Welcome & PEER Overview

Khalid M. Mosalam
PEER Director, Taisei Prof. of Civil Eng., UC-Berkeley

2019 PEER Annual Meeting (PAM)

PAM Steering Committee


Gregory Deierlein


Grace Kang


Amarnath Kasalanati


Steven Kramer


Sashi Kunnath


Khalid Mosalam

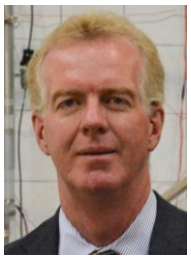

Thomas Shantz


Matthew Barnard


Craig Davis

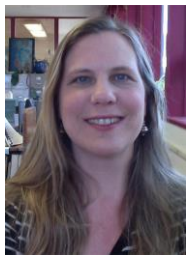

Jonathan Stewart


Ertugrul Taciroglu


John Wallace


Farzin Zareian

PEER Staff Supporting PAM


Christina Bodnar-Anderson


Erika Donald


Selim Günay


Claire Johnson


Zulema Lara


Gabriel Vargas


Helen Weary, UCLA

PEER

Jan. 17, 1994 Northridge Earthquake

More Today & Tomorrow!

Soft & weak story wood-frame collapses

Fractures in welded steel moment frame beam-to-column connections

Non-ductile concrete & weak stories

57 lives lost & about $40B in property damage

PEER

1994 Northridge Earthquake Consequences

More Today & Tomorrow!

Seismic Hazard Analysis
$\lambda(im)$
IM: intensity measure

→

Response Analysis
$G(edp \mid im)$
EDP: Engineering Demand Parameter

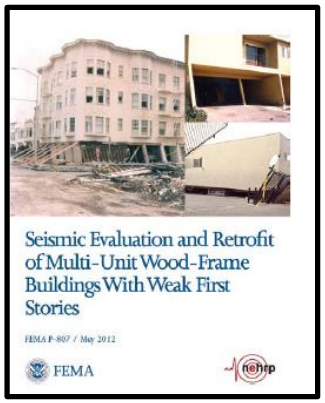
→

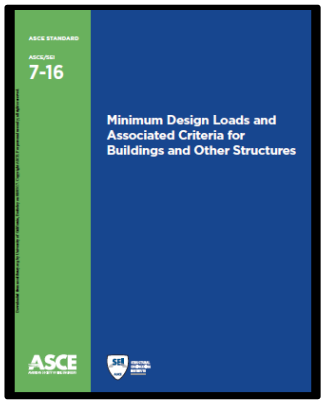
Damage Analysis
$G(dm \mid edp)$
DM: Damage Measure

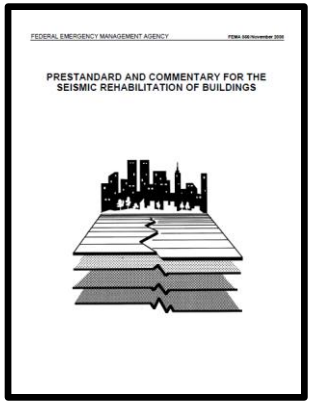
→

Loss Analysis
$G(dv \mid dm)$
DV: Decision Variable

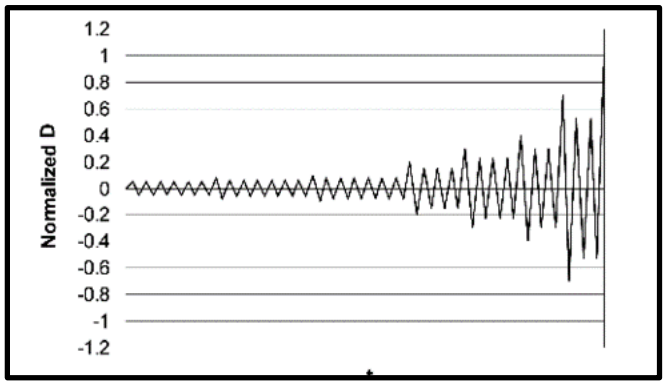
Initiation of PBEE







Changes to codes & guidelines



New load protocols & expanded testing opportunities

PEER

Older Concrete Buildings

10/la-seismic-safety-law-of-october-9-2015-peer-research/ Search

News

LA Seismic Safety Law of October 9, 2015 & PEER Research

PEER News Alerts

RSS Industry News Feed

News Archive

Media Requests

Site Map

Search

LA Seismic Safety Law of October 9, 2015 & PEER Research

On October 9, 2015, after receiving unanimous support by the Los Angeles City Council, Los Angeles Mayor Eric Garcetti signed a law mandating seismic retrofits of vulnerable buildings. The mandatory retrofit law would affect up to 13,500 soft-story wood-frame structures as well as 1,500 older concrete buildings.

Under the new ordinance, building owners will be required to accomplish the following seismic safety measures:

For soft-first story buildings built before 1980, under the new law, building owners will have one year to submit to the City documentation establishing that an acceptable retrofit has already been conducted or that a retrofit is required, and an additional year to acquire necessary permits. Property owners will have seven years total to retrofit their buildings upon receipt of notice. The seven years is inclusive of the two years granted to the property owner to conduct an assessment and obtain permits.

For non-ductile reinforced concrete, building owners will have three years to submit documentation to the City to begin the inspection process, and 10 years to establish whether an acceptable retrofit has already been conducted or that a retrofit is required. Property owners would have 25 years total to complete the retrofit work, inclusive of the first 13.

This mandate follows a plan released by the Mayor on December 8, 2014 to address the city's greatest earthquake vulnerabilities, including timelines for mandatory retrofitting of both soft-story and non-ductile reinforced concrete buildings.

PEER research about the performance of older concrete buildings, started in the late 1990s, and funded by Network for Earthquake Engineering Simulation – National Science Foundation (NEES-NSF) from 2007-2012 provided the basis of information about the seismic performance of these older concrete buildings, which can be severely damaged or collapse due to insufficient design consideration of earthquake effects. This project identified how widespread the collapse hazard is in the existing building stock, and it developed engineering and policy tools to identify and reduce the risk of hazardous buildings.

PEER research made a difference!

PEER

ShakeAlertLA Announced Early January

NEWS EARTHQUAKES

Earthquake early warning app now available for LA

ShakeAlertLA sends a warning to smartphones when shaking is expected anywhere in Los Angeles County

By Alissa Walker | @awalkerInLA | Updated Jan 3, 2019, 12:26pm PST

More in Plenary 6 Tomorrow!

PEER

Outline

- **PEER status**
- PEER vision, mission & strategic plan
- Highlights of ongoing & future PEER activities

Status (1/3)

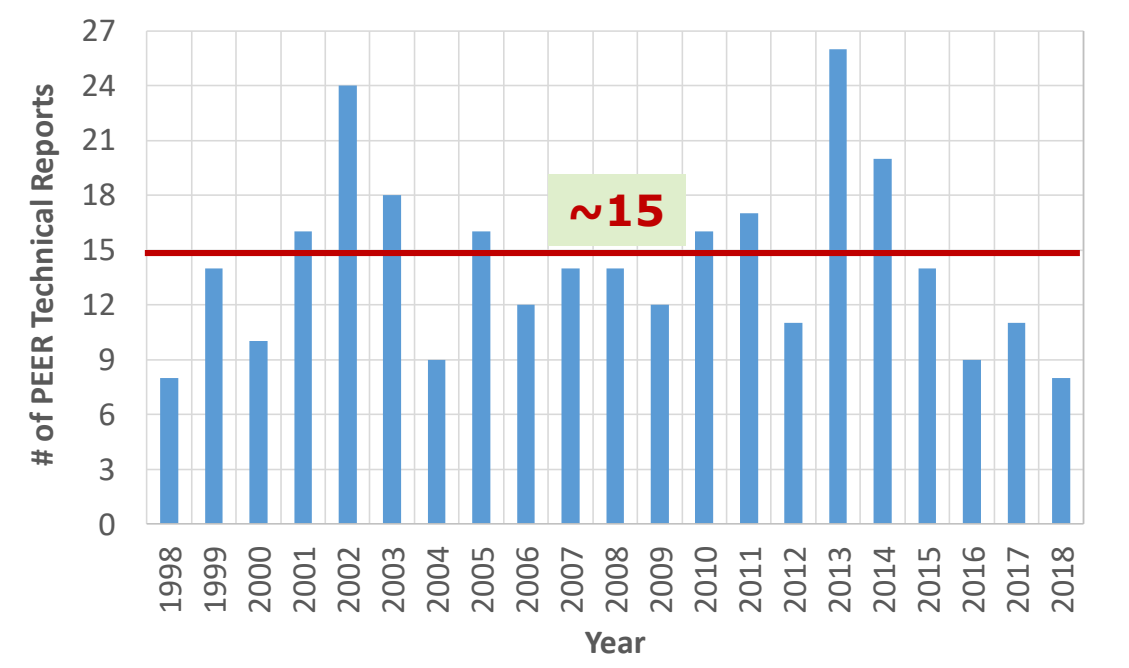
- PEER has been the primary earthquake eng. research arm of CA since 1997 & home for earthquake eng. research in Western United States.

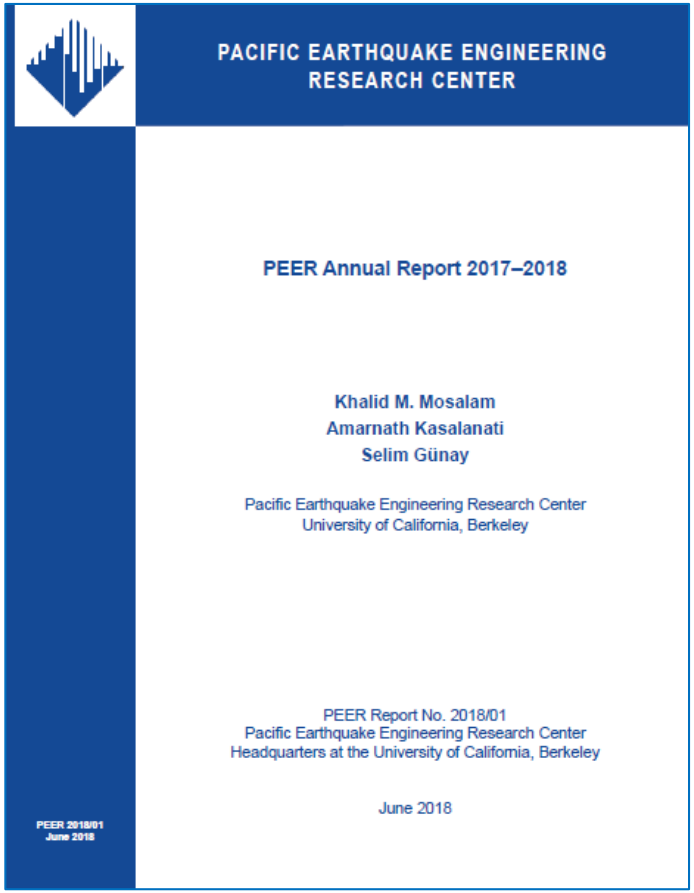
- PEER had major impacts on research & professional practice nationally & internationally and continues to provide major contributions by supporting:

  a) research in Transportation & Lifelines, Tall Buildings and Ground Motions,
  b) technology development including OpenSEES in analytical simulation, OpenFresco in hybrid simulation & BridgePBEE for PBEE in bridges, and
  c) disseminating research outcomes, supporting undergraduate interns, training graduate researchers, publishing PEER reports, and operating NISEE* library.

*NISEE: National Information Service for Earthquake Engineering

Technical Reports




PACIFIC EARTHQUAKE ENGINEERING RESEARCH CENTER

PEER Annual Report 2017–2018

Khalid M. Mosalam
Amarnath Kasalanati
Selim Günay

Pacific Earthquake Engineering Research Center
University of California, Berkeley

PEER Report No. 2018/01
Pacific Earthquake Engineering Research Center
Headquarters at the University of California, Berkeley

