

# Data Integration and Reporting

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**Geotechnical Extreme Events Reconnaissance**  
*Turning Disaster into Knowledge*



# Reconnaissance

- Five parts of reconnaissance:
  - Planning
  - Field Reconnaissance
  - Report Preparation
  - Papers & Presentations
  - Follow-On Research

# Post-Reconnaissance

- Data sharing and integration
- Reporting:
  - GEER Web Reports
  - *Earthquake Spectra* papers for EQs
  - *International Journal of Geoengineering Case Histories*

# Data Sharing and Integration

- Synthesize and interpret your field observations
  - Generate graphics for sites mapped
  - Identify most useful photos
- GEER ftp site & NEHRI DesignSafe CI for sharing information with team members
  - Graphics
  - Photos
  - Track logs

# GEER Web Reports

- Goal: Rapid reports that responsibly describe the key observations
- Quick Report within 1-3 weeks
- Version 1 Report within 4-8 weeks
- Divide up the work: 1 or 2 lead authors of each section with each team member assigned to 1 or 2 sections

# **GEER Report Outline**

**A. CONTEXT**

**B. DEMAND**

**C. EFFECTS**

**D. TOOLS**

# GEER Report Outline

## A. CONTEXT

1. Areal extent
2. Societal setting
3. Antecedent conditions
4. Geological setting
5. Seismological aspects
6. Meteorological aspects
7. Multi-event considerations
8. Scale effects

# GEER Report Outline

## B. DEMAND

1. Wind and wind-driven surge
2. Rainfall/Snowfall/Snowmelt/hail intensity and flooding
3. Drought and temperature extremes
4. Surface fault rupture/tectonic deformation
5. Tsunami/seiches or drawdown/run-up effects
6. Earthquake ground shaking characteristics
7. Volcanic eruptions (lava flows and ash fall) and solidification/accumulation effects
8. Landslides, rock fall, debris flows, and lahars
9. Geology-related ground movements, e.g., karst subsidence, collapse, expansive soils
10. Human-induced ground movements, e.g., mining subsidence, excavations



# GEER Report Outline

## C. EFFECTS

1. Disruption or sedimentation of waterways
2. Scour and erosion effects
3. Impacts due to landslides, rock fall, & debris flows
4. Impacts to infrastructure from other ground movements
5. Local amplification effects of ground shaking
6. Liquefaction and its effects, including lateral spreading
7. Earth and waste structures, e.g., dams, levees, landfills
8. Ports, harbors, and waterfront structures
9. Transportation systems, e.g., bridges, tunnels, highways
10. Lifeline systems, e.g., water, wastewater, power, & gas
11. Industrial facilities and storage tanks
12. Infrastructure damage
13. Excellent performance of infrastructure
14. Impacts on emergency management and response

# GEER Report Outline

## D. TOOLS

1. Remote sensing, e.g., satellites, drones
2. Wireless sensors
3. Lidar, photogrammetry, & other survey tools
4. Geophysical methods, e.g., SASW
5. Penetration tests, e.g., Swedish Weight Sounding, Dynamic Cone Penetration

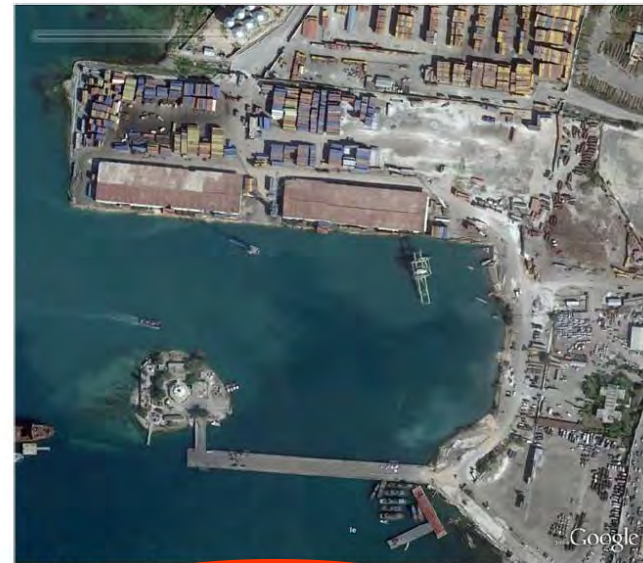
***Look at previous GEER reports as guides***

# GEER Reports

- Mostly photographs, GE images, brief descriptions
- All observations are geo-coded (lat-long)



