DESIGNSAFE-CI

A NATURAL HAZARDS ENGINEERING COMMUNITY

A Cyberinfrastructure for the Natural Hazards Community

Tim Cockerill

DesignSafe Deputy Project Director

TACC Director of User Services

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DesignSafe-ci.org Leadership

Director
Ellen Rathje
Univ. of Texas

Simulation
Clint Dawson
Univ. of Texas

Data
Jean-Paul Pinelli
Florida Inst. Tech.

ECO
Jamie Padgett
Rice Univ.

CI
Dan Stanzione
Univ. of Texas
TACC

What is DesignSafe?

- A web-based research platform that provides computational tools to manage, analyze, and understand critical data for natural hazards research

DesignSafe Vision

- A CI that is an integral part of research discovery
  - Support end-to-end research workflows and the full research lifecycle, including data sharing/publishing
  - Cloud-based tools that support the analysis, visualization, and integration of diverse data types
- Amplify and link the capabilities of the NHERI partners and natural hazards researchers around the globe

DESIGNSAFE-CI

NHERI: A NATURAL HAZARDS ENGINEERING RESEARCH INFRASTRUCTURE

Welcome, Tim!

Research Workbench | Learning Center | NHERI Facilities | NHERI Community | About | Help | Search DesignSafe

DesignSafe is the web-based research platform of the NHERI Network that provides the computational tools needed to manage, analyze, and understand critical data for natural hazards research.

- Learn how to **Start Using DesignSafe**
- Browse the Data Depot's **Published Data Sets**
- Join the conversation in **DesignSafe's Slack Channel**
- Learn more about **NHERI, the NCO & DesignSafe**

NHERI Five-Year Science Plan

This NOAA/RAMMB satellite image taken on October 8, 2018 shows Hurricane Michael off the U.S. Gulf Coast. (HO / AFP/Getty Images)

Hurricane Michael Barreling Toward Florida Gulf Coast

Hurricane Michael will make landfall mid-day Wednesday, Oct 10 with life threatening storm surge forecasted up to 12 feet, heavy rainfall up to 12 inches and damaging winds. Researchers from the Florida Coastal Monitoring Program are heading into the field ahead of the storm to set up two 15 meter weather stations.

READ MORE IN THE NEWSROOM

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DesignSafe Components

- Research Workbench
  - Data Depot
  - Discovery Workspace
  - Reconnaissance Portal
- Learning Center
  - Training resources and student engagement
- NHERI Facilities
  - Access to information about all NHERI facilities
- NHERI Community
  - News and online Slack community

Data Depot Features

- Different areas:
  - My Data (Private)
  - My Projects (Semi-Private, Collaborative)
  - Published (Publicly accessible, curated)
  - Community Data (Publicly accessible, uncurated)
- Upload files/folders via computer, cloud service providers, or bulk transfer (Globus)
- Manage, preview files within Data Depot
- Data curation and publishing

My Projects

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Categorize | Tag | Rename | Move | Copy | Preview | Preview Images | Download | Share | Move to Trash