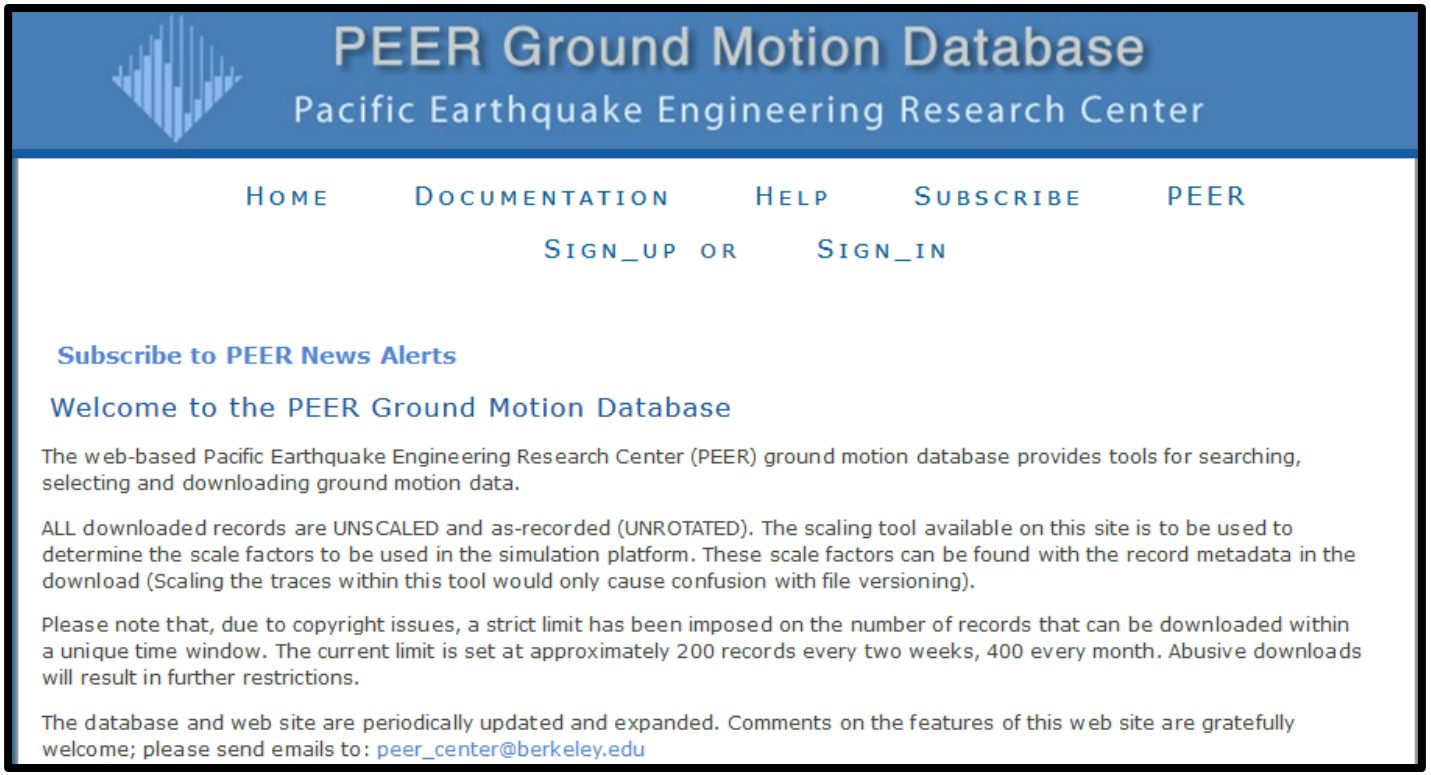
June 2018

PEER 2018/01
June 2018

To date, **299** PEER technical reports published,
http://peer.berkeley.edu/publications/peer_reports.html

PEER

Future Reports: Ground Motion Prediction & NGA Databases



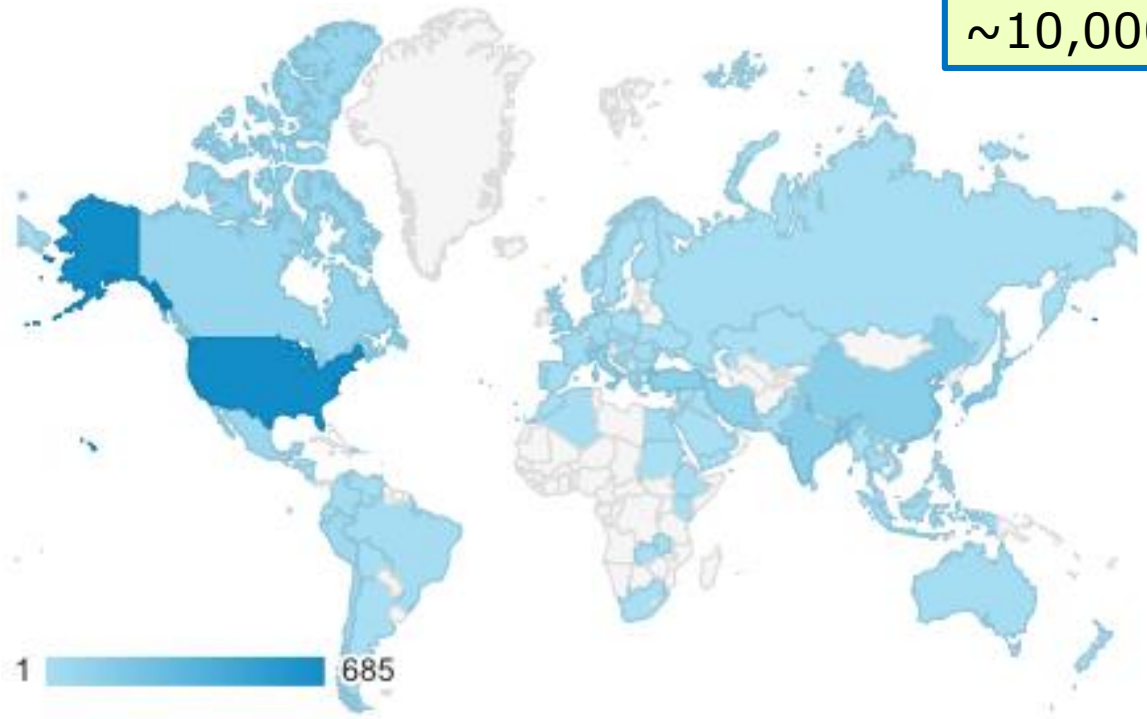
NGA-East: Final report approved and to appear as a PEER report (end of **Jan. 2019**).

NGA-Subduction: A PEER report with one ground motion model published **mid-2018**. Four new models are being finalized and a PEER report to be published **March 2019**.

PEER

NISEE-PEER Library Users [Oct. 1 – Dec. 31, 2018]

~10,000 members



(From Google Analytics)

NISEE-PEER Library – Extensive collection of hard copy & digital texts, images & software specializing in earthquake structural eng., geotechnical eng., engineering dynamics, engineering seismology, earthquake public policy & natural hazard risks.

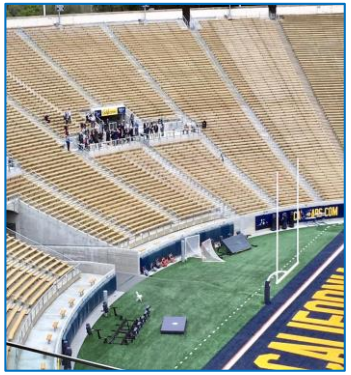
https://nisee.berkeley.edu/elibrary/

PEER

Highlights of 2018 Events (1/3)

HayWired workshop – Jan. 2018
https://peer.berkeley.edu/news/peer-usgs-workshop-haywired-and-building-codes

HayWired scenario press conference – April 2018
https://peer.berkeley.edu/news/haywired-scenario-rollout-april-18-2018
PEER is a partner in the HayWired Coalition (HayWired scenario creates a platform where research can dig deeper into developing solutions to **shorten the region's recovery time**.)

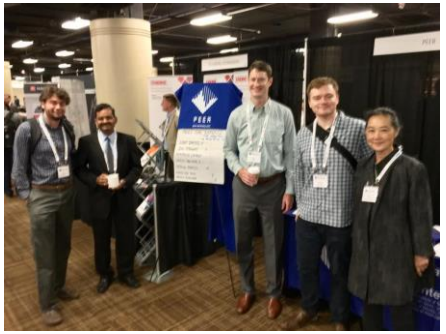


PEER

Highlights of 2018 Events (2/3)

Cal Day, UC Berkeley lab, April 2018

PEER participation at 11NCEE, June 2018
https://peer.berkeley.edu/news/peer-participation-11ncee



PEER researchers workshop, Aug. 2018
https://peer.berkeley.edu/news/peer-researchers'-workshop-summary

PEER

Highlights of 2018 Events (3/3)

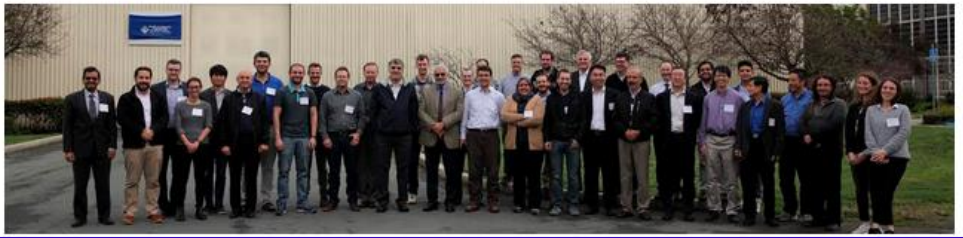
March 2018 – MTS/PEER Hybrid Simulation Workshop

Hybrid Simulation Workshop Hosted by PEER and MTS

PEER, in collaboration with MTS's Lab Expert Seminar Series, held a two day workshop on March 20-21, 2018, focusing on a comprehensive exploration of hybrid simulation technologies and methods. The event was held at the UC Berkeley Richmond Field Station and had a great turnout with active participation of 45 attendees.

The first day of the workshop focused on quasi-static (slow) hybrid simulation. The morning session was devoted to lectures that described an overview of the methodology and fundamentals. Professor Khalid Mosalam, PEER Director and Professor at UC

Hybrid Simulation Testing Demonstration at PEER-UC Berkeley Lab Shaking Table



http://apps.peer.berkeley.edu/events/mts2018/

PEER

Status (2/3)

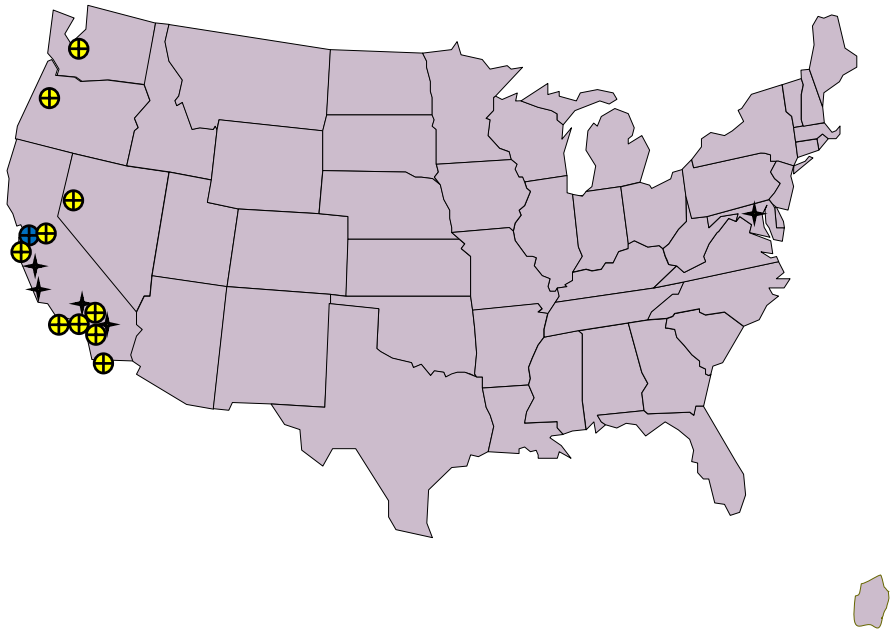
- Today, PEER comprises **11** core institutions & **6** educational affiliates with over **200** researchers to participate in or contribute to PEER research activities.
- These researchers have expertise in geo-hazards, building & bridge systems, network systems, experimental & analytical techniques, and new technologies.
- With access to this expertise, excellent research facilities at core institutions, and culture of developing powerful & robust methodologies, simulation tools & databases, PEER is poised to achieve **Resilient Design for Extreme Events**.

PEER: University, Government, Professional & Industry Alliance

PEER: **The Pacific Earthquake Engineering** Research Center is a multi-institutional research & education center with headquarters at the **University of California, Berkeley**.

6 Educational Affiliates

- California Polytechnic State University, San Luis Obispo
- California State University, Los Angeles
- California State University, Northridge
- San Jose State University
- University of Hawaii
- Johns Hopkins University



11 Core Institutions

- University of California, Berkeley - Lead Institution
- California Institute of Technology
- Oregon State University
- Stanford University
- University of California, Davis
- University of California, Irvine
- University of California, Los Angeles
- University of California, San Diego
- University of Southern California
- University of Nevada, Reno
- University of Washington

PEER combines resources of major research universities in Western US where earthquake hazards are largest. PEER is able to represent consensus of many experts. PEER Mission focuses on **Integrated Performance-based Engineering (PBE) Methodology** towards **Resilient Design for Extreme Events.**

PEER

Why "**Resilience**"?

National Benefit-Cost Ratio Per Peril *BCR numbers in this study have been rounded	Federally Funded	Beyond Code Requirements
Overall Hazard Benefit-Cost Ratio	6:1	4:1
Riverine Flood	7:1	5:1
Hurricane Surge	Too few grants	7:1
Wind	5:1	5:1
Earthquake	3:1	4:1
Wildland-Urban Interface Fire	3:1	4:1

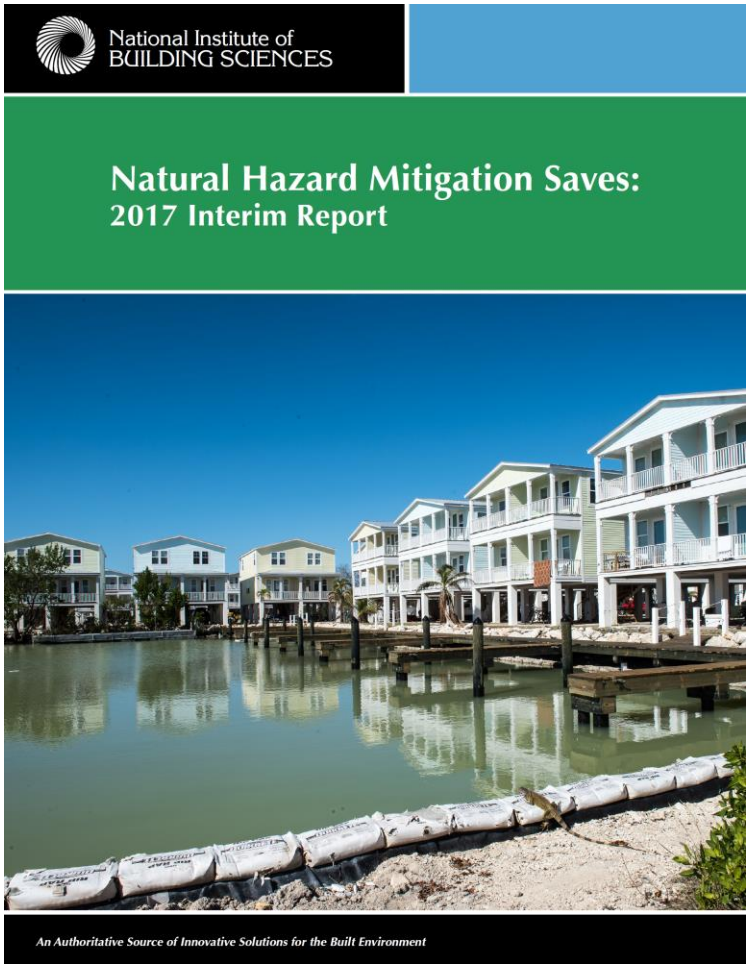
Table 1. Benefit-Cost Ratio by Hazard and Mitigation Measure.