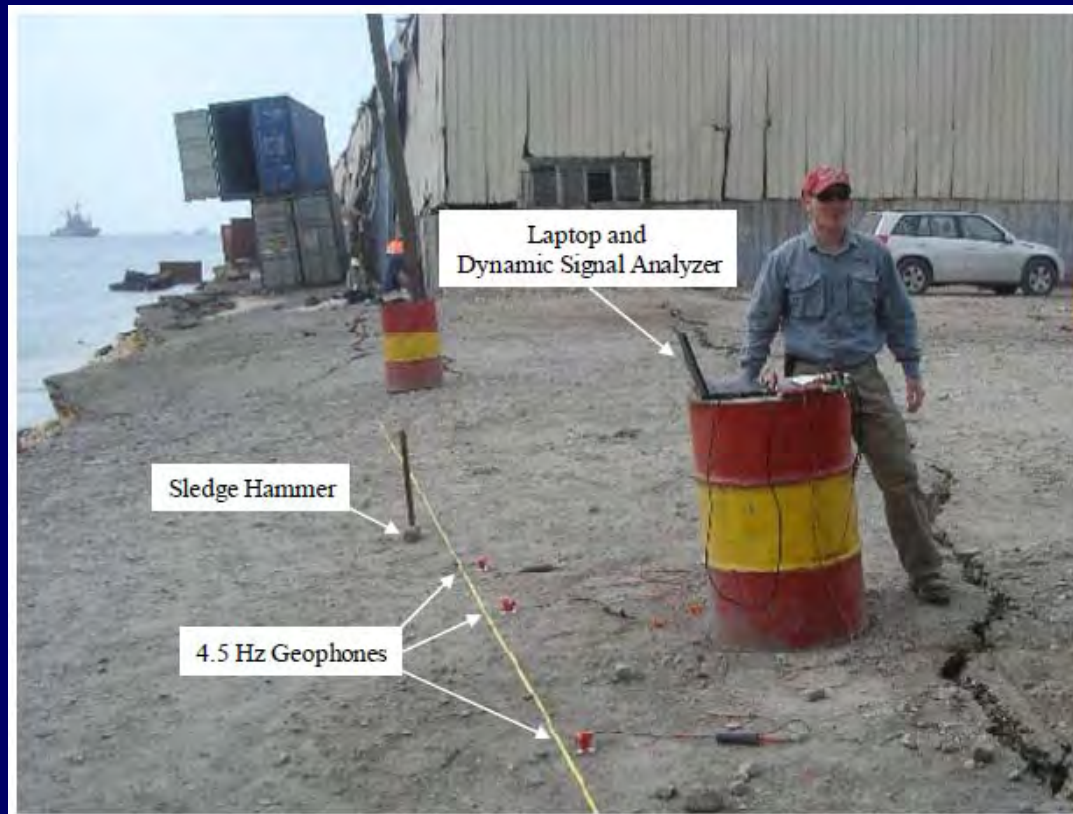
**Figure 6.9** Lateral spreading under the two metal warehouses. Photo taken facing south with the metal warehouses to the left. (N18.557075, W72.352045)



**Figure 6.2** Pre- and post-earthquake satellite/aerial imagery (top and bottom, respectively) of the port at Port-au-Prince, Haiti. (N18.555058°, W72.351144°) Imagery courtesy of Google Earth.

# GEER Reports

- Follow-up phase can capture field measurements of  $V_s$  (SASW), Swedish Weight Sounding (SWS) & Dynamic CPT (DCPT)





