UNESCO-IPRED International Memorial Symposium on "Protecting Lives from Earthquake and Tsunami Disasters" and the 5th session of IPRED in Tokyo, Japan, 26-29 June 2012

現地調査の遂行における問題 とSATREPSプロジェクトの進捗

PROBLEMS IN THE EXECUTION OF FIELD SURVEY AND ADVANCE ON SATREPS PROJECT

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災害の前（準備）
BEFORE THE DISASTER

ペルーのチーム
The Peruvian TEAM

❑ GEOTECHNICAL GROUP　**土質グループのメンバー**
- Dr. Zenon Aguilar
- Msc. Fernando Lazares
- Eng. David Luna
- Eng. Luis Chang
- Dr. Diana Calderon
- Eng. Silvia Alarcon
- Eng. Selene Quispe
- Eng. Rocio Uriarte
- Eng. Ramiro Piedra

Advisor: Dr. Jorge Alva

BEFORE THE DISASTER
災害の前（準備）

The Peruvian TEAM
ペルーのチーム

❑ BUILDING GROUP
- Dr. Carlos Zavala
- Dr. Miguel Estrada
- Msc. Ricardo Proaño
- Msc. Jenny Taira
- Msc. Lourdes Cardenas
- Eng. Luis Lavado
- Eng. Cesar Fajardo
- BCE. Luis Moya
- BCE. Lucio Estacio
- BCE. Erika Flores
- BCE. Jorge Morales

建築グループのメンバー

災害の後
AFTER THE DISASTER:　チーム間の連携
Establishment communication between teams

GEOTECHNICAL TEAM
土質チーム
BUILDING TEAM
建築チーム

Team meeting to study the possibility to dispatch immediately with Researchers own founds. If there is not possibility we must wait for Emergency found of UNI

災害の後
AFTER THE DISASTER

UNI – National University of Engineering

国立工科大学

Faculty of Civil Engineering

土木学部

CISMID

緊急時:5日間 2千ドル 日本・ペルー地震防災センター

現地
: 3日間

TIME FOR ACTIVATION OF THE EMERGENCY ECONOMIC FOUND: 5 days (There are bureaucracy items delay the Generation of the found US$ 2000 maximum amount)

DURATION OF FOUND ON FIELD: 3 days

緊急時の活動費用の問題点
PROBLEMS FOR THE GENERATION OF THE EMERGENCY FOUND

- ❑ Ministry of Economy had a protocol even in emergency cases
- ❑ Priorization of the found must be submitted
- ❑ Approval of the Priorization must be submitted for certification
- ❑ Certification of the found by Ministry of Economy will allow the use of the found
- ❑ After Certification is approve the found money will be allowable
- ❑ Found could not be more than US$ 2000 from and are taken from CISMID founds
- ❑ Teams can survive only 2 days with this money.

ー経済省は緊急時でも儀礼的だった
ー優先順位が高いことを示さなければならない
ー保証のために優先順位の承認を提出する必要がある
ー経済省による費用の保証によって活動費用が使用できる
ーCISMIDの費用から使い、2千ドルを超えてはならない
ーこの費用でチームは2日間しか現地にいられない

ペルーにおける地震防災の障害は何か？
WHAT ARE THE IMPEDIMENTS TO EARTHQUAKE DISASTER MANAGEMENT IN PERU?

- ❑ Government Officers of Ministry of Economy, Majors of City Office and also City Planners are not sensible with disaster risk.
- ❑ There are cities where Hazard, Microzonification and Risk Analysis has been developed. Authorities of City office don´t use it on the planning of the city. Studies are on a shelf or in a drawer very hide.
- ❑ CENEPRED (brand new government agency) should be more aggressive and active consider alliance and teach the local authorities about the disaster management policies.