Two mitigation strategies:

Federal grants: The impacts of 23 years of federal mitigation grants provided by FEMA, the Economic Development Administration (EDA), and Department of Housing and Urban Development (HUD), resulting in a national benefit of $6 for every $1 invested.

Beyond code requirements: The costs and benefits of designing all new construction to exceed select provisions in the *2015 International Building Code* (IBC) and the *2015 International Residential Code* (IRC) and the implementation of the *2015 International Wildland-Urban Interface Code* (IWUIC). This resulted in a national benefit of $4 for every $1 invested.

Modern mitigated homes withstood Hurricane Irma, Good **mitigation** learns from mistakes to build **more-resilient communities**.



Mitigation pays back at a benefit-cost ratio of over **5:1**; for every $1 spent, more than $5 are saved, not including measures of human suffering (**World Bank, 2008**).

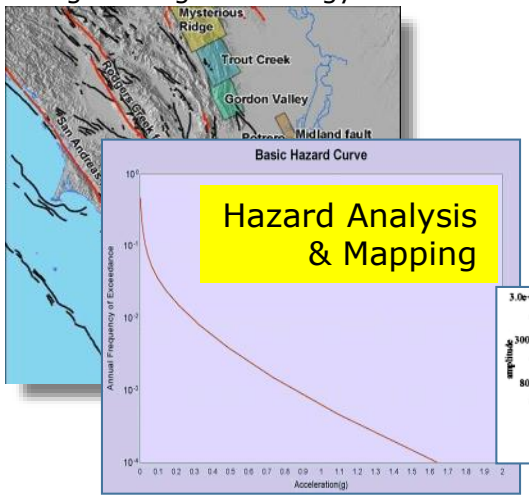
PEER

Status (3/3)

- In past decade, there has been rapid growth in available data, affordable sensors, High-Performance Computing (HPC) & **Artificial Intelligence** (AI) tools.
- These tools are now popular in domains such as **Structural Health Monitoring** (SHM), city-scale simulations & physics-based ground motion modeling.
- PEER recognizes the far-reaching potential of these tools if incorporated into **research & practice of earthquake engineering and other extreme events building on past & on-going research in PBEE**.

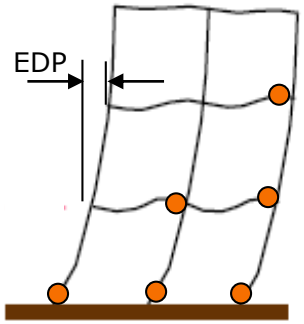
PEER DNA: Integrated PBEE Methodology

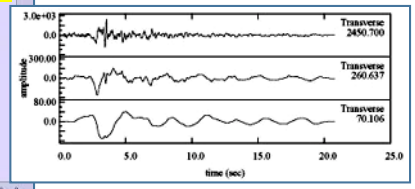
Engineering Seismology



Hazard Analysis & Mapping

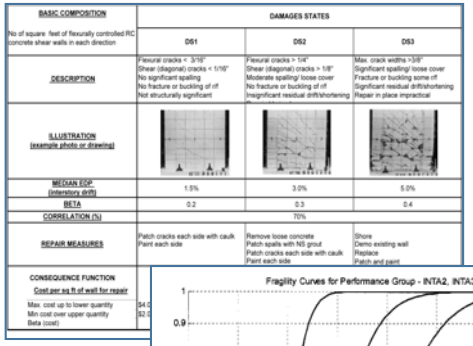
HPC simulation

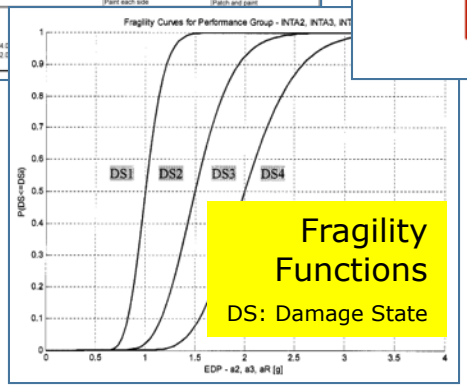




Ground motion selection & scaling

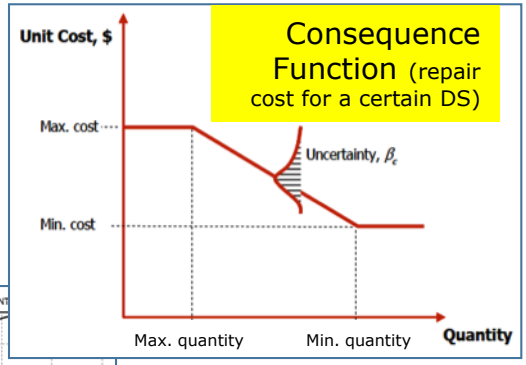
Performance Databases



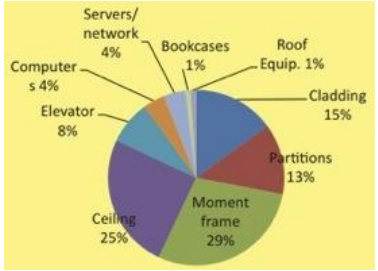


Fragility Functions

DS: Damage State



Consequence Function (repair cost for a certain DS)



Loss Assessment

Seismic Hazard Analysis	Response Analysis	Damage Analysis	Loss Analysis
$\lambda(im)$	$G(edp \mid im)$	$G(dm \mid edp)$	$G(dv \mid dm)$
IM: intensity measure	**EDP**: Engineering Demand Parameter	**DM**: Damage Measure	**DV**: Decision Variable

Probabilistic Assessment of:
- ✓ Cost of repair & Downtime
- ✓ Lifecycle costs
- ✓ Casualties
- ✓ *Embodied energy*

$$\lambda(DV > dv) = \int_{im}\int_{dm}\int_{edp} G(dv \mid dm)\, dG(dm \mid edp)\, dG(edp \mid im) \left| d\lambda(im) \right|$$

PEER

Enabling Technology Development

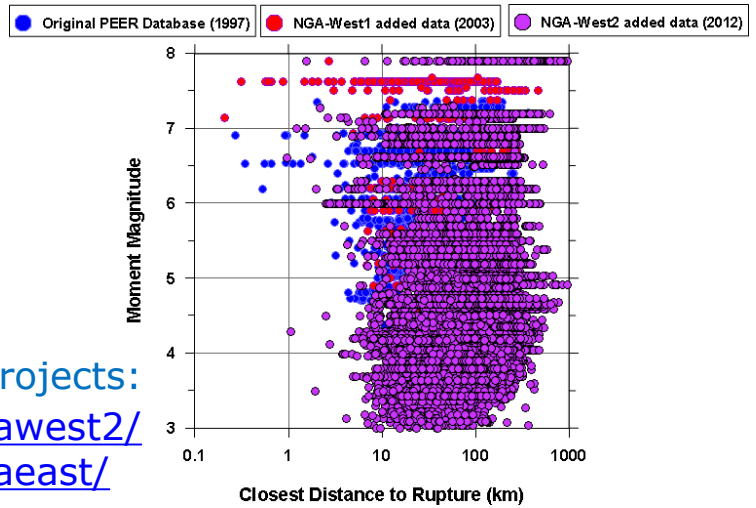
Analytical Simulation → OpenSees

Open System for Earthquake Engineering Simulation, http://opensees.berkeley.edu/

Hybrid Simulation (HS) → OpenFresco

Open-source Framework for Experimental Setup and Control, http://openfresco.berkeley.edu/

Databases →



Next **G**eneration **A**ttenuation (**NGA**) Projects:
http://peer.berkeley.edu/ngawest2/
http://peer.berkeley.edu/ngaeast/

PEER STRUCTURAL PERFORMANCE DATABASE SPD
https://nisee.berkeley.edu/spd/

Seismic Performance Observatory
Pacific Earthquake Engineering Research Center
https://peer.berkeley.edu/spo

PEER

OpenSEES & NGA Analytics for 2018

OpenSEES

Visitors
130,496
% of Total: **100.00% (130,496)**

Visits
403,316
% of Total: **100.00% (403,316)**

Pageviews
2,188,456
% of Total: **100.00% (2,188,456)**

Visitors
39,519
% of Total: **100.00% (39,519)**

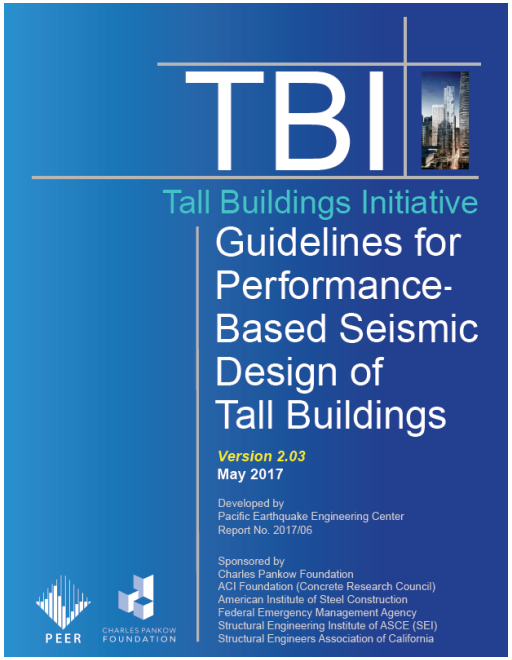
Visits
92,355
% of Total: **100.00% (92,355)**

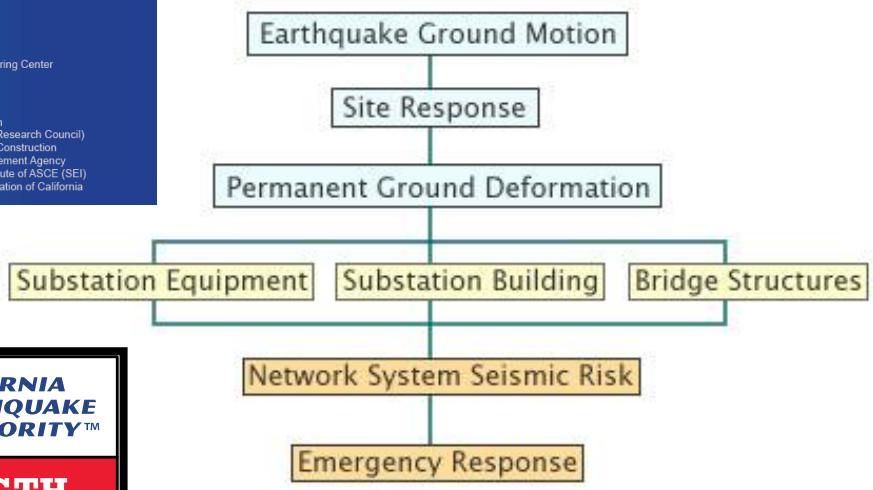
Pageviews
178,057
% of Total: **100.00% (178,057)**

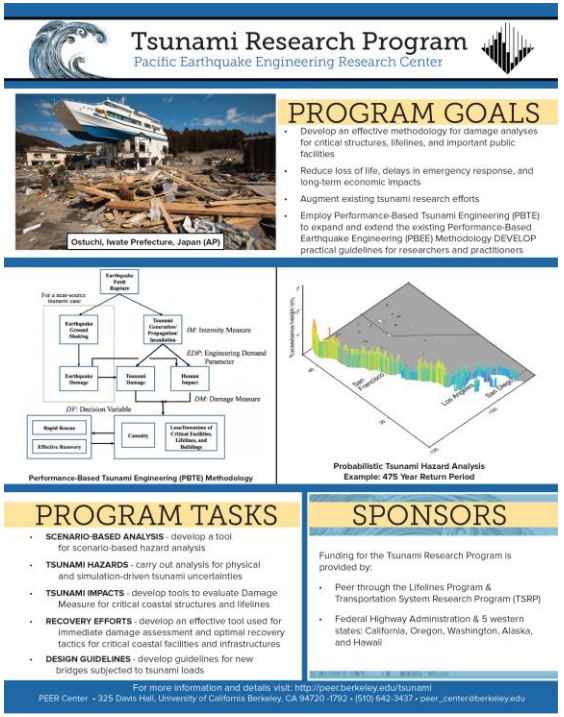
NGA

PEER

Mega-Projects







PEER

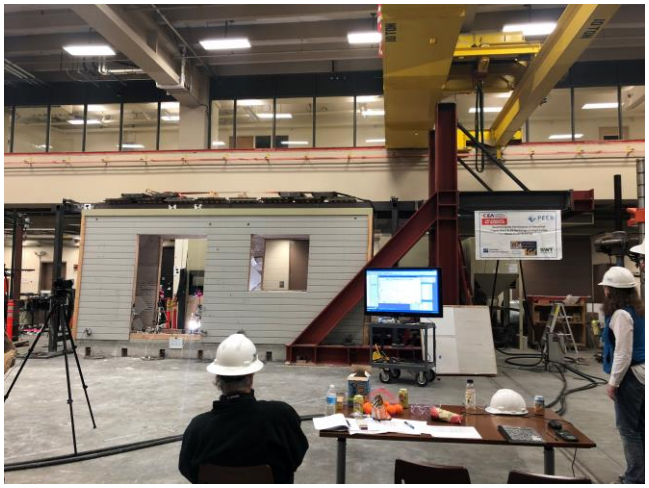
CEA Project

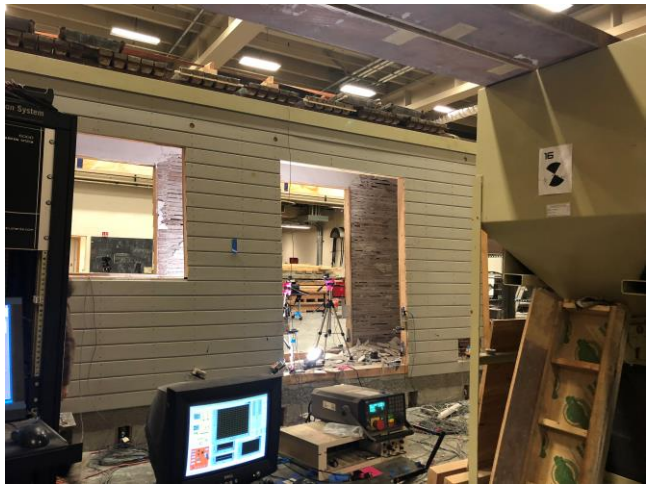
Quantifying Performance of Retrofitted & Unretrofitted Cripple Walls & Sill Anchorage in Single Family Wood-frame Buildings

Objective: Develop "fragility" (damage) function modification factors for use by loss modelers in evaluating raised-foundation homes that have a cripple-wall & sill-anchorage retrofit

Technical progress as planned in the contract with end date of **March 2020**.