# GEER Reports

- Useful to show pre- and post-event photographs, if available

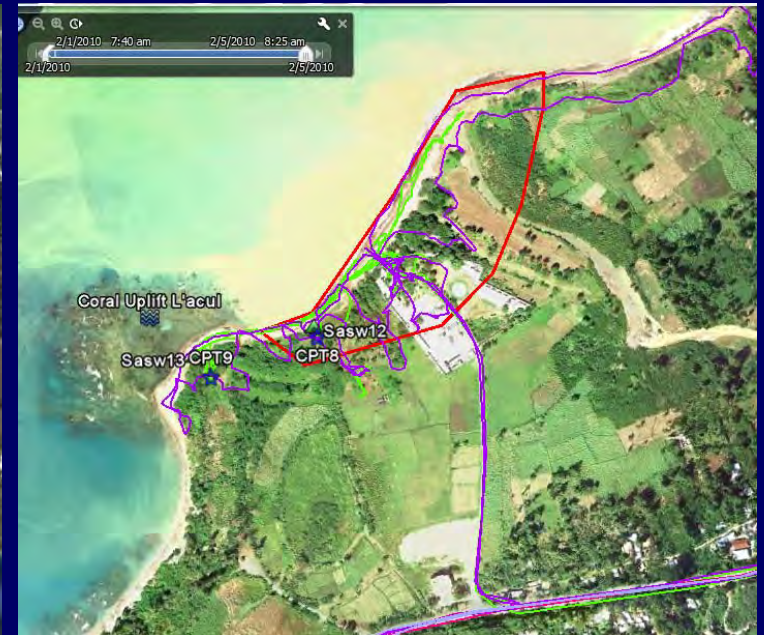
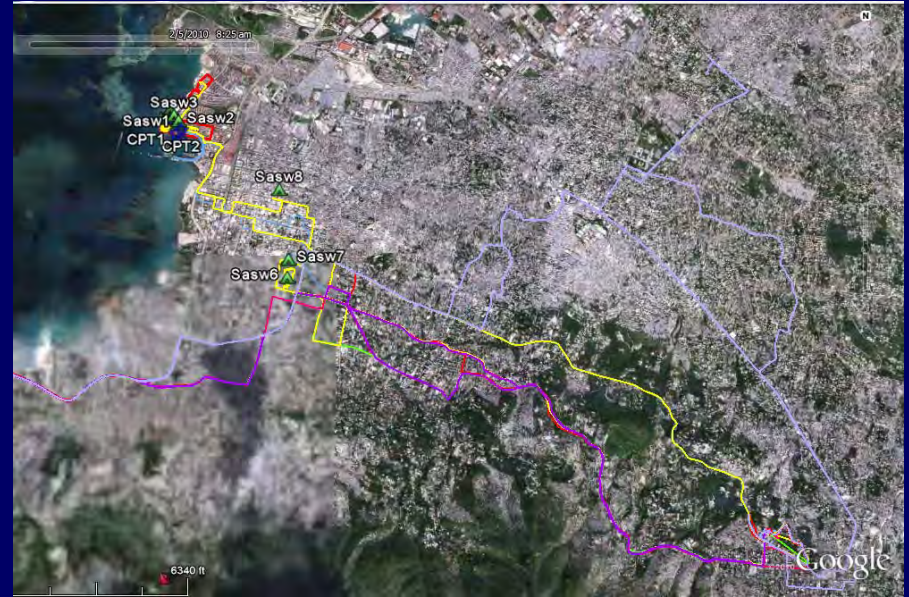


**Figure 7.3.** Pre- and post-earthquake images of coastline near village of L'Acuil. Note in the lower, post-earthquake image the significant cracking subparallel to the coast and the arcuate slump in the northern end of the failure. SASW and DCPT testing was performed near several large sand blows located near the south end of the failure zone, as well as farther south outside of the failed reach. Imagery courtesy of Google Earth. Approximate center of image at  $18^{\circ}26'51.17''\text{N}$ ,  $72^{\circ}41'11.06''\text{W}$ .



