-17:00 Working group discussion
- # Special Meeting Room at F3: (Chairs Awata/Shyu)
(1) Active fault parameters
(Lin-Ho Chung, Kuo-En Ching, Bruce Shyu, Awata)
- # Meeting Room 1/(and 2) at F3: (Chairs Maeda/Wen)
(2) Velocity structure and (3) Scenario EQ waveform simulation
(Chun-Te Chen, Kuo-Liang Wen, Yin-Tung Yen, and Yi-Wun Liao, Maeda)
- # Seminar Room at F1: (Chairs Hao/Ma)
(4) GMPE (Po-Shen Lin) and (5) Earthquake hazard
(Yu-Ju Wang, Yating Lee, and Chung-Han Chan, Hao)

The 2015 NIED-TEM workshop of Seismic Hazard Assessment

27 August (Thu):

(Chairs Hao/Awata/Wen/Rau)

- 08:30 Pickup at public parking area of Tsukuba Bus center
- 09:00-12:00 Wrap-up presentations of the working groups and writing of group discussion conclusions -Seminar Room at Exchange Building F1
- (1) Active fault parameters (Lin-Ho Chung)
 - (2) Velocity structure (Kuo-Liang Wen or Chun-Te Chen)
 - (3) Scenario EQ waveform simulation (Yin-Tung Yen)
 - (4) GMPE (Po-Shen Lin)
 - (5) Earthquake hazard (Yu-Ju Wang)
- 13:30-17:00 NIED tour II: (Okouchi, Esaki)
- (1) Geological Museum, AIST
 - (2) Science Square Tsukuba, AIST

28 August (Fri): NIED tour III

(Okouchi, Esaki, K. Nakamura)

- 08:00 departure from Tsukuba Center Bus Terminal
- 08:30-12:00 F-net (Mt. Tsukuba) (筑波山広帯域地震観測施設視察),
<http://www.mir.co.jp/towntopics/tsukubasan/map.html>
(Aoi, Naito, Maeda, Iwaki, K. Kimura, Yano, Okouchi, Esaki)
- 12:00 departure from Mt. Tsukuba
- 13:00-15:00 JAXA (宇宙航空研究開発機構視察),
<http://global.jaxa.jp/> (英語ガイドあり)
- 15:15-16:30 GSI (国土地理院視察),
<http://www.gsi.go.jp/ENGLISH/index.html> (英語ガイドあり)

The 2015 NIED-TEM workshop of Seismic Hazard Assessment

The **purpose** of this working group discussion is to strengthen the interaction between NIED and TEM and ultimately improve our capability on the earthquake hazard assessment of these two countries. We plan to organize 5 working groups in this discussion; they are (1) active fault parameters, (2) velocity structure, (3) scenario earthquake, (4) GMPE, and (5) earthquake hazard. The specific questions and the corresponding TEM and NIED members for each group are listed as follows:

(1) Active fault parameters

J. Bruce H. Shyu, Jian-Cheng Lee, Kuo-En Ching, Ray Chuang, Yuan-Hsi Lee, Ling-Ho Chung, and Ruey-Juin Rau, 栗田泰夫(Yasuo Awata), 吾妻崇(Takashi Azuma), 武田哲也(Tetsuya Takeda)

- (a) How to deal with fault segmentation and connection (e.g., the 1935 Taichung-Hsinchu event ruptured two adjacent fault segments)? Do we follow UCERF3 and propose 'Plausible Rupture Criteria'?
- (b) How to deal with M_u (the maximum magnitude of the fault) for active fault sources? The magnitude estimated from fault source is smaller than the reported magnitude of the historical events (e.g., 1906 Meishan).
- (c) How to determine the fault slip rate without trenching data? How to deal with their uncertainty?
- (d) How to determine the slip rate deficit properly on a creeping fault?
- (e) How to estimate the earthquake hazard for a creeping fault?