ー経済省、市役所、都市計画者は災害リスクに敏感でない
ーハザードやリスク分析はしてあっても市役所で棚に眠っている
ー国は地方政府にもっと働きかけるべきである

国家防災システム

National System on Disaster Management - SINAGERD

Components of the disaster management	National and International Policies for the development	Process for the implementation of disaster management
Prospective Management	-Education -Health -Science & Technology -Planning for development -Citizens security -Environmental -Public investment -Control & monitoring	-Estimation of the risk -Prevention and reduction of the risk -Preparation Response and rehabilitation -Reconstruction
Corrective Management		
Reactive Management		

Source: CENEPRED

防災の要素　開発の国家・国際政策　防災の実施プロセス

計画とリスク管理のための技術的なツール

Technical Tolls for planning and management the risk (Source: CENEPRED)

ペルーにおける(防災の)主な将来の課題

MAIN CHALLENGES FOR FUTURE IMPLEMENTATION OF MANAGEMENT AND CORRECTIVE IN PERU? (SOURCE: CENEPRE)

- Achieving a culture of disaster risk management in the population located in urban and rural areas nationwide.

・防災の文化を都市・地方を問わず構築する

- Articulate a consistent manner between the public and private institutions involved in the processes of prevention and relief, to ensure consensus and commitments necessary to enable the formulation, implementation, monitoring and evaluation of policies, plans, programs and investment projects .

・政策・投資の実施・評価のため官民で防災への合意形成に努める

- Achieve a system of automated information about potential risks at local, regional and national levels, enabling the formulation of plans and investment projects reducing the vulnerability of the population and heritage.

・市民や遺跡を守る計画や事業のためリスク情報システムを構築する

- Strengthen the SINAGERD integrally from a decentralized perspective to empower regional and local governments under the leadership CENEPRED

・国家防災システム(SINAGERD)を地方分権の視点で強化する

防災の総合的なアプローチとは何か？

WHAT WOULD BE THE INTEGRATED APPROACH TO DISASTER MANAGEMENT?

- Integrated approach to disaster management should include the participation of the population, because if technical tools are development, people should know about the risk they are expose.

・総合的な防災には市民がリスクを知るよう、住民の参加が不可欠

- Risk Reduction plan should be developed for each governmental agency or ministry to produce a national plan. Disaster reduction plan of each sector with the knowledge of the population, will judge the authorities, and monitoring can be effective.

・各政府機関が防災計画を作る。部門毎の計画は市民、専門家参画と監視が有効

- Sustainable Development demands the improve of the capacities of the authorities and also officers with power of decision

・持続可能な開発には、決断の出来る機関と担当者の能力改善が必要

地震防災国際協力のため日本とUNESCOがすべきことは？

WHAT DO YOU SUGGEST JAPAN AND UNESCO TO DO FOR THE FURTHER INTERNATIONAL COOPERATION ON EARTHQUAKE DISASTER MANAGEMENT?

HISTORICAL BUILDINGS UNDER RISK – NON BUDGET TO KEEP OUR HERITAGE

リスクにさらされている歴史的建築 – その遺産を守る予算がない

歴史的建築　ー　クスコ大聖堂

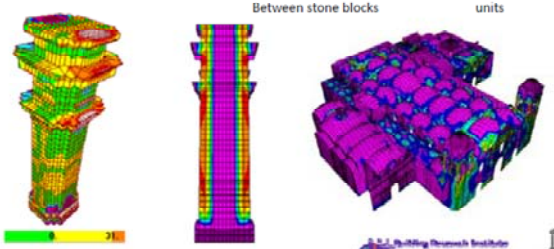
HISTORICAL BUILDINGS – CUZCO CATEDRAL

Vertical Cracking on stone

Peeling and Cracking

Loss of horizontal mortar Between stone blocks

Replacement of stone units



Horizontal Stresses Due to quake

危険な学校

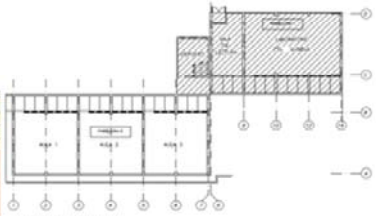
SCHOOLS UNDER RISK

Source: CISMID-UNI

Source: CISMID-UNI

Designed with
1977 Peruvian Standards
Drift control inefficient

1977年のペルー基準で設計された学校



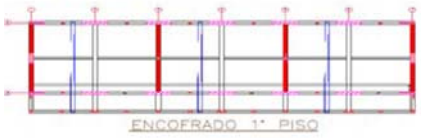
Source: Eng. A. Blanco

1997年にペルー基準を改訂したが多くの学校が危険な状態

1997 PERUVIAN STANDARD CHANGE DRIFT EXIGENCE

SCHOOLS BECAME SAFE BUT MANY SCHOOLS STILL REMAIN ON RISK

Source: Eng. A. Blanco



Source: Eng. A. Blanco

Source: Eng. A. Blanco

地球規模課題対応国際科学技術協力
Science and Technology Research Partnership
for Sustainable Development : SATREPS