# Google Earth *kmz* Files

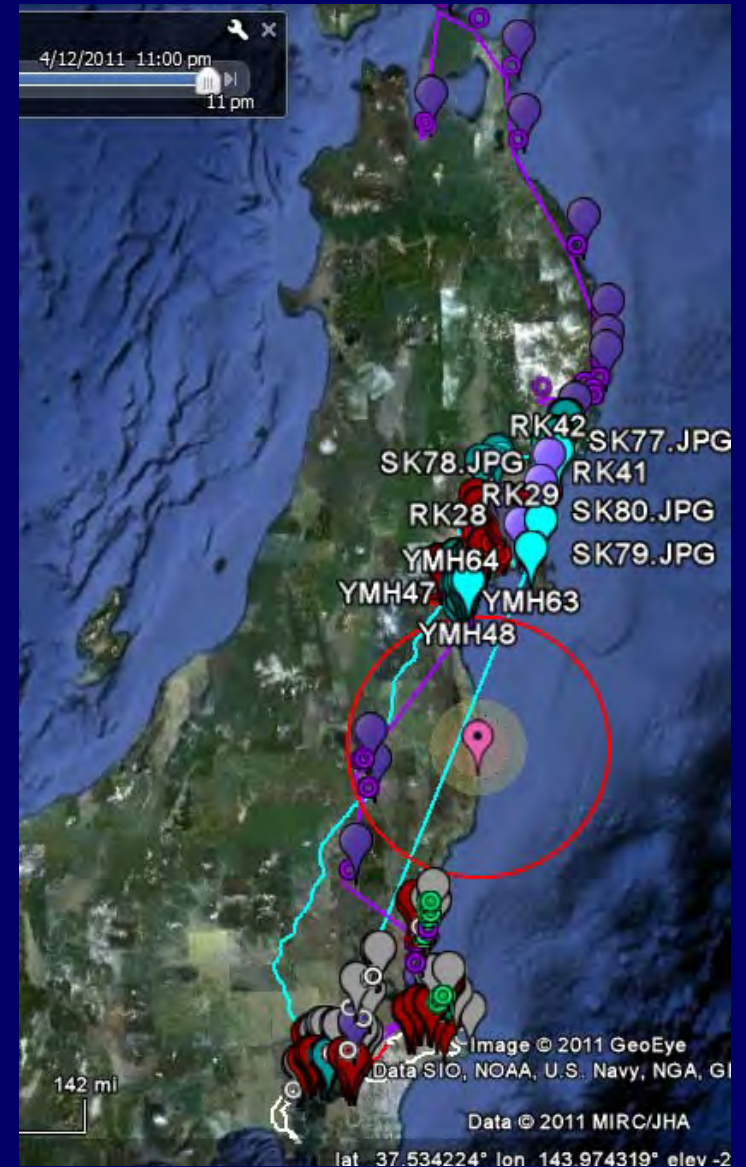
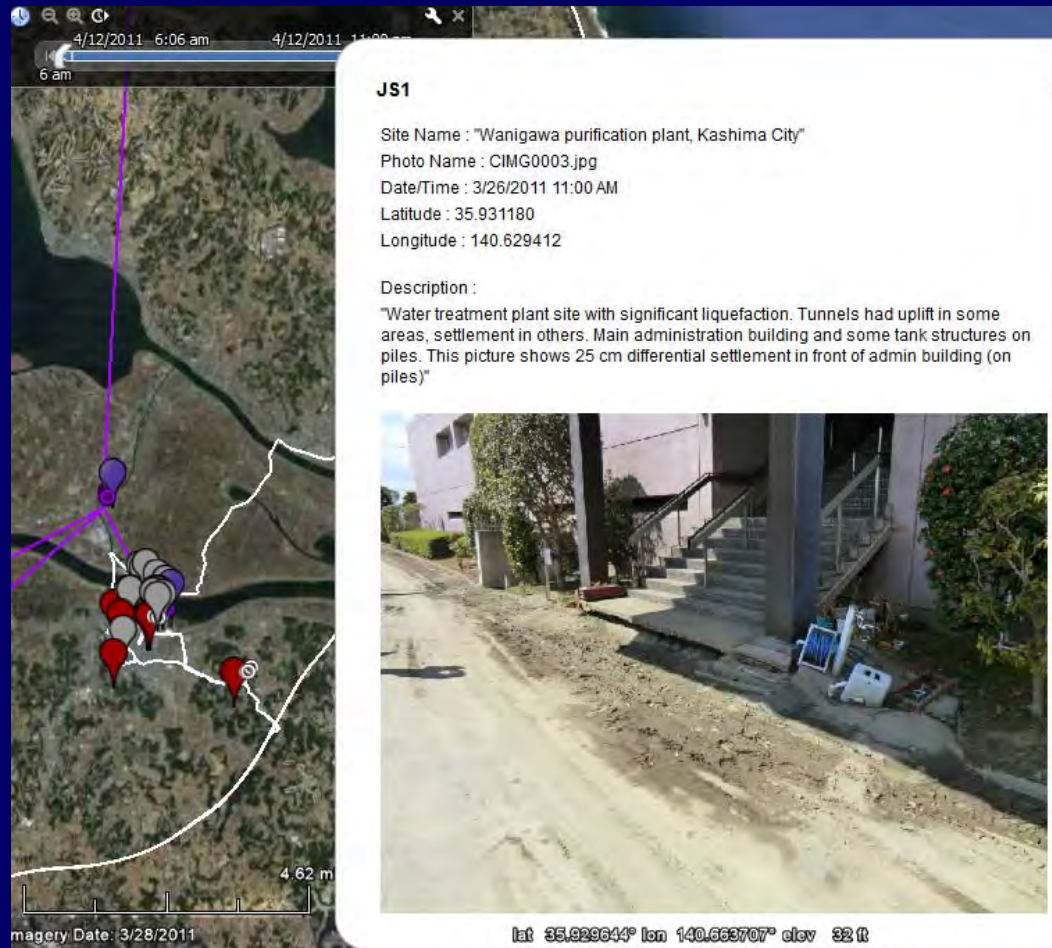
- Track logs
- Label sites described in report
- Tells reader where you have not been