Add

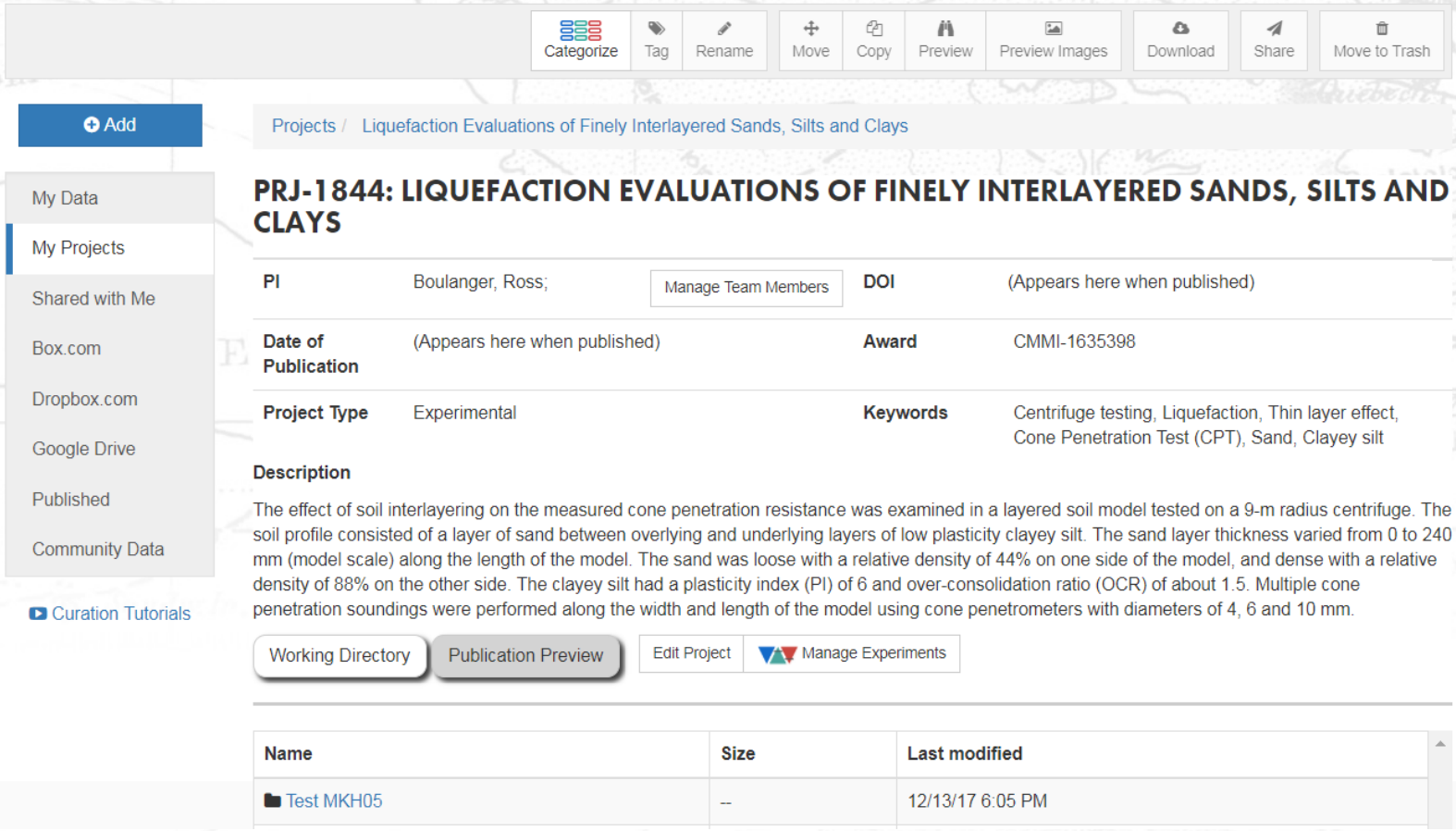
- My Data
- My Projects
- Shared with Me
- Box.com
- Dropbox.com
- Google Drive
- Published
- Community Data

Curation Tutorials

Projects /

Project title	PI	Last modified
Hurricane Harvey (Texas) Supplement -- Collaborative Research: Geotechnical Extreme Events Reconnaissance (GEER) Association: Turning Disaster into Knowledge	Tracy Kijewski-Correa (tkijewsk)	5/23/18 4:09 PM
NGA-East Site Response Simulation Database	Youssef Hashash (hashash)	5/22/18 12:49 PM
NGA-East Site Response Simulation Database	Youssef Hashash (hashash)	5/18/18 10:11 AM
NHERI Partner Visits Spring 2018	Tim Cockerill (cockeril)	4/30/18 5:30 PM
Finite Element Analysis of Drain-Treated Ground	Ellen Rathje (erathje)	4/28/18 8:12 AM
Community Data	Charlie Dey (charlie)	4/27/18 12:21 PM

My Projects



A space to share files/data/results with collaborators and to eventually publish for public use

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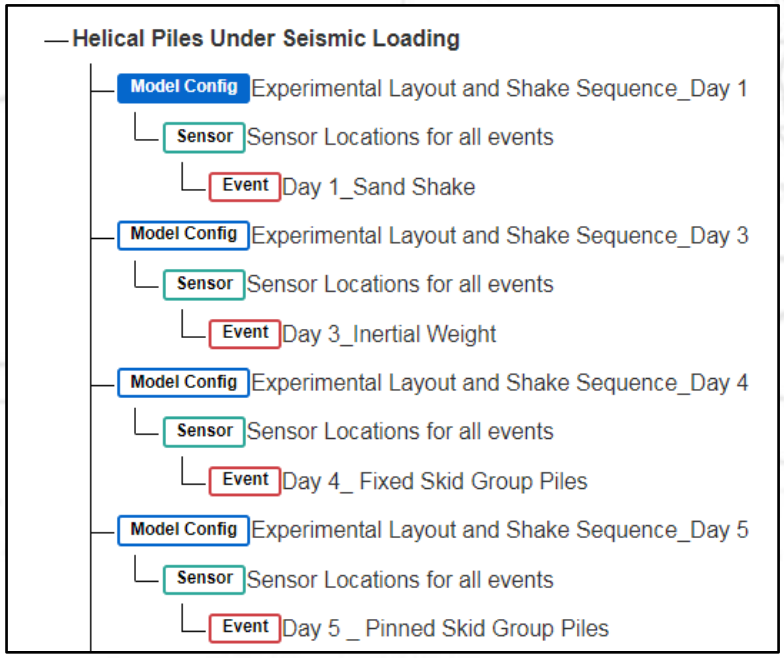
Data Curation Philosophy

