Research Plan and Progress of SATREPS Peru Project

March 15, 2012

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Needs of EQ & T Disaster Mitigation in Peru (1)

- Peru locates in the circum-Pacific seismic belt with high seismic and tsunami risks.
- Large inter-plate earthquakes occurred in Atico (2001) and in Pisco (2007), and thus EQ & T disaster mitigation draws significant attention in Peru.

Needs of EQ & T Disaster Mitigation in Peru (2)

- Peru has a long term relationship with Japan since 1873.
- CISMID was established within UNI in 1987 by the support of Gov. of Japan. CISMID became the leading center of earthquake engineering research in South America.
- CISMID has been in collaboration with Japanese research institutions.

Significance of joint research between Peru and Japan

- Both countries are located in a similar seismic environment, frequently hit by damaging earthquakes & tsunamis.
- Contribution of Japanese science & technology to disaster mitigation in Peru
- Merits to Japanese geoscience since subduction-zone EQs are rare events
- Tsunamis caused by subduction-zone earthquakes in South America hit Japan (1960, 2010 Chile EQs) and vice verse (2011 Tohoku EQ). Thus the joint-research contributes to the tele-tsunami study in the world.
- Promotion of disaster mitigation and capacity building through sharing the knowledge from the international joint research
Enhancement of Earthquake and Tsunami Disaster Mitigation Technology in Peru

Research Topics and Groups

G1: SM/GT
Source Model
• Deep Structure
• Rock Motion
• Topography & Soil
• Spatial Database
  • Seismic Resistance
  • Tsunami Propagation
• Tsunami Run-up
• Tsunami Damage
• T. Countermeasures
G2: Tsunami
• Bathymetry
• Tsunami Propagation
• Tsunami Run-up
• Tsunami Damage
• T. Countermeasures
G3: Building
• Damage Assessment
• Diagnosis & Retrofit
• Spatial Database
G4: DA
• Damage Detection
• Spatial Database
G5: DM Plan
• Disaster Mitigation Plan

International Joint-research Project
MINSA Peruvian Research Team

Development and Implementation of EQ & T Disaster Mitigation Technology in Peru

Knowledge Transfer to Other Pacific-Rim Countries

Research Plan
Project Management and Coordination
PI: F. Yamazaki (Chiba U), C. Zavala (CISMID/UNI)
• Project Management, International & domestic coordination
• Public relations, Information dissemination
• International workshops, symposia

GL: S. Nakai (Chiba U), Z. Aguilar (UNI) & H. Tavera (IGP)
• Source Modeling and Simulation of Seismic Motion
• Microzonation based on EQ and MT observations
• Risk Assessment of Slope Failures

Source Model
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Peru-Japan WS, 2010 March, UNI

http://ares.tu.chiba-u.jp/peru/
Scenario Earthquakes

1746 (Mw=8.6)
and
1868 (Mw=8.8)

Implementation of New Seismometers

Contamana Earthquake 2011.08.24 M$_{L}$ 7.0

G2: Tsunami Simulation and Damage Mitigation

GL: S. Koshimura (Tohoku U), C. Jemenez (DHN), IGP, CISMID

- Tsunami Source, Propagation and Impacts
- Tsunami Hazard and Impacts Mapping
- Implementation of Tsunami Disaster Mitigation Technology

Data Collection, Hazard Mapping, and Evacuation Planning

Evacuation building

Multi-agent evacuation simulation
G3: Seismic Resistance of Buildings

- Develop Database of Structural Tests for Masonry Buildings
- Develop Seismic Diagnosis and Retrofit Technologies
- Assessment and Retrofit of Historical Buildings

Research Progress of Building Group

Seismic Test Database
- Structural Test at National Yokohama University (2010-2011)
- BRI and Akita Pref. Univ.

Computer Simulation of Seismic Diagnosis
- Vibration Characteristics of Adobe-Quincha Buildings

Equipment introduced to Peru

- Structural testing
  - Self supporting loading system
  - 4-ch jacks with Control system
- Material testing
  - Renewal of old CISMID machine
  - 50ton Universal
  - 300ton Compression
- Building monitoring
  - Internet sensor monitored by Peru and Japan
- Dynamic behavior monitoring & test
  - Shaking machine
  - Acc. sensor
  - Laser sensor

Tsunami Hazard Mapping in Lima-Callo

Bruno Adriano@CISMID, Cesar Jimenez@DHN
Source Model (Pulido et al., 2011)
G4: Geo-spatial Database and Damage Assessment

GL: S. Midorikawa (Tokyo Tech), M. Estrada (UNI)

- Development of Geo-spatial Database
- Damage Detection using Satellite Images
- Damage Assessment for Scenario Earthquakes

2.5m DEM by ALOS/PRISM

G4: Development of Building Inventory Data in Lima

- Census data (No. of households)
- High-Resolution Satellite Image
- Building height and size
- Field survey
- Relationship between number of households and number of buildings
- Accuracy assessment

2010 Chile EQ joint survey (G4+G5)
by 5 SATREPS members

Talca city hall

Comparison of satellite images in Talca

(a) Before EQ 2008/1/1 QuickBird
(b) After EQ 2010/3/10 WV
(C) GIS damage map

G5: Development of Disaster Mitigation Plan

GL: F. Yamazaki (Chiba U), A. Bisbal (INDECI)

- Formulate Land-use Policies for Disaster Mitigation
- Develop Local Disaster Mitigation Plans for the Study Areas
- Awareness Raising and Dissemination Activities

Land-use plan after the 2007 Pisco EQ (CISMID)

Technical seminar (JICA-Peru, 2004)
G5 Activities in 2010-2011

Selection of target areas and field survey

Meeting with INDECI

Field survey in Tacna

Seminar at Peruvian Congress

Recovery survey in Pisco

Meeting at Tacna Private Univ.

Public Relations

Human Resources Development

Trainees from CISMID to Chiba U.

Tsunami Training Course at CISMID

Attending a practical class at Chiba U.

C. Jemenez in Onagawa

Schedule of the Research Project

Research Items

<table>
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<tr>
<th>Research Items</th>
<th>Period FY (2010-2014)</th>
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<td>Project Management</td>
<td>2010</td>
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<tr>
<td>【Chiba U and CISMID/UNI】</td>
<td>WS▼</td>
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<td>G1: Seismic motion &amp; Geotechnical</td>
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<td>1-2 Site response &amp; Microzonation</td>
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<td>Source modeling</td>
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<td>Hazard map</td>
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<td>G3: Buildings</td>
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<td>3-1 Seismic tests database</td>
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<td>Assessment, risk map</td>
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Thank you very much!
Muchas Gracias!
ご清聴ありがとうございました.