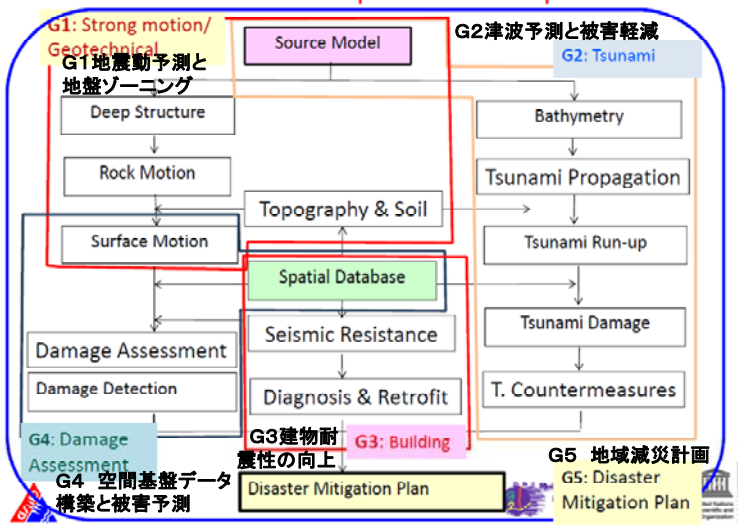
ペルーの耐震工学研究の進捗とSATREPSプロジェクト

Advance on the Earthquake Engineering Research in Peru and SATREPS Project

千葉大学とペルー国立工科大学のプロジェクト

Project between
Chiba University and
National University of Engineering

研究課題とグループ Research Topics and Groups



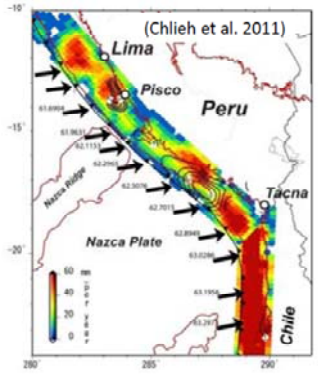
新しい設備の適用によるSATREPSの成果

SATREPS OUTPUTS RELATED WITH APPLICATION OF NEW EQUIPMENT

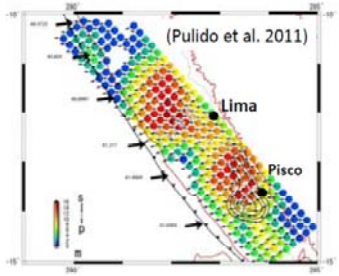
G-1 G-2 G-3 G-4 G-5

ペルーとチリ南部のすべり率とペルー中部のシナリオ地震

Slip deficit rate for Peru and Northern Chile and scenario earthquake for Central Peru



- Slip deficit since 1746 (265 years)
- Maximum slip is 15 m
- Magnitude Mw~8.9, neglecting the 20 century earthquake sequence