# Google Earth *kmz* Files

- Embedded photos





# GEER Reports (bring data together)

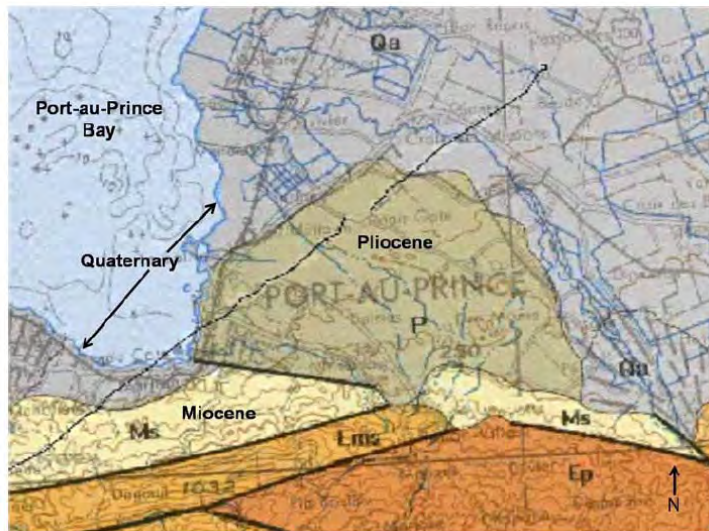
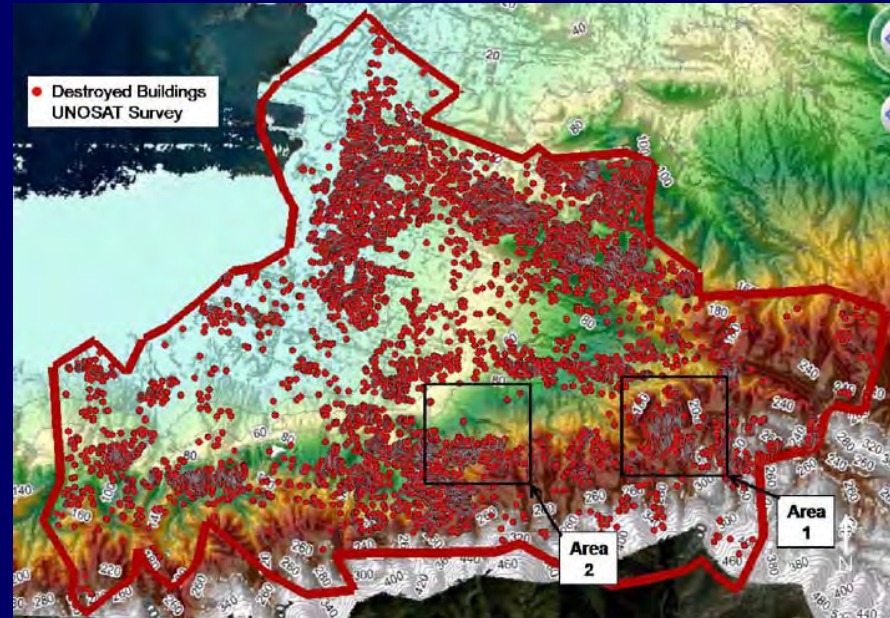
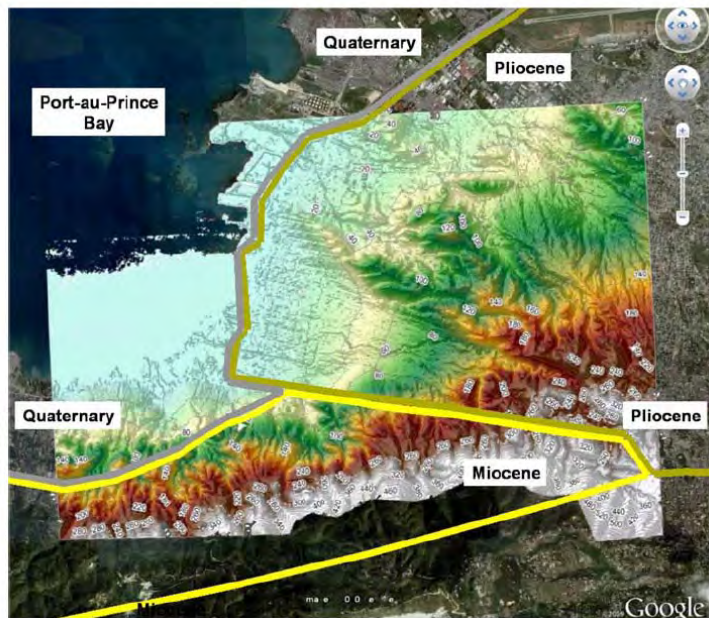


Figure 5.2 Geology of Port-au-Prince area.  
(C.E.R.C.G. IMAGEO Lambert, Gaudin, and Cohen, 1987)





# GEER Reports

- Multiple quick reports for some events



## GEOTECHNICAL EXTREME EVENTS RECONNAISSANCE

*Turning Disaster into Knowledge*

### **Reconnaissance Files Authored and Co-Authored by the National Science Foundation-Sponsored GEER Team**

#### [Quick Report 1: GEER Association Report No. GEER-025a \(April 5, 2011\)](#)

Geotechnical Quick Report on the Kanto Plain Region during the  
March 11, 2011, Off Pacific Coast of Tohoku Earthquake, Japan