Testing on 1/11/2019!



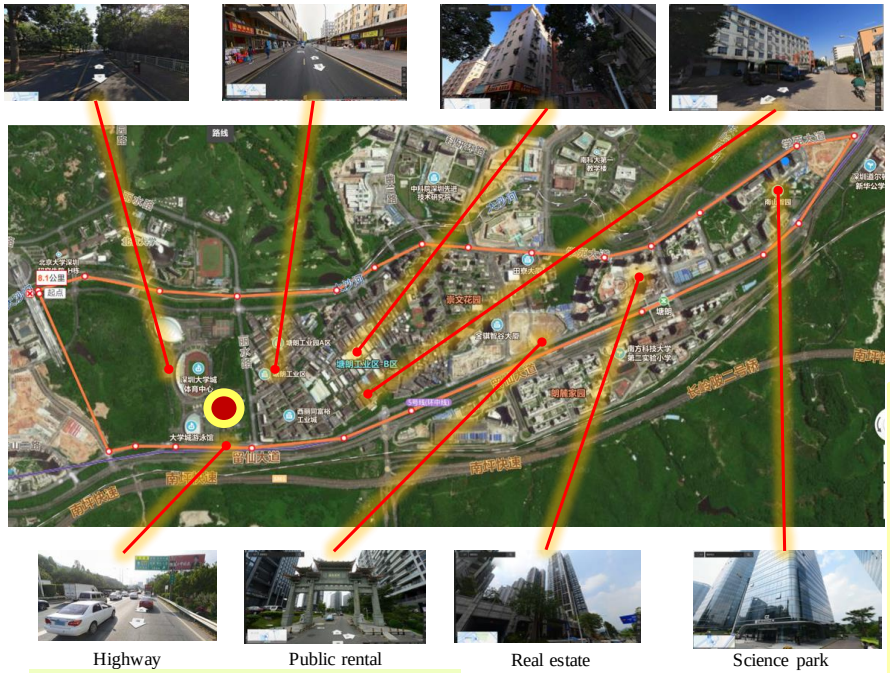


More in concurrent Discussion C6 Tomorrow!

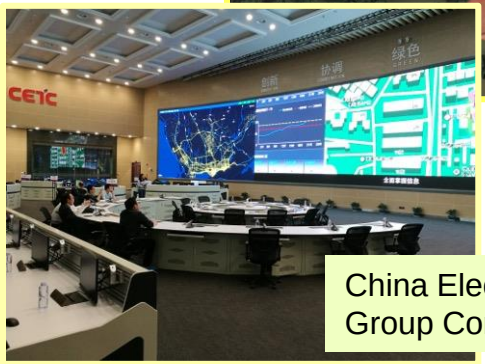
PEER

New Project: PEER-TBSI Research Towards Resilient Shenzhen, China

- About **20,000,000 RMB** (**~$3M**) funds from Shenzhen Innovation Commission approved **Jan. 2019**
- A multidisciplinary team from UC-Berkeley, MIT, CMU, Tsinghua hosted by TBSI* in Shenzhen
- Team expertise includes Structure Eng., Machine Learning, Sensor Networks & Computer Simulation
- Team will develop the **digital twin of urban system** for physics-based simulation & machine learning techniques to create **city's resiliency against hazardous conditions**.
- A 4 km^2 testbed in Shenzhen will be outfitted with sensors to validate developed algorithms and tools.
- As a concerted effort with PEER, **TBSI welcome visitors to Shenzhen to collaborate**.



4 km^2 testbed in Shenzhen



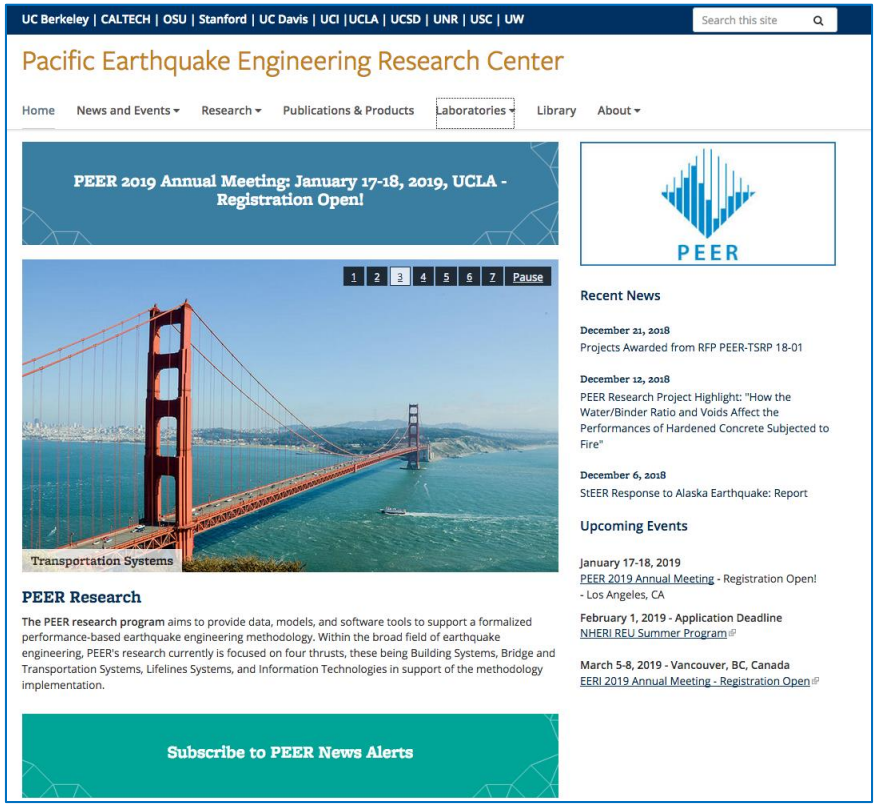
China Electronics Technology Group Corporation (**CETC**)

***TBSI**: Tsinghua-Berkeley Shenzhen Institute new **fully instrumented campus**

PEER

PEER Website Gets a Makeover (Open Berkeley Drupal Platform)

- Critical solutions to security, accessibility & maintenance
- Continuous improvement & new features automatically rolled out to all sites

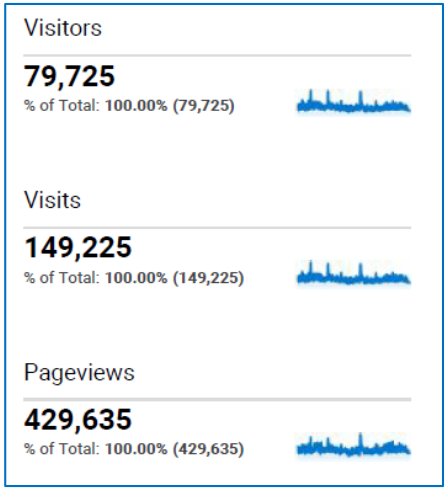


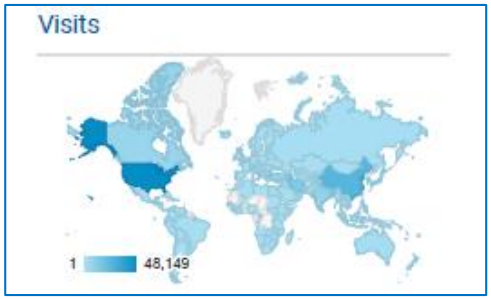
New PEER Website went live on July 23, 2018

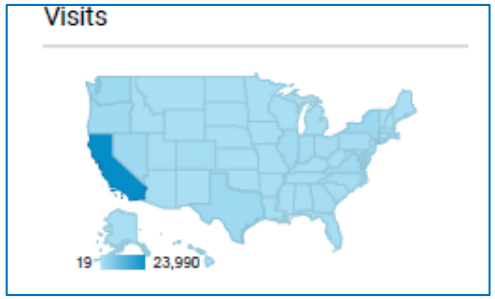
PEER products & most visited sites:

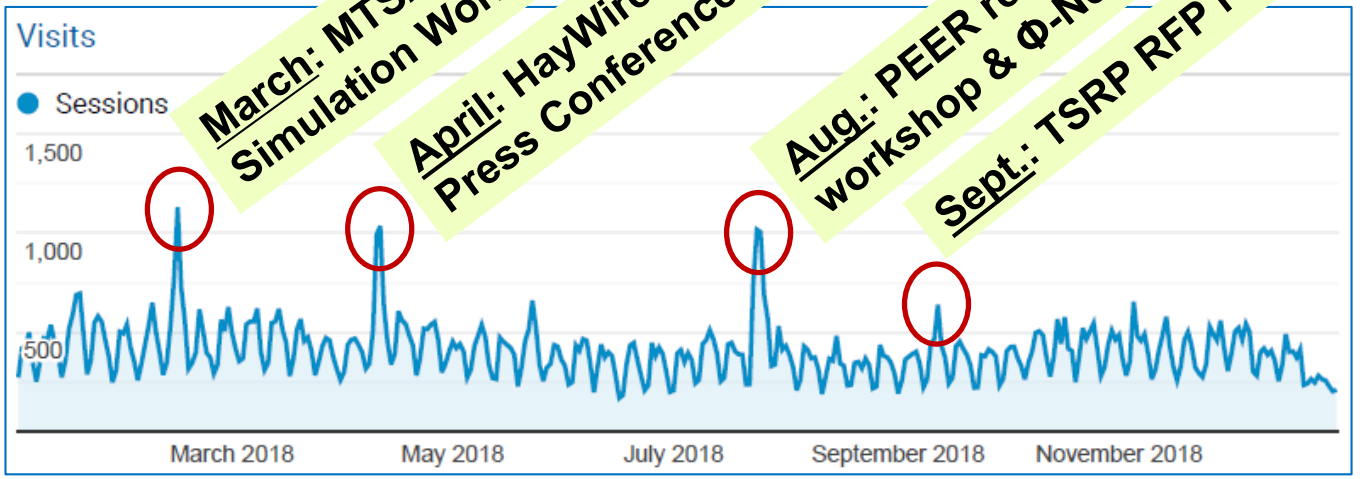
PEER

PEER Analytics for 2018









March: MTS/PEER Hybrid Simulation Workshop

April: HayWired Scenario Press Conference

Aug.: PEER researchers workshop & Φ-Net Challenge

Sept.: TSRP RFP release

PEER

Outline

- PEER status
- **PEER vision, mission & strategic plan**
- Highlights of ongoing & future PEER activities

PEER

Vision

PEER's vision is to be the leader in **Resilient Design for Extreme Events** affecting the built environment. PEER will lead the research and development of new modeling, analysis, assessment, and design frameworks, technologies and tools to enhance the **resilience of communities** exposed to natural hazards.

PEER

Mission

PEER's mission is to:

1. develop, validate, and disseminate **performance-based engineering technologies** for buildings, critical civil structures, and infrastructure networks subjected to earthquakes and other natural hazards, with the goal of achieving community resilience; and
2. equip the earthquake engineering and other extreme event communities with **tools, technologies and the future workforce**, through collaboration between PEER institutions and industry partners.

PEER

Strategic Goals

1. Bring PEER institutions closer, with **focus on multi-institution research work and interaction**;
2. Continue **innovative research in earthquake engineering** and expand to other extreme events;
3. Develop **new AI tools for extreme events**, in combination with physics-based analysis tools;
4. Expand **outreach activities** and increase the advocacy role in shaping public policy; and
5. Identify and **pursue new, large and sustained funding sources** to achieve these goals.

PEER

Committee Structure in 2019

1. Institutional Board (**IB**): provides policy level guidance and oversight to the PEER Director and Associate Director.