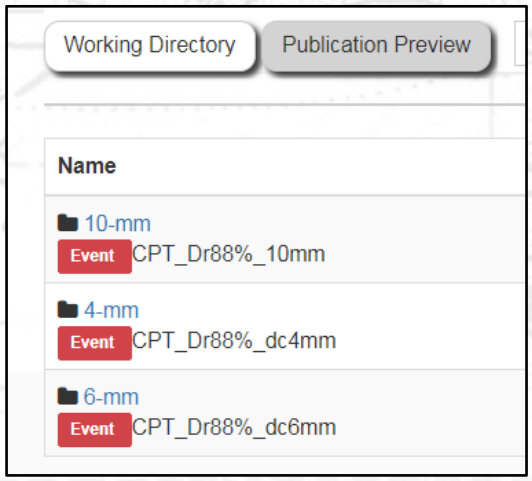
- ***Vision:*** Allow users to <u>easily</u> store, share, document, and publish data throughout the life of a project
- Flexible data models and interactive curation
  - Allows researchers to decide how to represent their research
  - Consider what is needed for data to be understandable by an outside user
  - Example: user-defined categories for experimental data

    Model Config, Sensor Info, Event, Analysis, Report

Data Curation and Publication

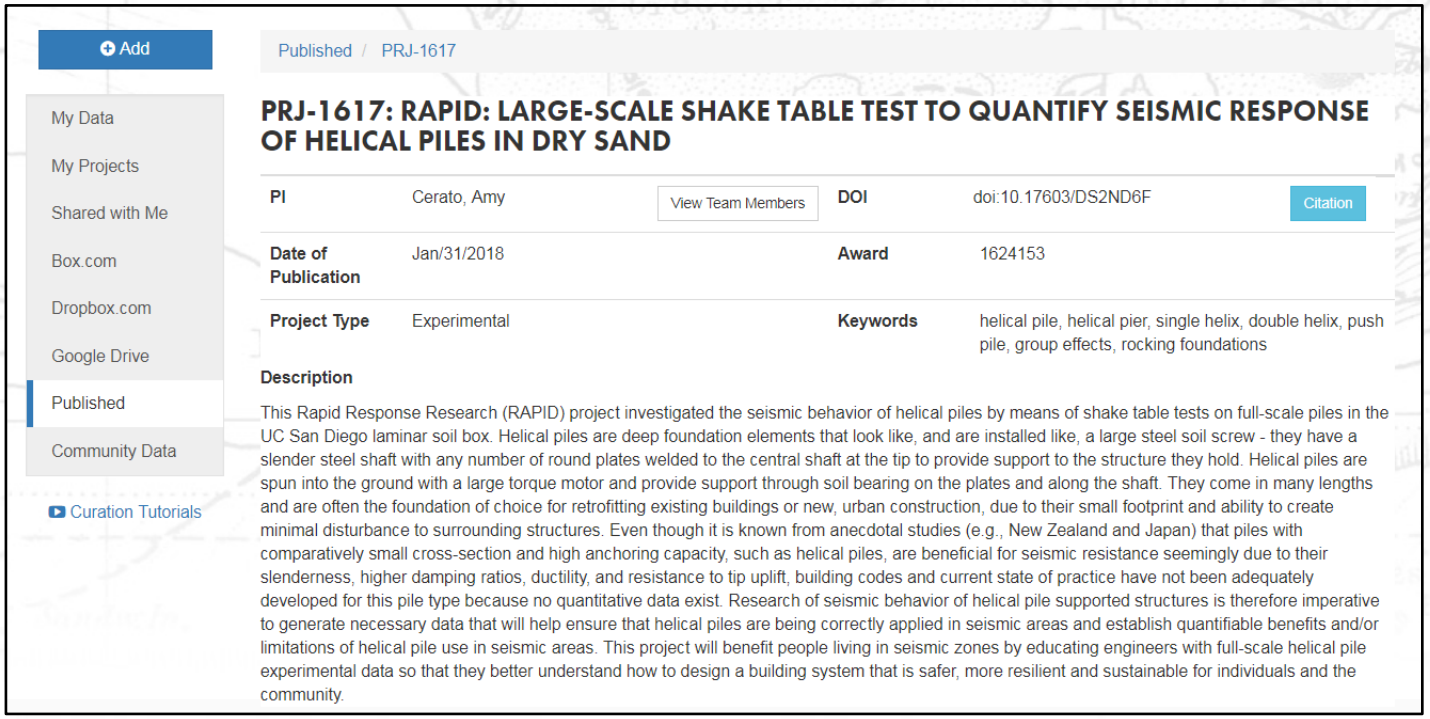
Define Category Tree → Assign Categories to Files