(2) Velocity structure

Kuo-Liang Wen and Chun-Te Chen, 先名重樹(Shigeki Senna), 木村克己(Katsumi Kimura), 松山尚典(Hisanori Matsuyama)

- (a) How to obtain the shallow and deep structure? What is the Suggested resolution? What information and data we need so as to construct the 3D velocity model?
- (b) Can we combine shallow and deep structure with Tomography model?
- (c) We have about 128 microtremor array measurements (interval 10~20km) and 3917 microtremor single station measurements (interval 1~2km) in Taiwan.
- (d) Is these data enough for mapping the subsurface structure?
- (e) How to plan appropriate fieldwork survey and how about the budget you need for the area like Taiwan? What is the current situation in Japan?
- (f) How to do model modification compared to observed waveform data with numerical modeling?

(3) Scenario earthquake waveform simulation

Yi-Wen Liao and Yin-Tung Yen, 前田宜浩(Takahiro Maeda), 青井真(Shin Aoi), 岩城麻子(Asako Iwaki)

- (a) How to incorporate shallow structure into scenario earthquake simulation?
- (b) How to simulate high frequency?
- (c) How to create more reliable source models for scenario earthquake simulation
- (d) How to determine suitable match filter in broadband simulation
- (e) How to quantify sensitivity of velocity structure in various frequency band of ground motion simulation

(4) GMPE

Po-Shen Lin, 森川信之(Nobuyuki Morikawa), 藤原広行(Hiroyuki Fujiwara)

- (a) How to incorporate shallow structure (e.g., for response spectra)?
- (b) How to minimize deviation?
- (c) GMPEs in intensity?

(5) Earthquake hazard

Yating Lee, Yu-Ju Wang, Chung-Han Chan, and Kuo-Fong Ma, 井元政二郎(Masajiro Imoto), 森川信之, 河合伸一(Shinichi Kawai), 郝憲生(Ken XS. Hao), 藤原広行

- (a) Is fault source independent of background area source? How to deal with M_u (the maximum magnitude of the area seismicity) for a- and b-values of the area sources with and without faults? TEM makes the $M > M_u$ to be fault related.
- (b) Use logic tree to implement area source and active fault source independently? Can area source parameters be modeled by earthquake catalog, whereas active fault ones by geological, geomorphological and geodetic evidence? How to evaluate the potential maximum magnitude of background area source? How to deal with fault segmentation for PSHA? How to deal with the slip rate for one segment or two?
- (c) Hazard map in intensity? GMPE in intensity? Through a relation between PGA/PGV/SA and intensity?
- (d) How to deal with unexpected extreme events (with extra-large magnitudes)?
- (e) How to determine the b-values in characteristic earthquake model for faults which are spanned two or more areas?
- (f) Should time-dependency be implemented? And how to implement it?
Not a well-developed approach.

The 2015 NIED-TEM workshop of Seismic Hazard Assessment

Long-term (e.g., BPT, Lognormal etc.), how to treat non-characteristic events?
How to determine the elapse time for those faults without
historical/paleo-seismic (trenching data) rupture records?
Short-term (e.g., ETAS, Coulomb etc.)
Should time-dependency be magnitude-dependent? And how to quantify
magnitude-dependent term?

The TEM members will attend the visit and discussion:

➤ **Academia Sinica:**

Jian-Cheng Lee (李建成), Chun-Te Chen (陳俊德), Yu-Ju Wang (王郁如)

➤ **National Taiwan University:**

J. Bruce H. Shyu (徐澔德)

➤ **National Central University:**

Kuo-Fong Ma (馬國鳳), Kuo-Liang Wen (溫國樑), Yating Lee (李雅婷),
Yi-wen Liao (廖怡雯)

➤ **National Chung Cheng University:**

Yuan-Hsi Lee (李元希), Ling-Ho Chung (鍾令和)

➤ **National Cheng Kung University:**

Ruey-Juin Rau (饒瑞鈞), Kuo-En Ching (景國恩)

➤ **Sinotech:**

Yin-Tung Yen (顏銀桐), Po-Shen Lin (林柏伸)

➤ **ERI, University of Tokyo:**

Kate Chen (陳卉瑄), Ray Chuang (莊詠叡)

➤ **EOS, Nanyang Technological University, Singapore:**

Chung-Han Chan (詹忠翰)

Total of 17

➤ **GNS Science representative**

Dr. Matthew Gerstenberger, GNS Science, New Zealand