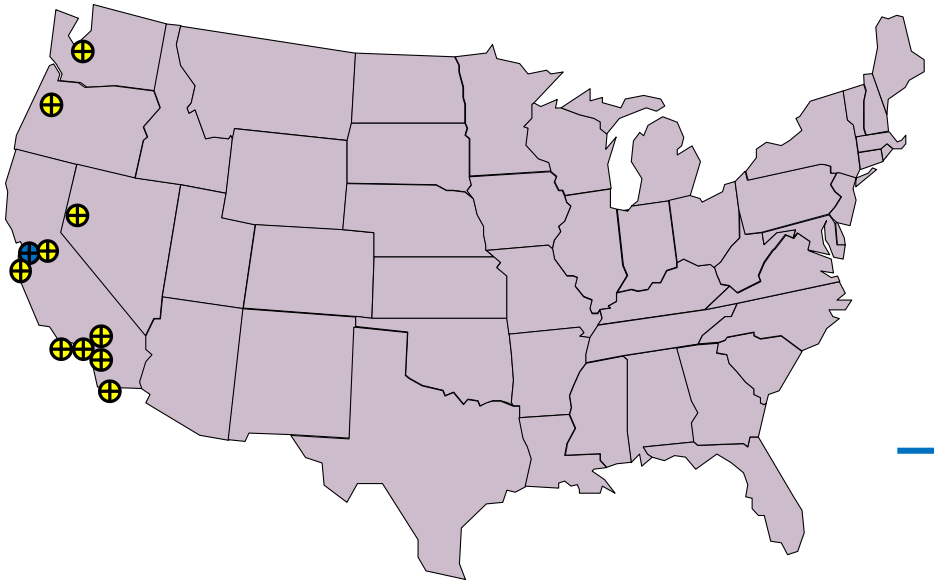
2. Research Committee (**RC**): sets the research agenda based on PEER's vision and work with stakeholders and industry partners to identify the needs of the community and integrate them into the research plan.

3. Industry Advisory Board (**IAB**): identifies present and future needs of the profession and the engineering community.

4. Resource Identification Committee (**RIC**): pursues existing opportunities and actively seeks out new sources of funding to help realize PEER's vision.

PEER: University, Government, Professional & Industry Alliance

Government/Industry Advisory Board Members



Caltrans

CEA CALIFORNIA EARTHQUAKE AUTHORITY

Degenkolb

FORELL/ELSESSER ENGINEERS
Structural Engineers

Holmes

PG&E

SOUTHERN CALIFORNIA EDISON
An EDISON INTERNATIONAL Company

VALIDUS RESEARCH

Business & Industry Partnership (BIP) Members

ARX PAX

BECHTEL

Exponent

FM Global

IHI

MICRON OPTICS

sage ENGINEERS

SOM

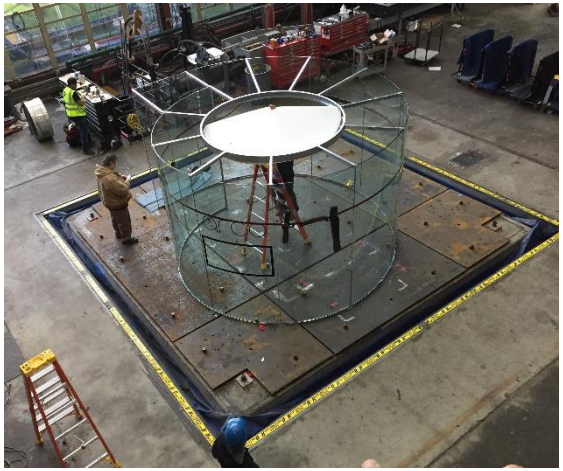
WJE

WALTER P MOORE

PEER

PEER Labs: Service to Industry

- Tesla
- ABB
- Caterpillar
- US Gypsum
- Autostore
- Multi-Stack
- HuntAir
- Engineered Air
- MindCore
- Southern States
- VMC Group
- Structural Integrity
- Soft Story Brace Co.
- EQX Global
- MuraFlex



PEER

PEER Labs: Research & Outreach

Research

- Resilient Bridge Column Tests – Shaking Table & Hybrid Simulation
- Non-structural Systems Anchorage Tests
- Hybrid Shaking Table Tests
- Steel Column Tension Tests

Outreach

- Kennedy High School – Richmond, CA
- Pre-College Trio – Berkeley, CA
- Gyeonggibuk Science High School, Korea

PEER

Outline

- PEER status
- PEER vision, mission & strategic plan
- **Highlights of ongoing & future PEER activities**

New Projects (1/2)

- PEER supports research to **lessen impacts of earthquakes on the transportation systems**, including highways & bridges, port facilities, high-speed rail & airports.
- Every **Sept. 12**, PEER issues request for proposals aligned with current **TSRP** research priorities & vision.
- 2018 RFP: **47** proposals received, covering **18 of 19** topics in Geotechnical Eng. (G), PBEE of Bridge & Other Transportation Systems (S), PBEE Methodology (M), PBEE Tools (T), and Different Areas of Application (A).
- Each proposal received **three** independent reviews. Based on priorities of the TSRP vision & evaluation criteria, **11** new projects are approved (~**$800,000**).
- This is in addition to currently active **23** projects & **8** completed ones in 2018.

More in Concurrent Discussions Tomorrow!

PEER

New Projects (2/2)

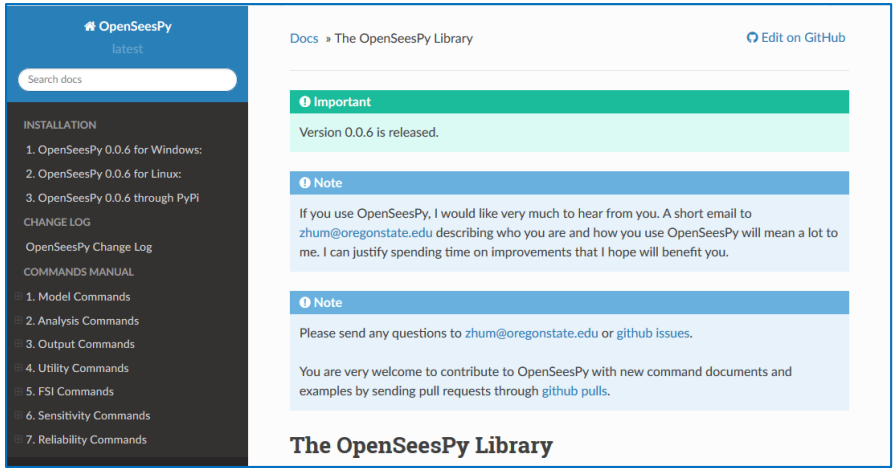
1. G1: **Analysis of fine-grained soil failure in Chiba during 2011 Tohoku Earthquake, and development of community lab test database**; PI: Scott Brandenberg, UCLA; Co-PI: Jonathan Stewart, UCLA
2. G3: **DEM modeling of the influence of depositional fabric on the mechanical properties of granular sediments using XRT data**; PI: Nicholas Sitar, UC Berkeley
3. S1: **Establishing bridge column capacity limit states through modeling and simulation**; PI: Sashi Kunnath, UC Davis
4. S1&T2: **Bridge functionality instead of component damage as PBEE metric**; PI: Michael Scott, OSU; Co-PI: Kevin Mackie, University of Central Florid
5. S3: **New seismically resilient system for HSR, ports and vehicular transportation systems: Reducing downtime, construction cost and post-earthquake repair**; PI: Dawn Lehman, UW; Co-PI: Charles Roeder, UW
6. M1: **Non-ergodic ground-motion model for California**; PI: Norm Abrahamson, UC Berkeley
7. M2: **Validation and utilization of physics-based simulated ground motions for bridge performance assessment**; PI: Farzin Zareian, UCI; Co-PI: Mayssa Dabaghi, American University of Beirut; Consultant: Sanaz Razeian, USGS
8. M3: **Inclusion of modeling uncertainty, parameter uncertainty and parameter estimation uncertainty in PBSD of ordinary standard RC bridges**; PI: Joel Conte, UCSD
9. T4: **City-scale multi-infrastructure network resilience simulation tool**; PI: Kenichi Soga, UC Berkeley; Co-PIs: Joan Walker, UC Berkeley, Alexandre Bayen, UC Berkeley & Jack Baker, Stanford
10. A1: **Tsunami-borne debris loading on bridges**; PI: Ian Buckle, UNR; Co-PIs: Denis Istrati, UNR & Michael Scott, OSU
11. A2: **Seismic evaluation of the California high speed rail system**; PI: John Stanton, UW; Co-PI: Marc Eberhard, UW

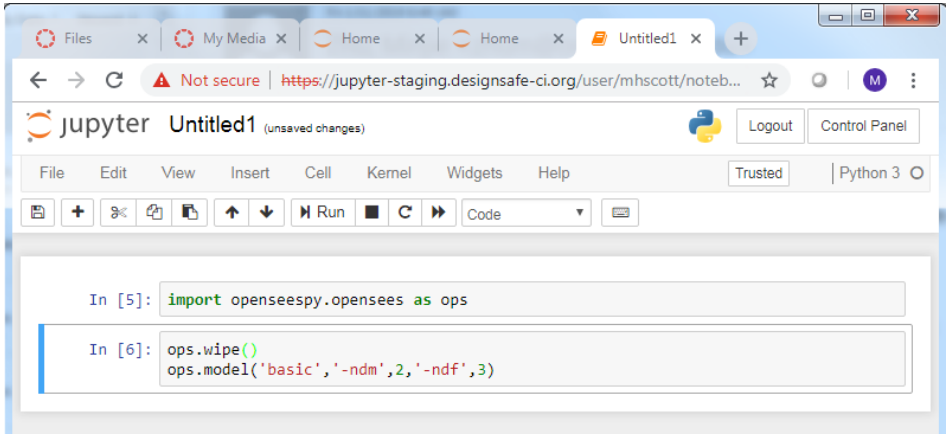
PEER

New in OpenSEES

OpenSeesPy = OpenSees + python™

- Python3 module available for OpenSEES
- All commands from Tcl have Python equivalents
- Leverage other Python tools to build applications around OpenSEES
- Available soon in Jupyter Notebooks on JupyterHub at DesignSafe

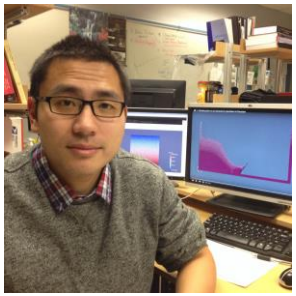




- Uses python instead of tcl
- Installation + Commands + Examples

https://openseespydoc.readthedocs.io

Developed by Dr. Minjie Zhu, Oregon State University

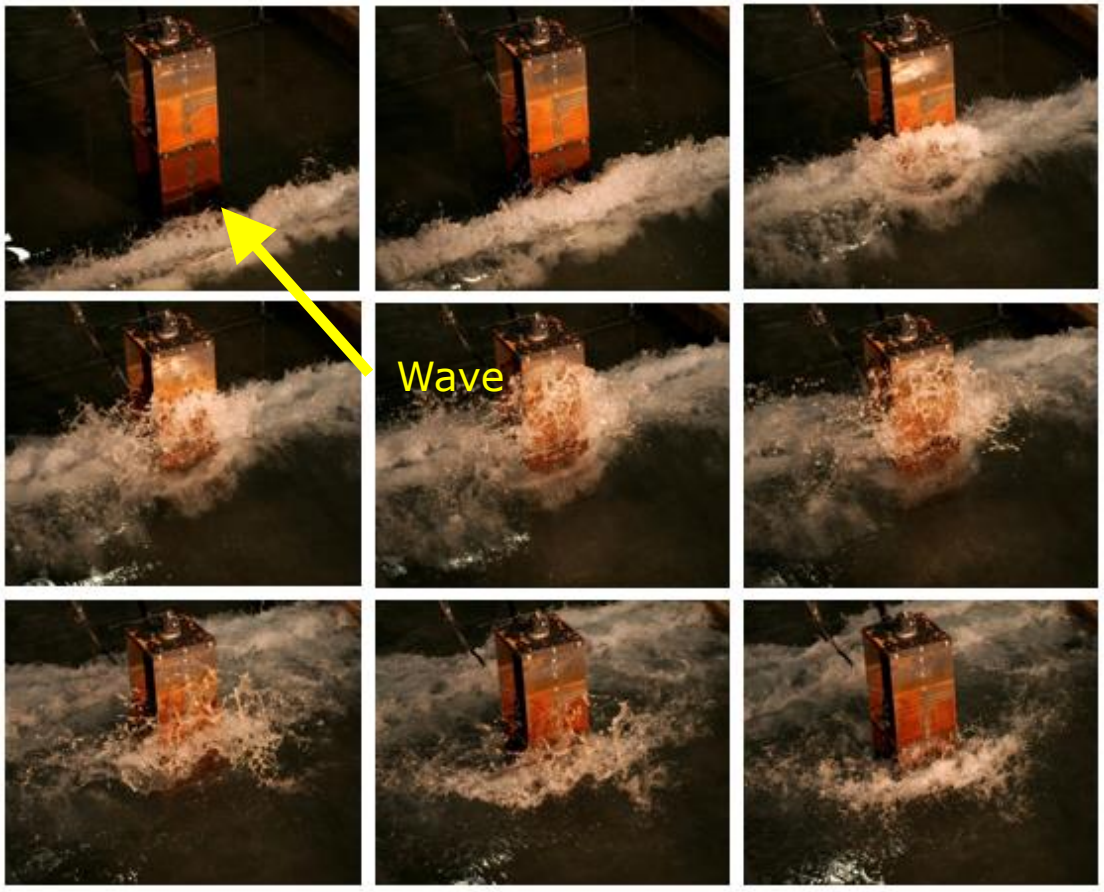


Oregon State University

PEER

New in OpenSEES – Fluid-Structure Interaction

- Particle Finite Element Method (PFEM) implementation validated for 2D problems
- 3D implementation & validation underway
- Testbed – Steel frame building model tested in long wave flume at OSU
  - ✓ Free vibration data for various inundation depths
  - ✓ Dynamic response and pressure distributions for wave loading