Data Curation and Publication

Define Category Tree → Assign Categories to Files → Publish Project and Files



Data Curation and Publication

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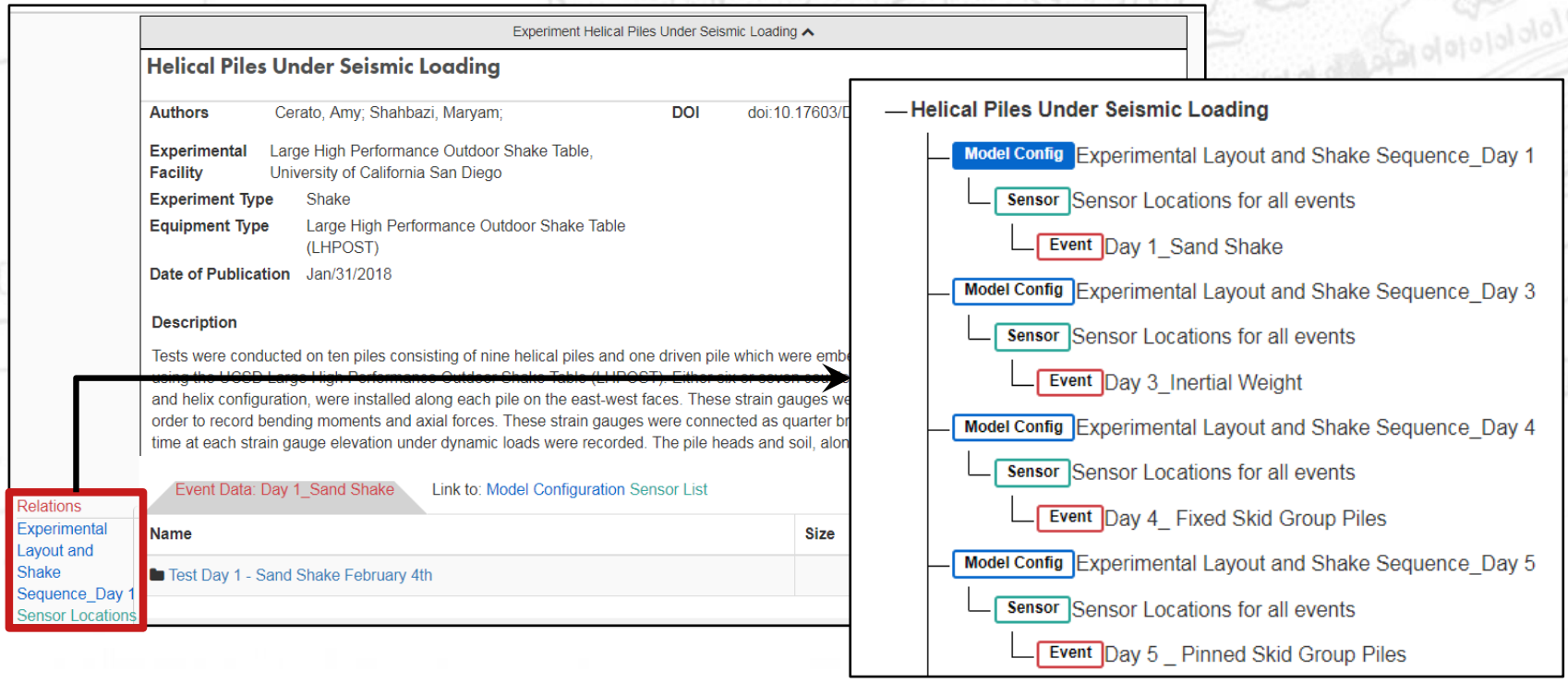
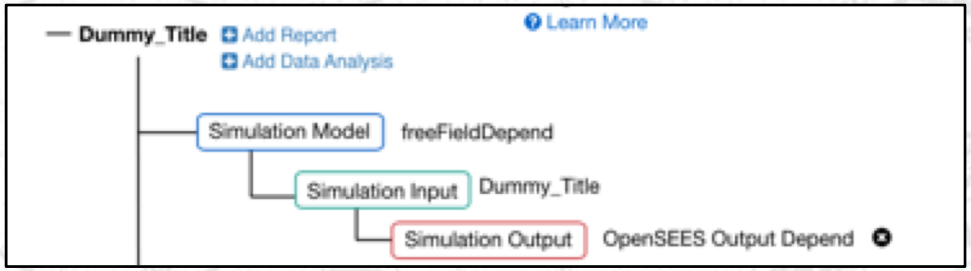


Data Curation and Publication

- Data Models
  - Experimental
  - Simulation
  - Other
  - Hybrid Simulation (coming in June)
  - Field Reconnaissance (working with RAPID)
- Virtual Office Hours with Data Curator
  - Tues/Thurs Zoom meetings with Maria Esteva



Make your data count!