$C(x).vo$

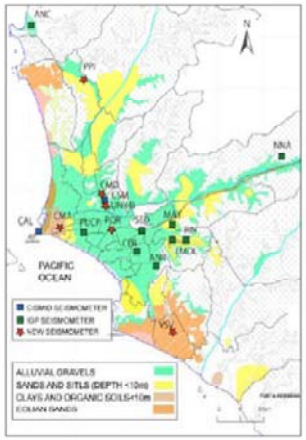
$S(x)=C(x) * vo * t$

S(x): slip, t : elapsed time

Source: Dr. Nelson Pulido

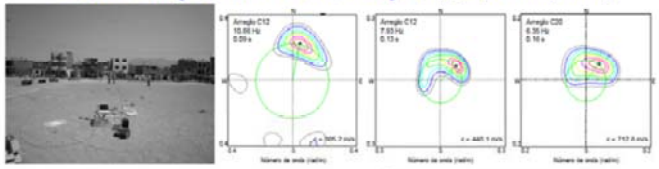
SATREPSプロジェクトによる地震観測

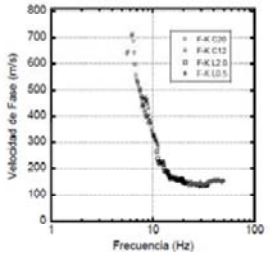
Seismometer implemetation on SATREPS Project

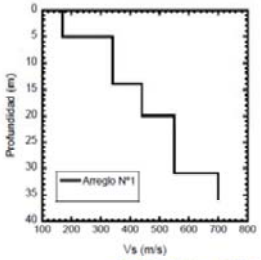


微動アレイ計測によるせん断波速度の推定

Use of Microtremor Array Measurement for Estimating Shear Wave Profile (Quispe et al, 2011)







記録された全ての観測データは CISMID地震ネットで利用可能

All the data from the recorded events will be available in the **Project** and **REDACIS** (CISMID Seismic Network) websites

http://ares.tu.chiba-u.jp/peru/
http://www.cismid-uni.org/redacis

ウェブサイト

グループ3（建築）の成果

G-3 Some Group 3 Outputs

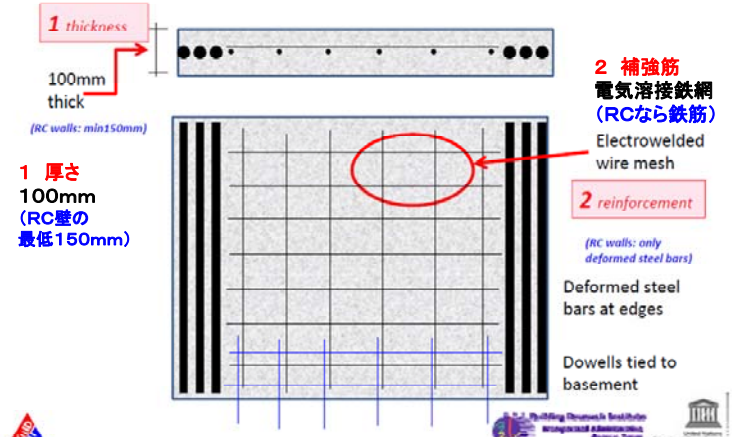
靭（じん）性の低い壁の実験

Low Ductility walls experiment

This walls are widely used on Middle rise buildings

靭性の低い壁： 主な違い

Low ductility wall: main differences

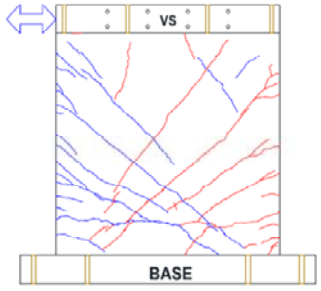


靭性の低い壁の試験

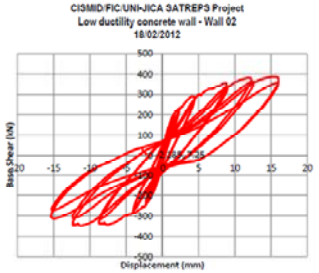
LOW DUCTILITY WALL TEST

靭性の低い壁の試験

LOW DUCTILITY WALL TEST

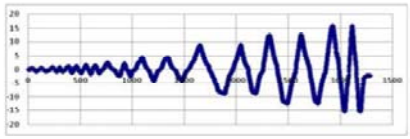


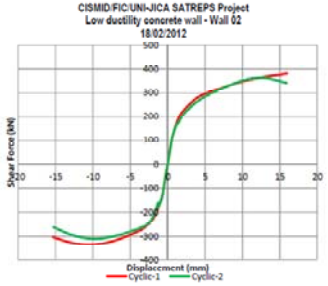
AGRIETAMIENTO MURO 2
Cara Sur
Drift:. 1/154