Oregon State University

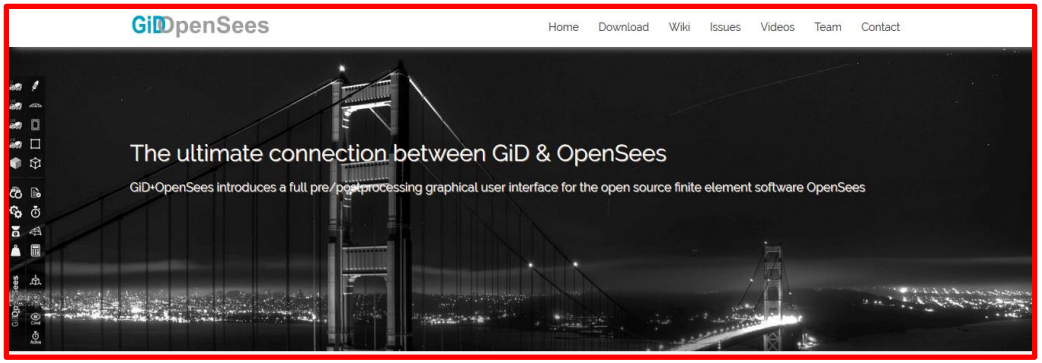
PEER

New in OpenSEES

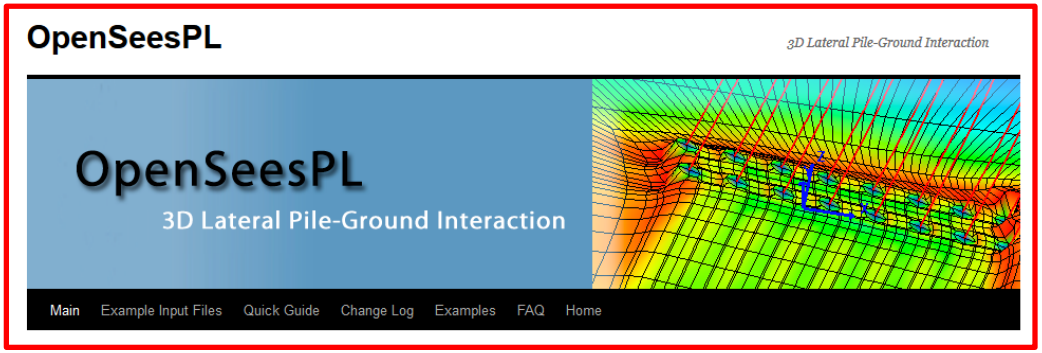
OpenSees: Regular sequential version

OpenSeesSP: For performing analysis of very large models

OpenSeesMP: For performing parametric studies, running many ground motions, etc.



GiD & OpenSEES
http://gidopensees.rclab.civil.auth.gr/



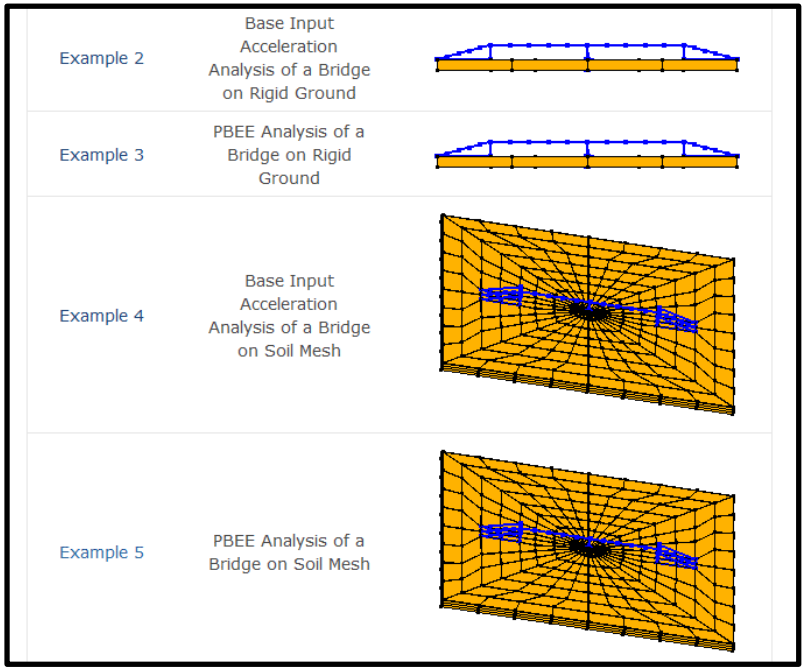
OpenSeesPL
http://soilquake.net/openseespl/

OpenSEES is growing not only in capabilities, but also in versions & user interfaces.

PEER

New Products

BridgePBEE: Software for PBEE of highway bridges with a GUI that runs OpenSEES for structural analyses



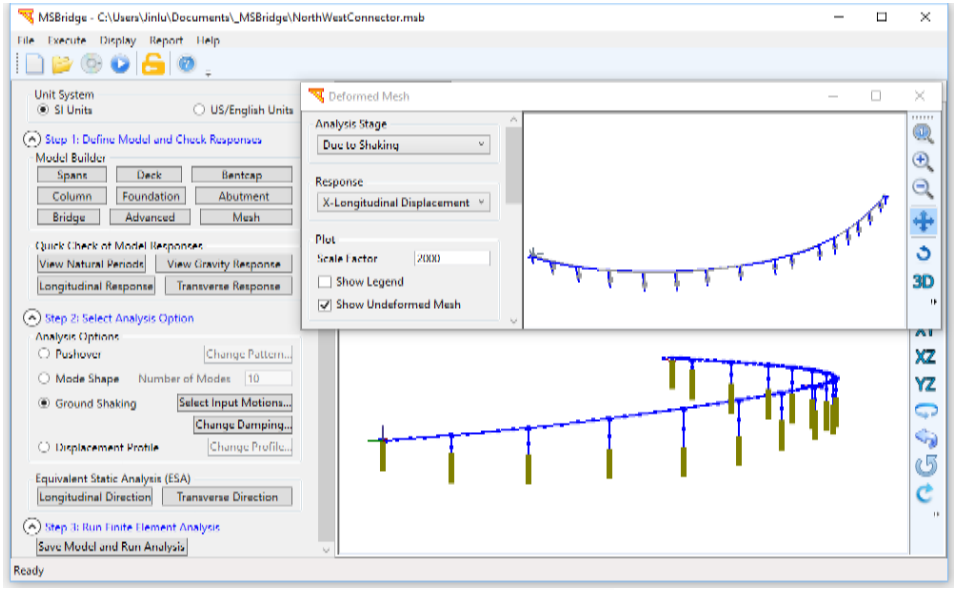
Developed by Prof. ElGamal Group, UCSD

PEER

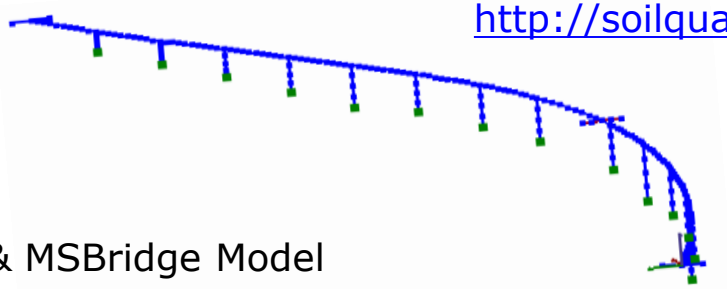
MSBridge: GUI for Seismic Analysis of Multi-Span Bridge-Ground Systems Integrated with PEER PBEE Framework

- A computational user interface (MSBridge) combine nonlinear THA (using OpenSEES) with PEER PBEE.

- Displays seismic response ensembles & PBEE outcomes



http://soilquake.net/msbridge

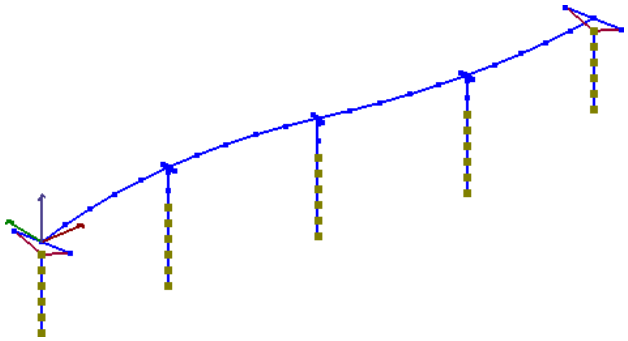


Eureka Channel Bridge & MSBridge Model

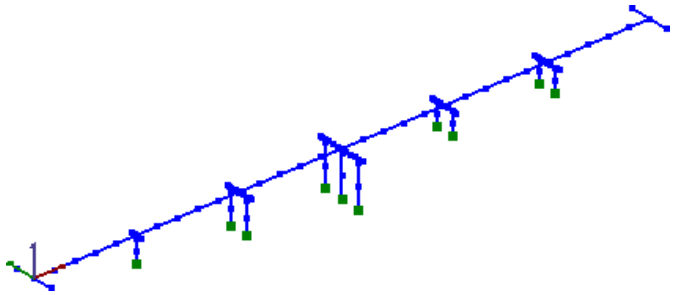
Details in: **Elgamal, A., Lu, J., Almutairi, A., and Mackie, K (2017). MSBridge: OpenSees Pushover and Earthquake Analysis of Multi-span Bridges - User Manual, Beta 1.0.**

PEER

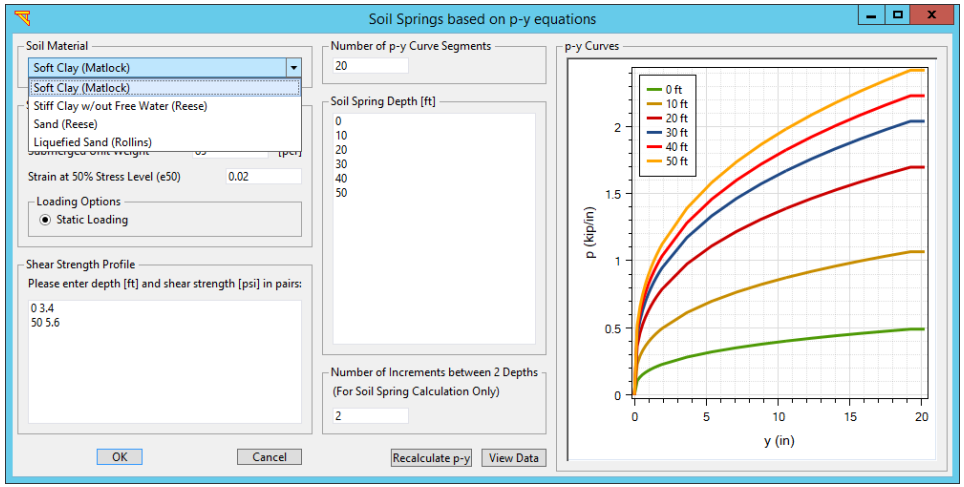
MSBridge: Capabilities



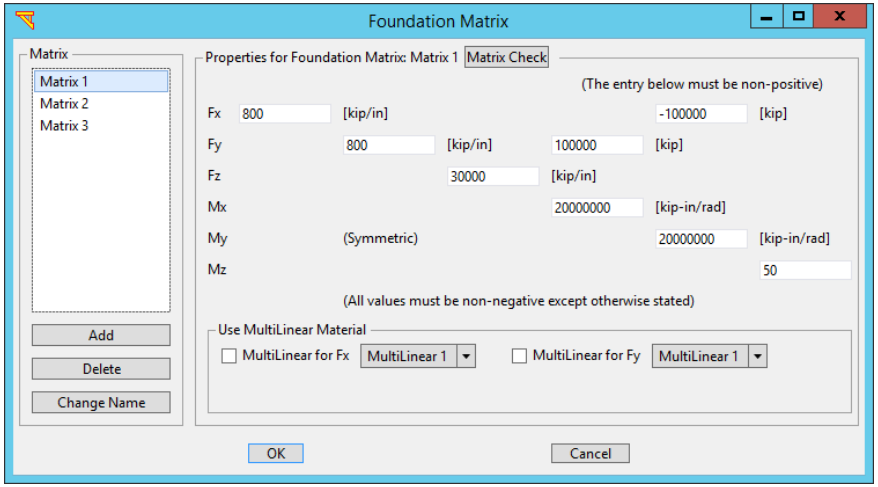
Curved bridge with foundation & soil springs



Bridge with different number of nonlinear fiber element columns for each bent



p-y springs: a) Soft clay (Matlock); b) Stiff clay without free water (Reese); c) Sand (Reese); & d) Liquefied sand (Rollins)

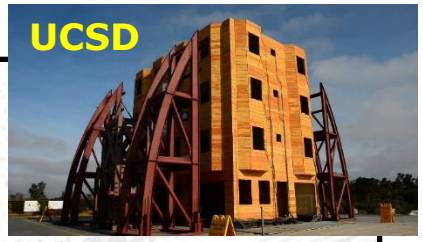


Foundation matrix (Lam and Martin 1986)

PEER

PEER Interacting with Natural Hazards Engineering Research Infrastructure (NHERI)

An NSF national facility to provide the engineering community with research infrastructure to protect homes, businesses & infrastructure lifelines from earthquakes & windstorms preventing natural hazards from becoming societal disasters.



NHERI FACILITIES

Shared-use sites including Experimental Facilities, the Computational Modeling and Simulation Center, and the Network Coordination Office.