MAKE DATA COUNT

- ***Formally publish*** data sets in stable data repositories
  - Include data processing scripts, visualizations, etc.
- Data needs a permanent, ***digital location (DOI)*** not just a URL
  - List curated data sets on your CV
- Formally cite data ***in your reference list*** of your papers using DOI, citation language as indicated in DesignSafe

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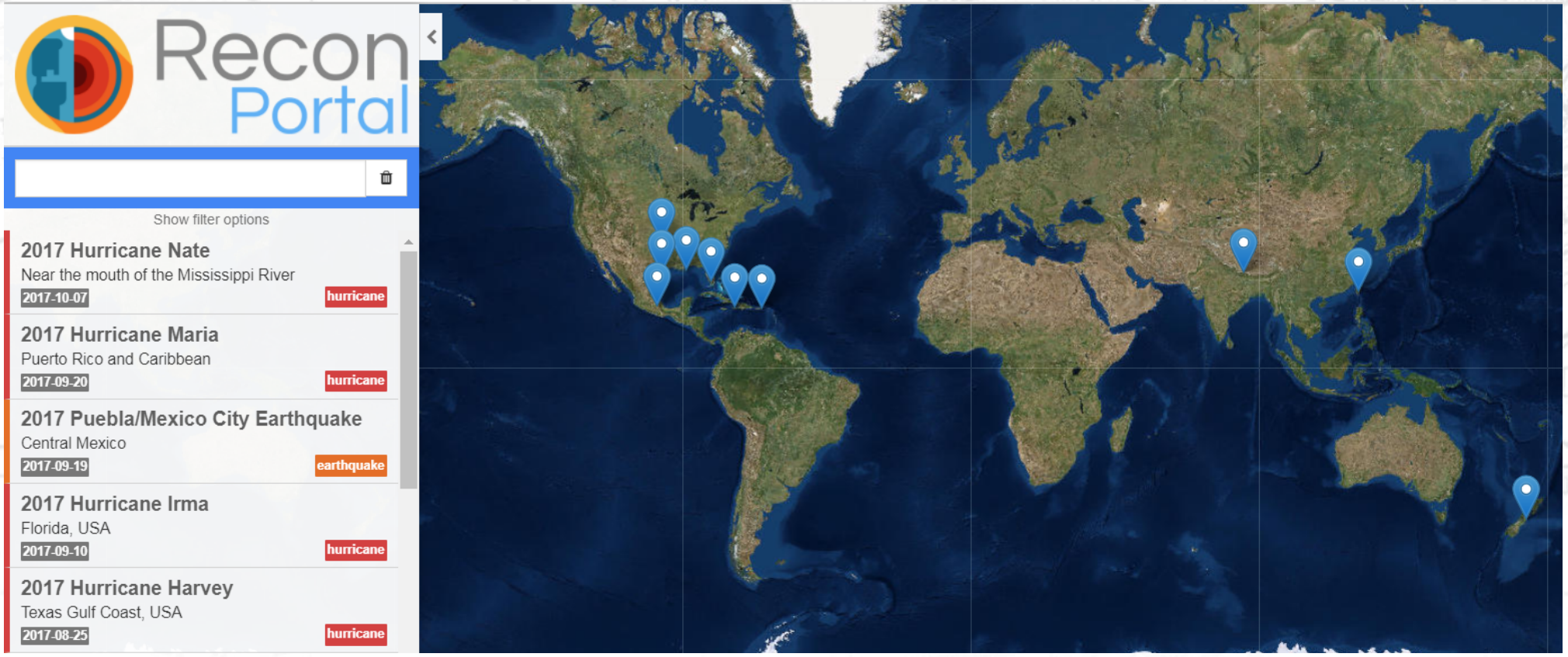
Reconnaissance Portal