#### [Quick Report 2: GEER Association Report No. GEER-025b \(May 4, 2011\)](#)

Preliminary Observations of Levee Performance and Damage following the  
March 11, 2011 Tohoku Offshore Earthquake, Japan

Contributing Authors (Alphabetical Order):

#### [Quick Report 3: GEER Association Report No. GEER-025c \(May 17, 2011\)](#)

Preliminary Observations of the Effects of Ground Failure and  
Tsunami on the Major Ports of Ibaraki Prefecture

Contributing Authors (Alphabetical Order):

Pedro Arduino (University of Washington, Seattle, Washington, USA)  
Jorge Meneses (Kleinfelder, San Diego, CA, USA)

Additional Contributors to GEER Field Reconnaissance (Alphabetical Order):

Eiji Kohama  
Takashi Nagao  
Takahiro Sugano

# GEER Reports

- Get Version 1 out quickly
- There is then time for Version 2, Ver. 3, etc.

## 2014 NAPA EARTHQUAKE



Event Date : 08-24-2014  
Location : South Napa, California  
Report Date : 09-15-2014  
Event Category : Earthquake  
Report Number : GEER-037  
DOI : doi: 10.13140/2.1.1094.7844  
Event Latitude : 38.298  
Event Longitude : -122.284  
Collaborators : CGS, PEER, and USGS

File Upload :

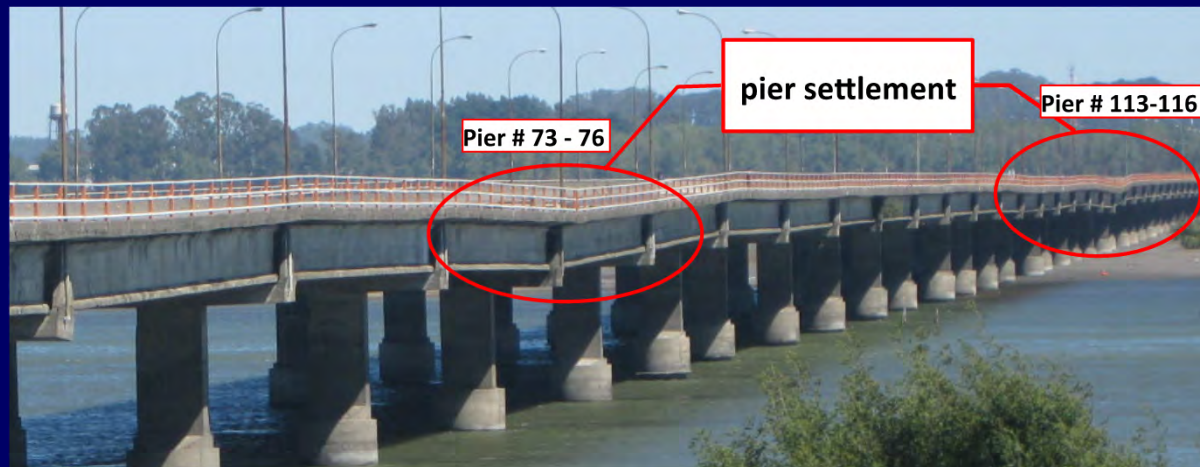
File Title	File Version	File Date	File Type
<a href="#">Full Report</a>	Version 3	01-08-2015	PDF
<a href="#">Cover Pages</a>	Version 1	09-15-2014	PDF