SimCenter NHERI
Center for Computational Modeling and Simulation

PEER

PEER – The EQ Node of StEER

Structural **E**xtreme **E**vents **R**econnaissance (StEER) Network

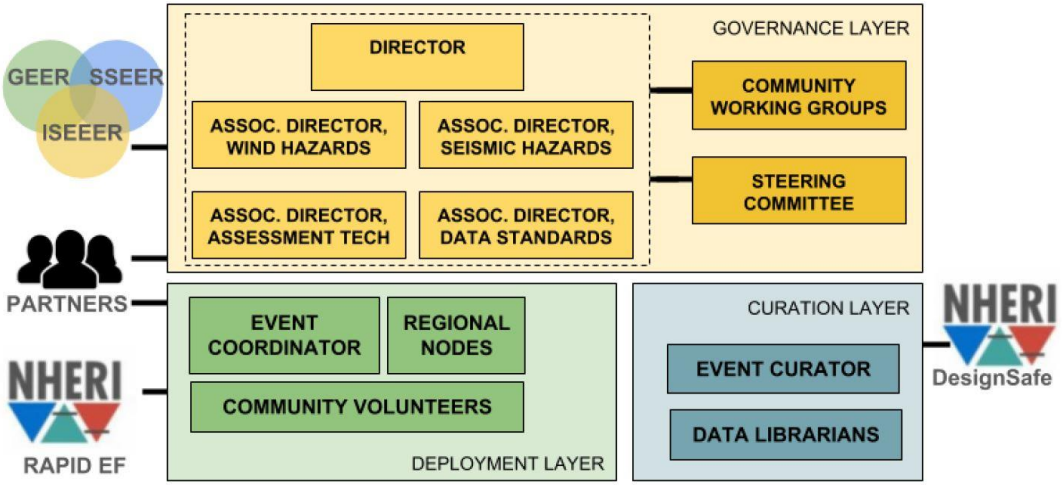
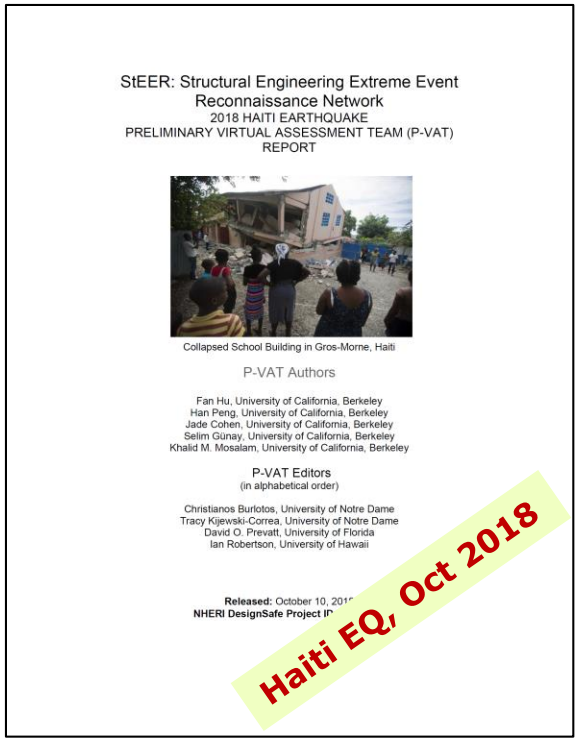


Figure 1. Proposed Initial Organizational Structure for StEER

NSF project: "**EAGER: Operationalization of the Structural Extreme Events Reconnaissance (StEER) Network**," co-PIs: T. Kijewski-Correa, K. Mosalam, D. Prevatt, I. Robertson & D. Roueche, 10/1/18 to 9/30/20.



StEER: Structural Engineering Extreme Event Reconnaissance Network
2018 HAITI EARTHQUAKE
PRELIMINARY VIRTUAL ASSESSMENT TEAM (P-VAT) REPORT

Collapsed School Building in Gros-Morne, Haiti

P-VAT Authors

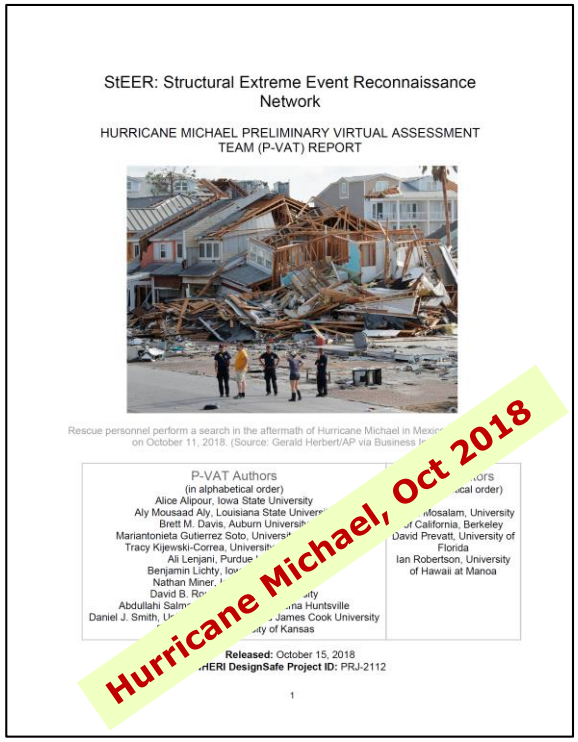
Fan Hu, University of California, Berkeley
Han Peng, University of California, Berkeley
Jade Cohen, University of California, Berkeley
Selim Günay, University of California, Berkeley
Khalid M. Mosalam, University of California, Berkeley

P-VAT Editors
(in alphabetical order)

Christianos Burlotos, University of Notre Dame
Tracy Kijewski-Correa, University of Notre Dame
David O. Prevatt, University of Florida
Ian Robertson, University of Hawaii

Released: October 10, 201
NHERI DesignSafe Project ID

Haiti EQ, Oct 2018



StEER: Structural Extreme Event Reconnaissance Network

HURRICANE MICHAEL PRELIMINARY VIRTUAL ASSESSMENT TEAM (P-VAT) REPORT

Rescue personnel perform a search in the aftermath of Hurricane Michael in Mexi
on October 11, 2018. (Source: Gerald Herbert/AP via Business In

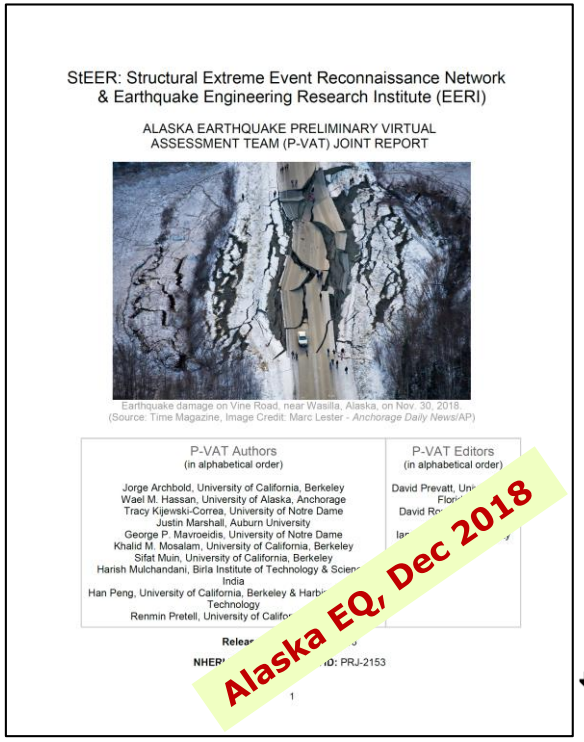
P-VAT Authors
(in alphabetical order)
Alice Alipour, Iowa State University
Aly Mousaad Aly, Louisiana State Univers
Brett M. Davis, Auburn Universit
Mariantonieta Gutierrez Soto, Univers
Tracy Kijewski-Correa, Universit
Ali Lenjani, Purdue
Benjamin Lichty, Iow
Nathan Miner,
David B. Ro
Abdullahi Salm
Daniel J. Smith,
ity
ma Huntsville
James Cook University
ity of Kansas

P-VAT Editors
(in alphabetical order)
David Prevatt, University of Florida
Ian Robertson, University of Hawaii at Manoa

Released: October 15, 2018
NHERI DesignSafe Project ID: PRJ-2112

1

Hurricane Michael, Oct 2018



StEER: Structural Extreme Event Reconnaissance Network
& Earthquake Engineering Research Institute (EERI)

ALASKA EARTHQUAKE PRELIMINARY VIRTUAL ASSESSMENT TEAM (P-VAT) JOINT REPORT

Earthquake damage on Vine Road, near Wasilla, Alaska, on Nov. 30, 2018.
(Source: Time Magazine, Image Credit: Marc Lester - *Anchorage Daily News*/AP)

P-VAT Authors
(in alphabetical order)
Jorge Archbold, University of California, Berkeley
Wael M. Hassan, University of Alaska, Anchorage
Tracy Kijewski-Correa, University of Notre Dame
Justin Marshall, Auburn University
George P. Mavroeidis, University of Notre Dame
Khalid M. Mosalam, University of California, Berkeley
Sifat Muin, University of California, Berkeley
Harish Mulchandani, Birla Institute of Technology & Scien
India
Han Peng, University of California, Berkeley & Harbi
Technology
Renmin Pretell, University of Califo

P-VAT Editors
(in alphabetical order)
David Prevatt, Uni
Flori
David Ro
Ia

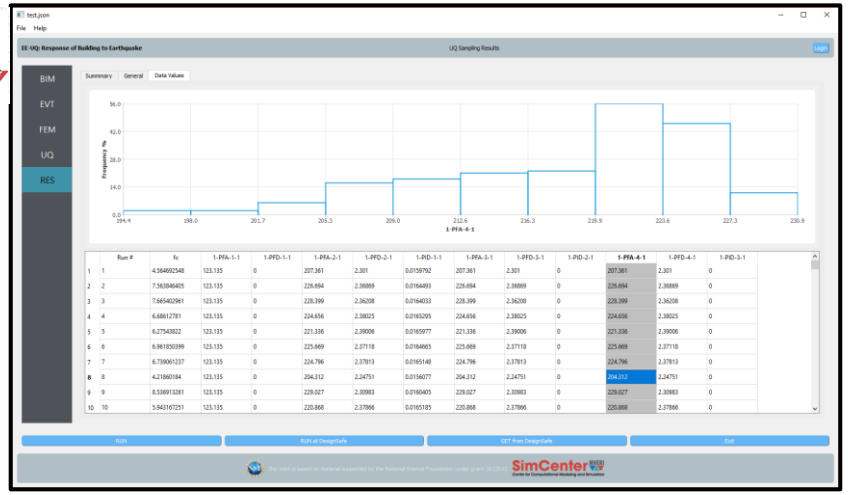
Releas
NHER
O: PRJ-2153

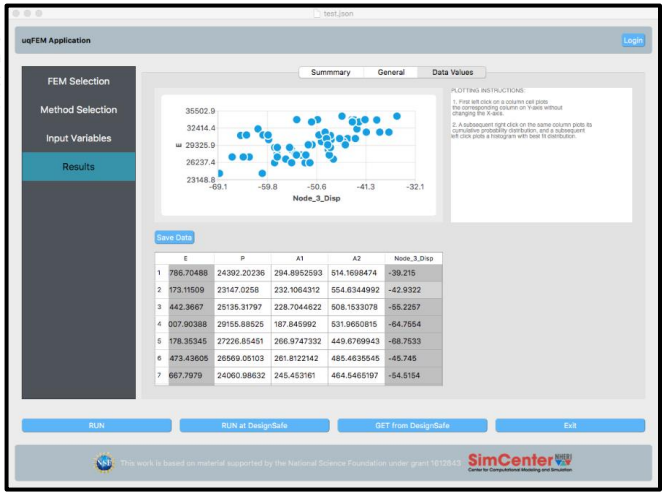
1

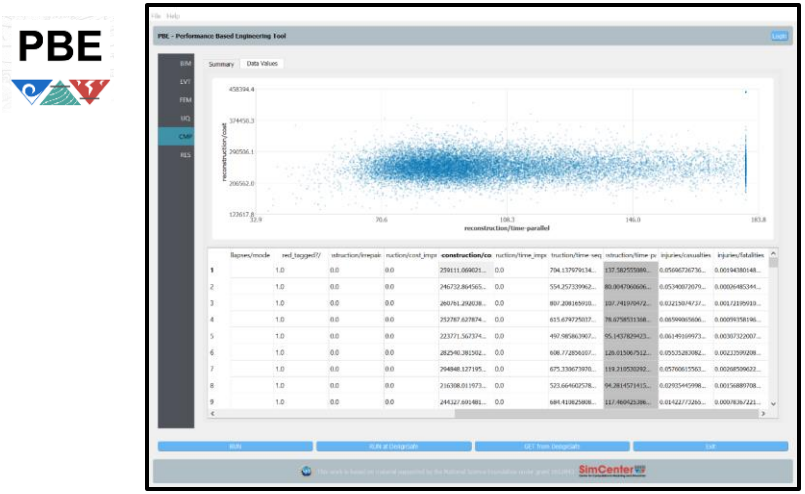
Alaska EQ, Dec 2018

PEER

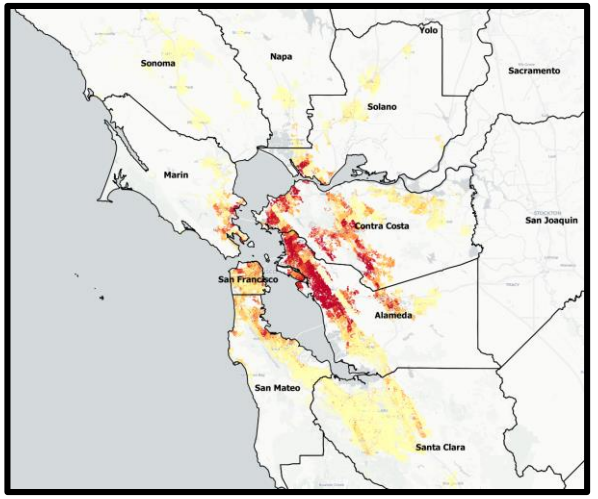
NHERI SimCenter Tools Promoted through PEER TSRP RFP (1/2)