Identifying Archived Datasets from Recon Events



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Reconnaissance Portal

Identifying Archived Datasets from Recon Events

Recon Portal

Back to results

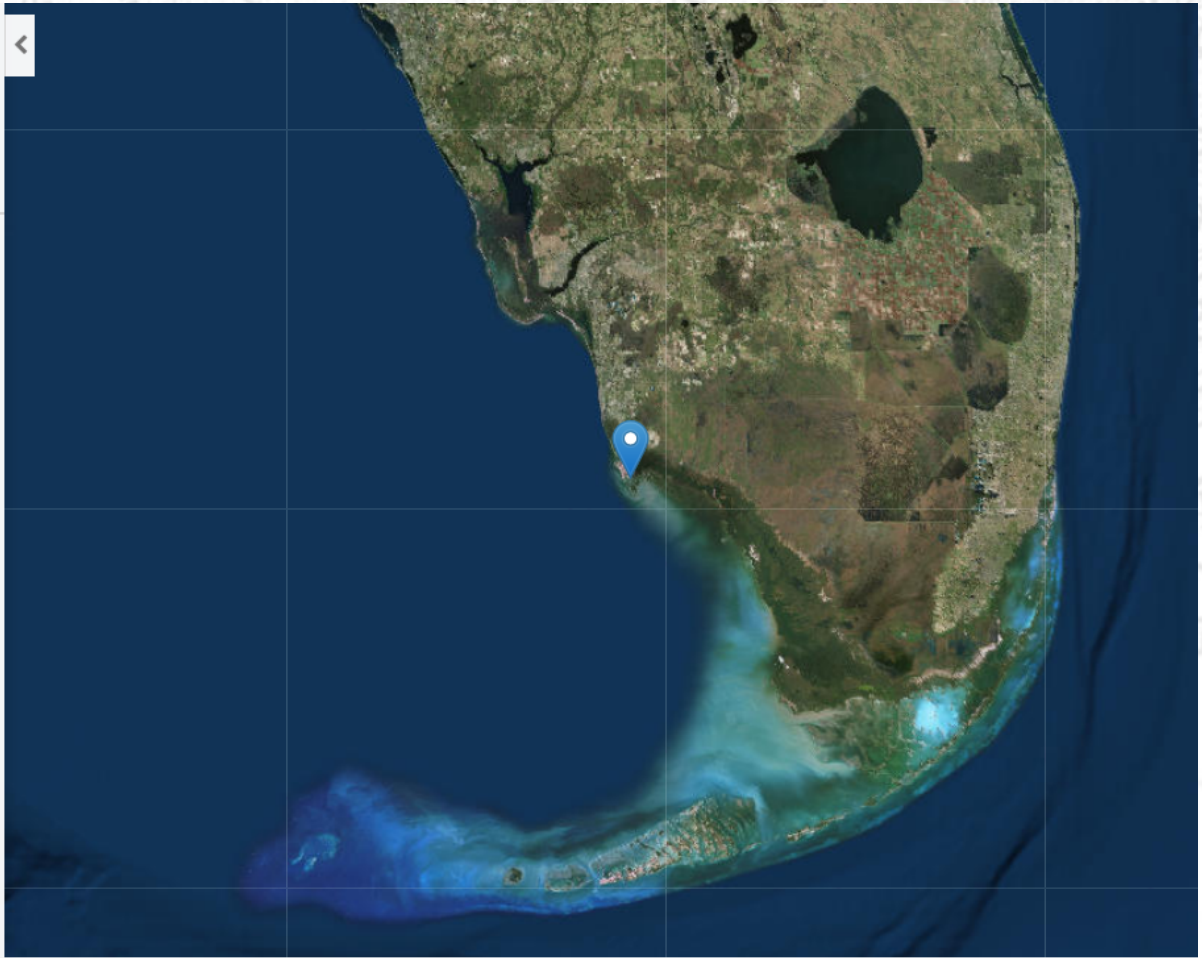
2017 Hurricane Irma

Florida, USA

2017-09-10 hurricane

Available datasets:

- Hurricane Irma Preliminary Reports and Information
- GEER Hurricane Irma - Cape Coral to Key West (Initial Data Collection)



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Recon Portal → Data Depot

Add

My Data
My Projects
Shared with Me
Box.com
Dropbox.com
Google Drive
Published
Community Data

Learn About 'My Projects'

Published / PRJ-1900

PRJ-1900: GEER HURRICANE IRMA - CAPE CORAL TO KEY WEST (INITIAL DATA COLLECTION)

PI	Stark, Nina	View Team Members	**DOI**	doi:10.17603/DS2239D	Citation
Date of Publication	Apr/19/2018		**Award**	NSF CMMI-1266418 (GEER)	
Project Type	Other		**Keywords**	reconnaissance, geotechnical, coastal, Hurricane Irma 2017	

Description

Hurricane Irma was a category 5 hurricane on the Saffir-Simpson hurricane wind scale. Irma developed from a tropical wave around the Cape Verde Islands. The National Hurricane Center started monitoring it on August 26, and it was classified as a tropical storm named Irma on August 30. Moving across the Atlantic Ocean, Irma increased in strength. On September 5, Irma was classified as a category 5 hurricane with wind speeds up to 175 mph (280 km/h). Irma made landfall in the U.S. on Cudjoe Key (near Big Pine and Summerland Keys) in the morning of September 10, still being a category 4 hurricane, and made a second landfall on Marco Island, south of Naples, on the same day as a category 3 hurricane. In preparation for Hurricane Irma, more than 6.5 million people were ordered to evacuate (http://www.pbs.org), 134 fatalities were associated to the storm, and damages were recorded of more than $50 billion (http://www.bbc.com/news/business-41231323; https://en.wikipedia.org/wiki/Hurricane_Irma). Two teams from the Geotechnical Extreme Events Reconnaissance (GEER) Association, supported by the National Science Foundation, were deployed to investigate geotechnical impacts of flooding, storm surge and wave forcing in Florida in response to Hurricane Irma in September of 2017. The teams worked collaboratively with federal, state, and local organizations in Florida. This initial data collection presents the field observations of the GEER team made during the field reconnaissance from September 24 to 28, 2017. The survey region extended along the coastal zone from Cape Coral to Key West.