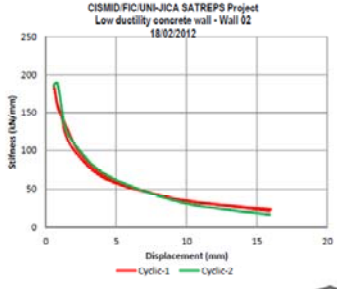


繰り返し荷重 試験壁02

Cyclic Load Test Wall-02

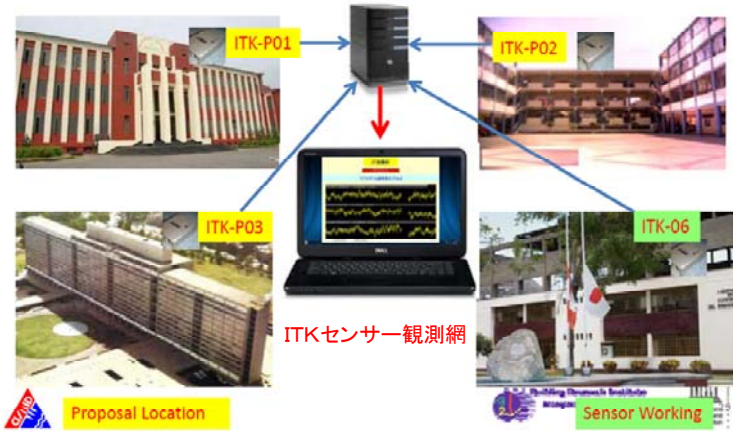






NATIONAL UNIVERSITY OF ENGINEERING
FACULTY OF CIVIL ENGINEERING
JAPAN-PERU CENTER FOR EARTHQUAKE ENGINEERING RESEARCH AND DISASTER MITIGATION - CISMID

ITK Sensor Monitoring Network



G4（地理空間情報）グループの成果

G-4 Some Group 4 Outputs

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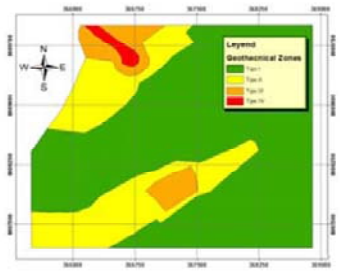
IPRED -2012

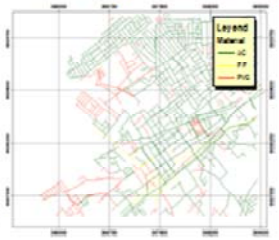
Analysis Tool Application
Tacna City – Southern Peru



Soils 土質

Buildings
建物

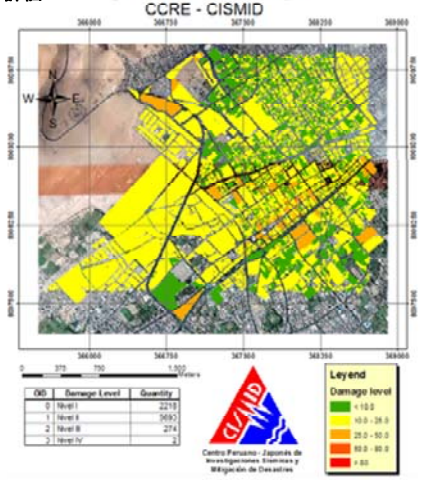
水道
Water pipes



分析ツールの適用
ペルー南部タクナ市

Dr. Carlos Zavala - czavala@uni.edu.pe
IPRED -2012

被害評価 Damage Evaluation Tacna City - Peru
CCRE - CISMID



分析ツールの適用

ペルー南部タクナ市

Analysis Tool Application

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IPRED -2012

まとめ

CONCLUSIONS

- The introduction for the implementation of a Filed survey in Peru has been treated 現地調査実施
- Peruvian disaster management scope was presented. ペルーの防災計画の紹介
- Indiference of decision makers and authorithies is one of the main problems. Improval of the capacities of the authorithies is neded.

  責任者の無関心が大問題
  関係者の能力改善が必要