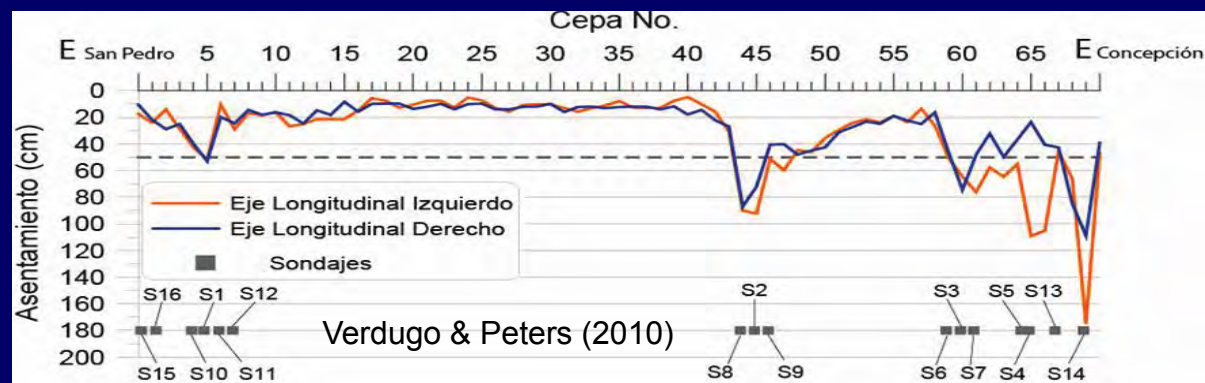
# Journal Papers

- Often contribute to *EQ Spectra* Special Issues on various earthquakes
  - More in-depth and polished than GEER report
  - If not special issue, can submit 1-2 papers for inclusion in regular issue
- *International Journal of Case Histories*
  - Electronic journal published by International Society for Soil Mechanics and Geotechnical Engineering
  - Include data along with journal

# EQ Spectra Special Issue: 2010 Chile EQ

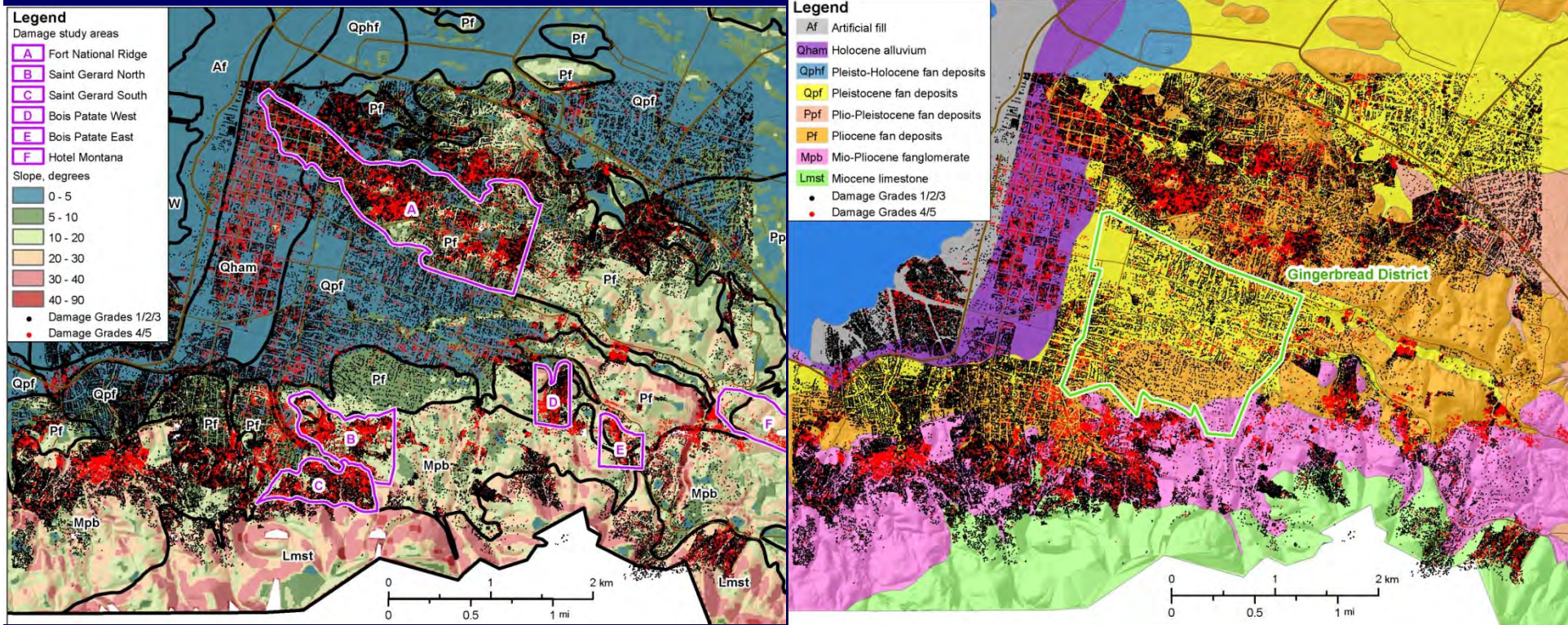


Ledezma et al. (2012)





# EQ Spectra Special Issue: 2010 Haiti EQ



Rathje et al. (2011)



# Journal of Geoengineering Case Histories

## International Journal of Geoengineering Case Histories

Paper # IJGCH\_1\_4\_1

[back to Issue # 4, Volume # 1](#) ISSN # 1790-2045

### Title:

Seismological and geotechnical aspects of the Mw=6.3 l'Aquila earthquake in central Italy on 6 April 2009

### Authors:

Giuseppe Lanzo, Professor, University of Rome, Italy; ([e-mail](#))

Giuseppe Di Capua, INGV Rome, Italy; ([e-mail](#))