Name	Size	Last modified
floridairma-coord.kml	378.1 kB	4/19/18 3:50 PM
GEER_report_#56.pdf	22.8 MB	4/19/18 3:48 PM
Photos	--	4/19/18 12:39 PM
READ ME_GEERIrma.pdf	305.8 kB	4/19/18 3:50 PM

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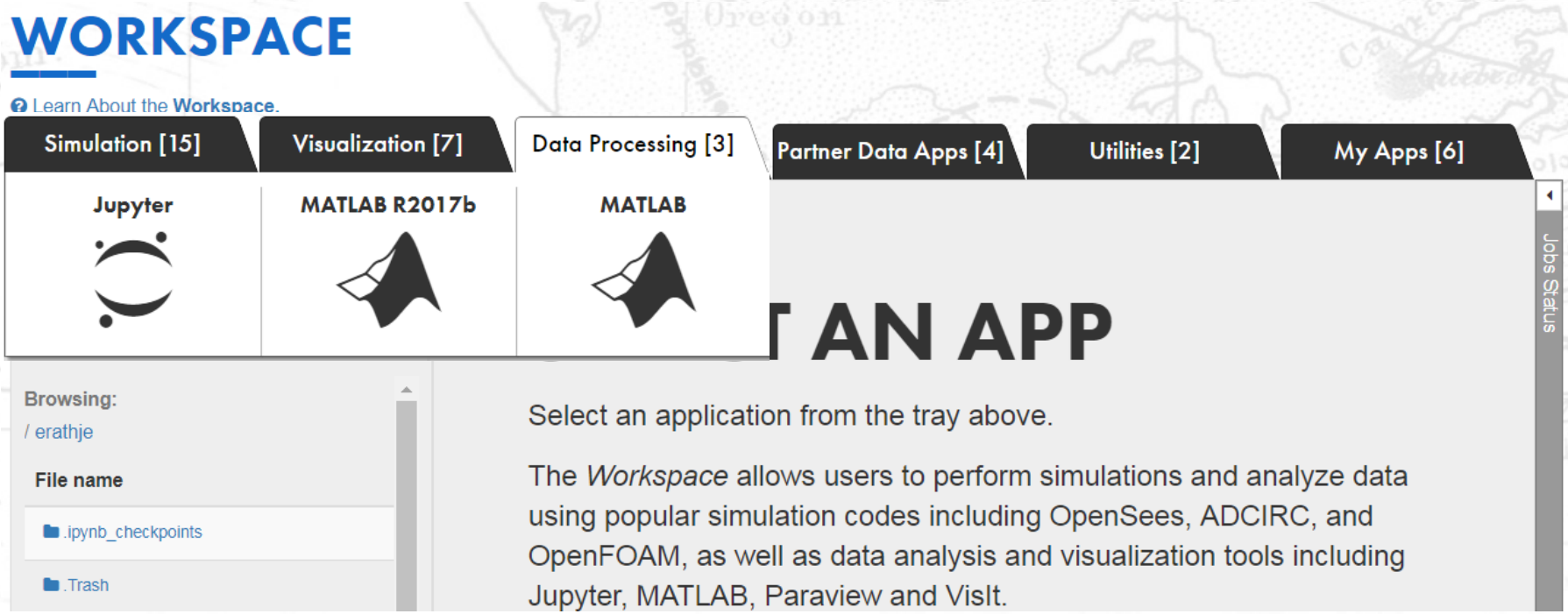
Discovery Workspace

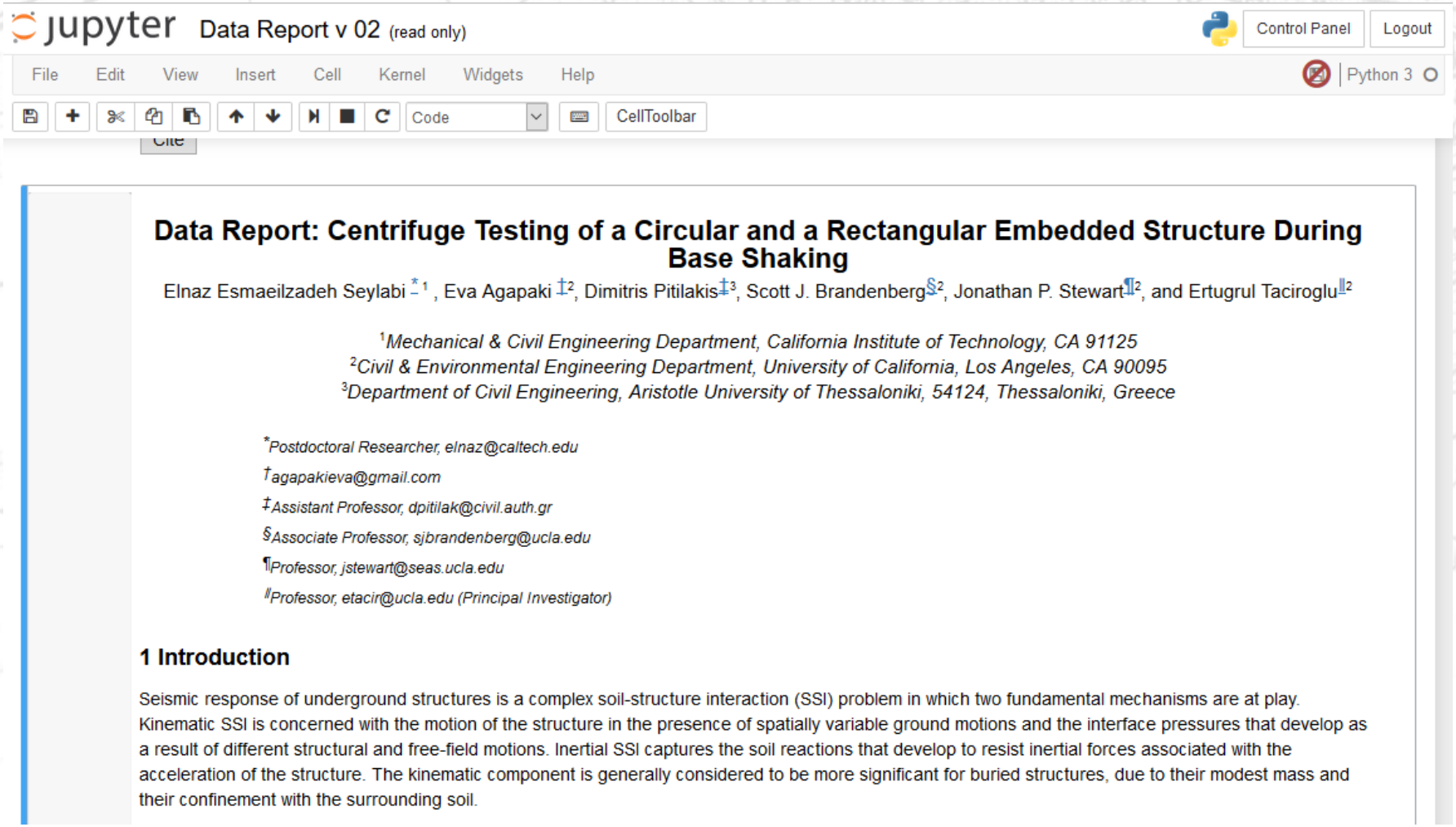
- Cloud-based tools for use in research
- Access to files in the Data Depot