Regional simulation workflows

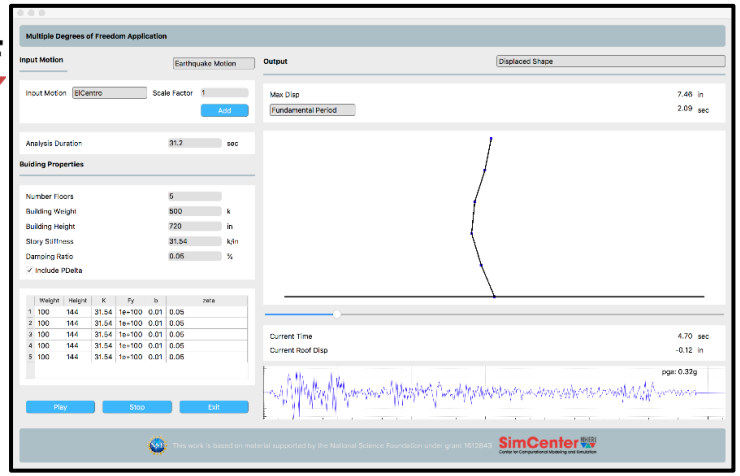


https://simcenter.designsafe-ci.org/research-tools

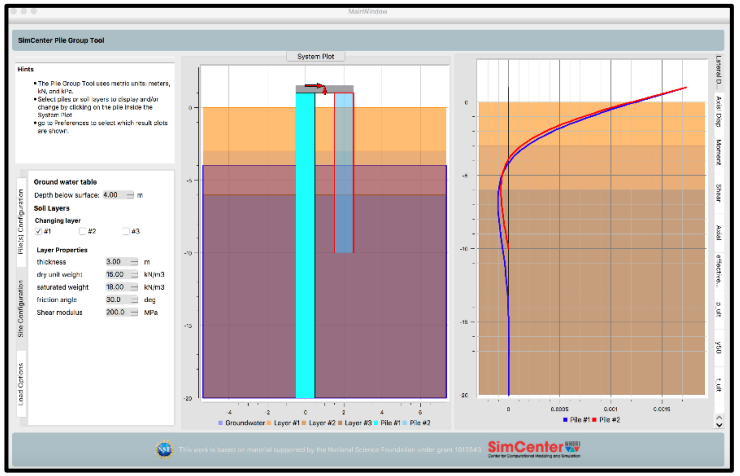
PEER

NHERI SimCenter Tools Promoted through PEER TSRP RFP (2/2)

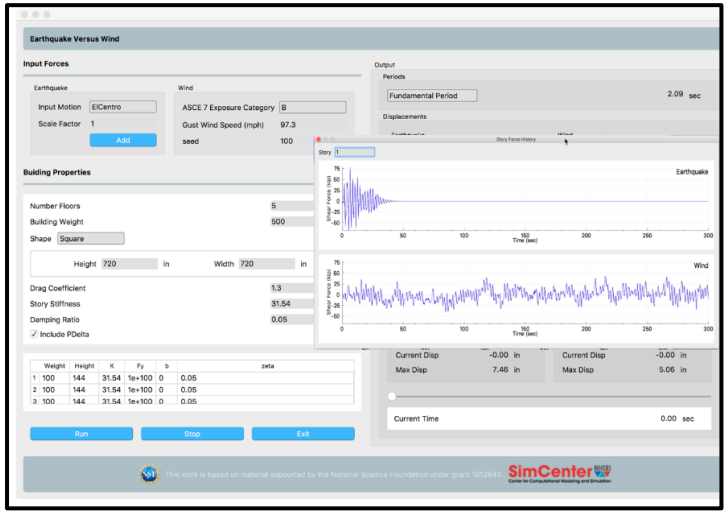
MDOF



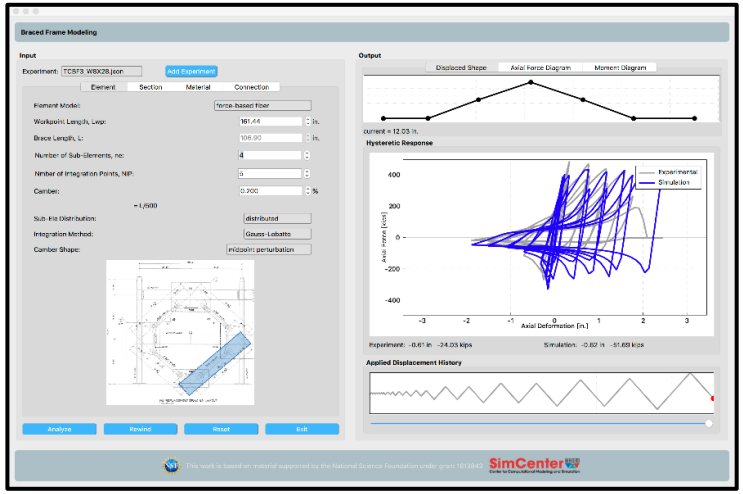
PGT



EvW



BFM



https://simcenter.designsafe-ci.org/learning-tools

PEER

Why Blind Predictions/Challenges?

- Highlight the gap between analysis & experiments
- What are the sources of these differences?
- A step towards IV&V [**I**ndependent **V**erification & **V**alidation]
- What does this mean to:
  - Safety of our structures
  - Expected performance levels (Immediate Occupancy vs. Operational)
  - Hybrid simulation, that relies on accurate modeling of part of the system
- How to systematically improve the analytical predictions?
- Many possibilities for blind predictions (challenges) of existing & new components, systems & systems of systems.

PHI Challenge 2018

- From August 23rd to November 25th, 2018
- Teams completed **8** multi-classification tasks
- **~25,000** labeled images for training
- Total of **68** team applications worldwide

PEER

PHI Challenge 2018

More in Plenary 4a Today!

PEER

2018 PEER Blind Prediction Contest

- ✓ Class B blind prediction of a large scale shaking table test on a shallow foundation in liquefied soils
- ✓ Collaboration between UNR & UCSD
- ✓ Tested on one of the UCSD shaking tables in June 19-21, 2018

More in Plenary 4a Today!

PEER

Future **2019-2028** PEER Blind Prediction Contests

PEER core institutions include major laboratories with unique features:

- ✓ The largest 1 DOF shaking table (UCSD)
- ✓ The largest 6 DOF shaking table (UC Berkeley)
- ✓ The largest geotechnical centrifuge (UC Davis)
- ✓ The largest field testing facility (UCLA)
- ✓ The largest tsunami wave tank (OSU)
- ✓ The largest shaking table array (UNR)

PEER

Education in PEER: Interns


Fan Hu


Jaewon Saw


Sunbin Kim


Albert Qu

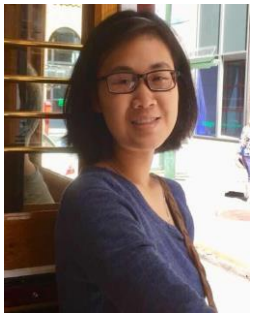

Wyeth Binder

Current Interns

Summer Interns


Matthew Yeung


Hagen Tam


Lillian Lau


Alida van der Eems

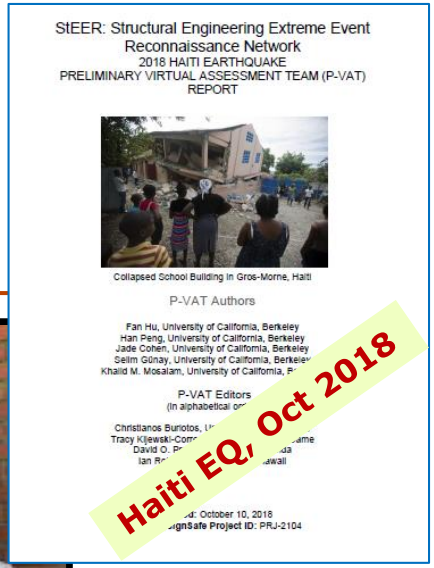

Efe Ozcanli


Alejandro Duerte


Giancarlo Garcia

PEER

Education in PEER: Interns


StEER: Structural Engineering Extreme Event Reconnaissance Network
2018 HAITI EARTHQUAKE
PRELIMINARY VIRTUAL ASSESSMENT TEAM (P-VAT) REPORT

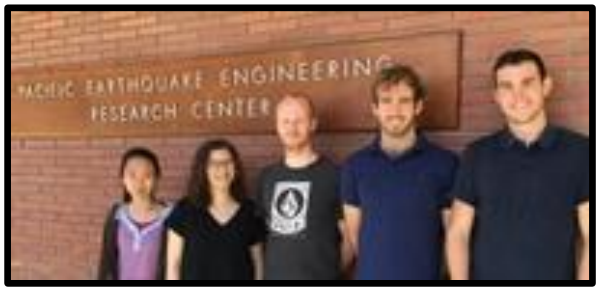
Collapsed School Building in Gros-Morne, Haiti

P-VAT Authors

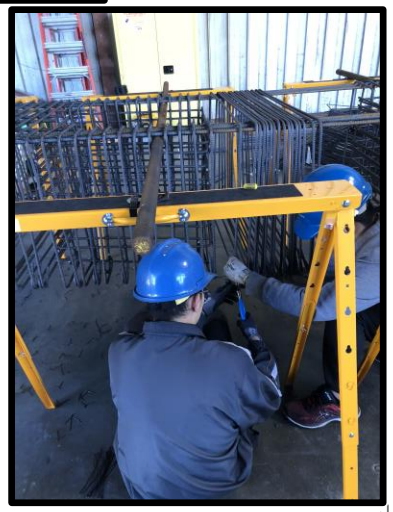
Fan Hu, University of California, Berkeley
Han Peng, University of California, Berkeley
Jade Cohen, University of California, Berkeley
Selim Günay, University of California, Berkeley
Khalid M. Mosalam, University of California, Berkeley

P-VAT Editors

Haiti EQ, Oct 2018

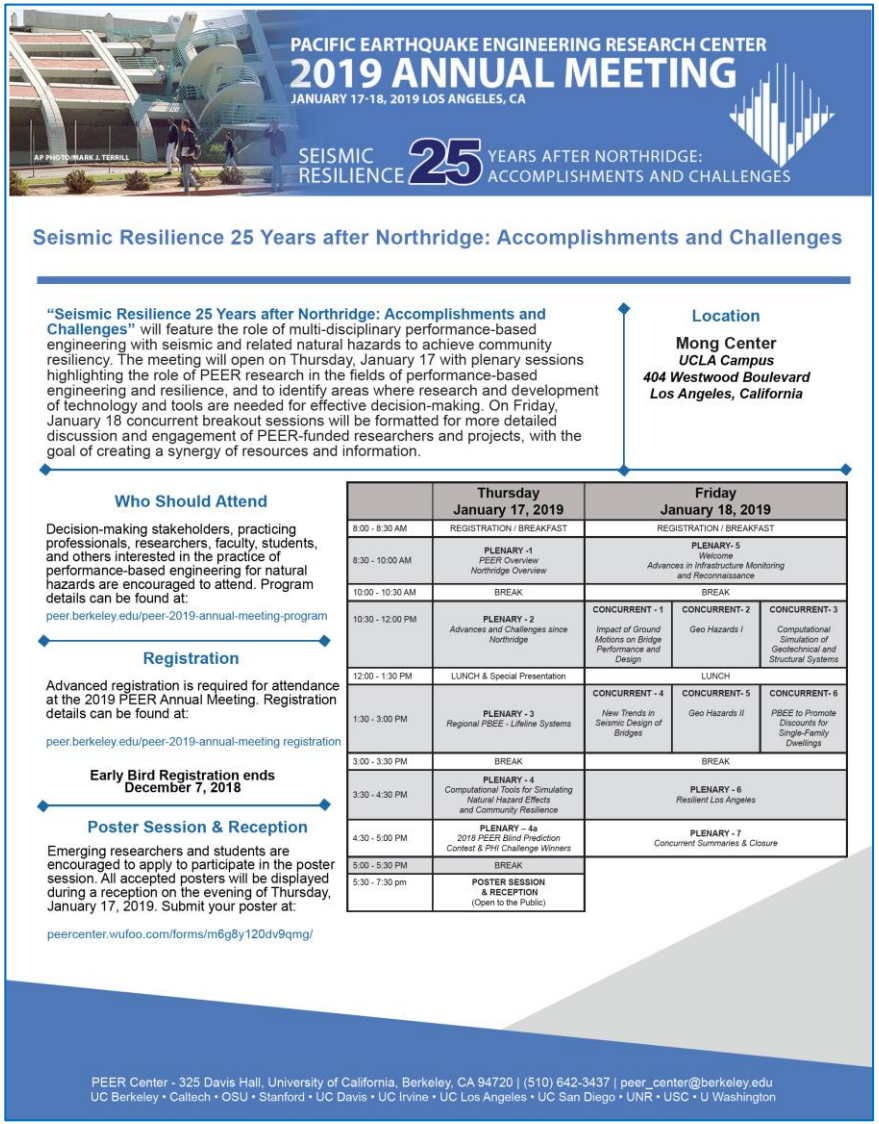


PEER interns come from different backgrounds & get involved in a broad range of activities including *hybrid simulation*, *Φ-Net challenge*, *field reconnaissance*, *testing*, *analytical simulation* & *hands-on construction*.



PEER

Have an enjoyable PEER Annual Meeting!



PEER