Robert E. Kayen, USGS Menlo Park, USA; ([e-mail](#))

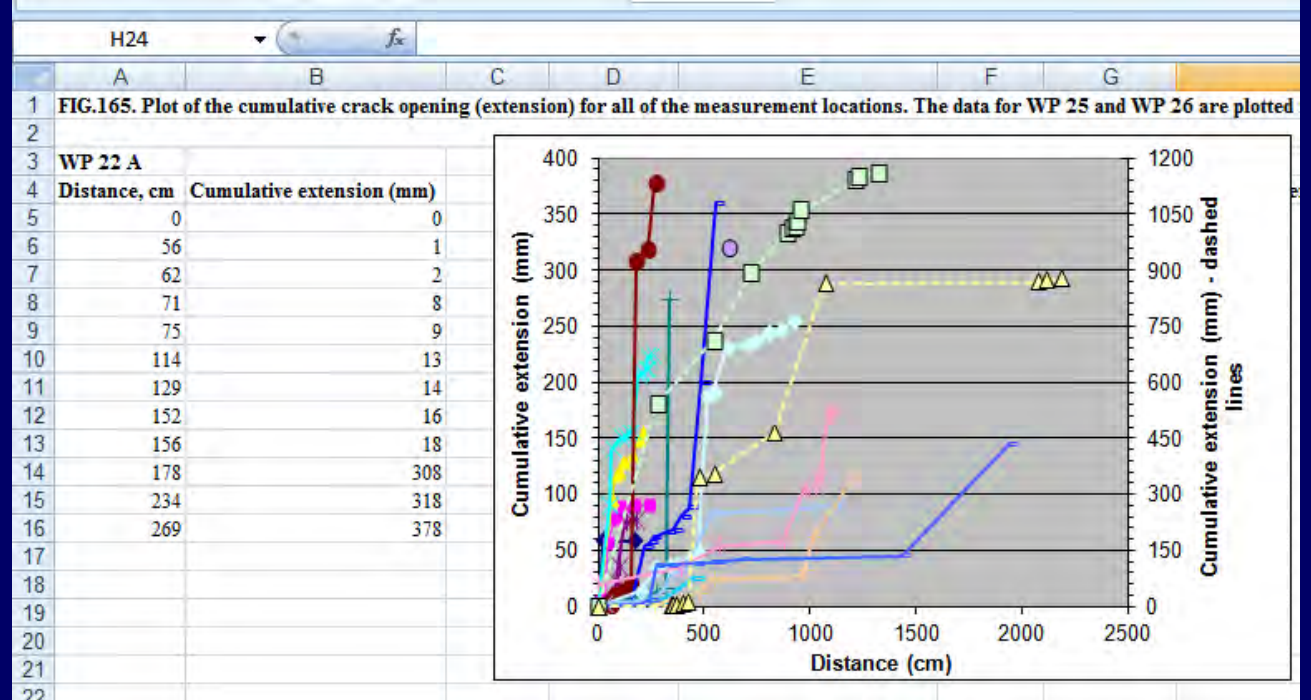
D. Scott Kieffer, Professor, Graz University of Technology, Austria; ([e-mail](#))

Edward Button, ETH Zurich, Switzerland; ([e-mail](#))


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[Case history  
geographic location  
on Google Earth](#)

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Data](#)



# Achieving our Goals



## Geotechnical Extreme Events Reconnaissance

*Turning Disaster Into Knowledge*

- Home
- Goals
- Activities
- Organization
- Post-Event Reports
- Join GEER


### GOALS

The Objectives and Purposes of **GEER** are:

1. Document geotechnical engineering and related effects of important earthquakes and other disasters to advance research and practice.
2. Advance the capabilities of individuals performing post-event reconnaissance.
3. Employ innovative technologies for post-event reconnaissance.
4. Facilitate access to equipment required for sensing and data collection.
5. Train individuals to perform effective post-event reconnaissance.
6. Disseminate timely and accurate post-event web-based reports and data.
7. Develop a coordinated response for geotechnical engineers, engineering geologists, and earth scientists, who have previously self-assembled, to form effective post-event reconnaissance teams.
8. Promote the standardization of measurement and reporting in reconnaissance efforts.

**If we do not publish our observations,  
we cannot achieve our primary goals**

# Achieving our Goals



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**Identify and pursue research using GEER observations that will advance practice**





# ***TURNING DISASTER INTO KNOWLEDGE***

- Well-documented case histories advance our understanding of extreme events
- Reconnaissance is no longer about taking photos and handwritten notes
- Geo-coded digital observations enable effective documentation and sharing
- SfM, LiDAR, and remote sensing capture post-event conditions
- Google Earth™ enables us to see the world