DesignSafe Discovery Workspace

- Data analysis in the cloud
  - Matlab: data analysis and plots
  - Jupyter : electronic notebook that supports Python and R
- Computational simulation codes
  - OpenSees: finite element code for structures and soil
  - ADCIRC: storm surge modeling
  - OpenFOAM: computational fluid dynamics
  - LS-DYNA: available via Bring Your Own License
- Visualization in the cloud
  - Potree: View and analyze point cloud data
  - QGIS: geospatial data analysis

Electronic Data Report



Published Analysis Scripts

jupyter 3b_app_flex_rev3_updated Last Checkpoint: 05/19/2017 (autosaved)

Control Panel | Logout

File Edit View Insert Cell Kernel Widgets Help | Python 3

Markdown | CellToolbar

Application of Probabilistic Framework for Flexible Sliding Displacements

Vector (PGA, PGV) Approximation

Site Location: W -121.99 and N 37.18, Santa Clara County, California

Deaggregation Source: (https://earthquake.usgs.gov/hazards/interactive/) - Vs30 = 760 m/s

Mean and standard deviations of ground motions (ie. PGA and PGV) Source: NGA_Models_Version2.4.xls

MRE for PGA obtained from deaggragation Correlation coefficient between PGA and PGV, rhopgapgv = 0.6 Correlation coefficient between kmaxz and kvmaxz, rho_kmaxkvmax = 0.6 Logic tree consists of 27 branches: 9 for Ts and ky (correlated) and 3 for Tm

Reference: Rathje, E.M., Wang, Y., Stafford, P.J., Antonakos, G. and Saygili, G., 2014. Probabilistic assessment of the seismic performance of earth slopes. Bulletin of Earthquake Engineering, 12(3), pp.1071-1090.

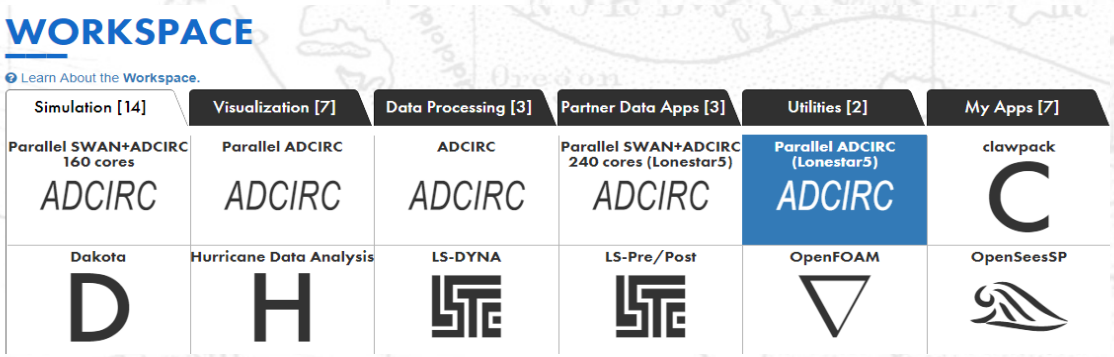
Site Location

Out[4]:

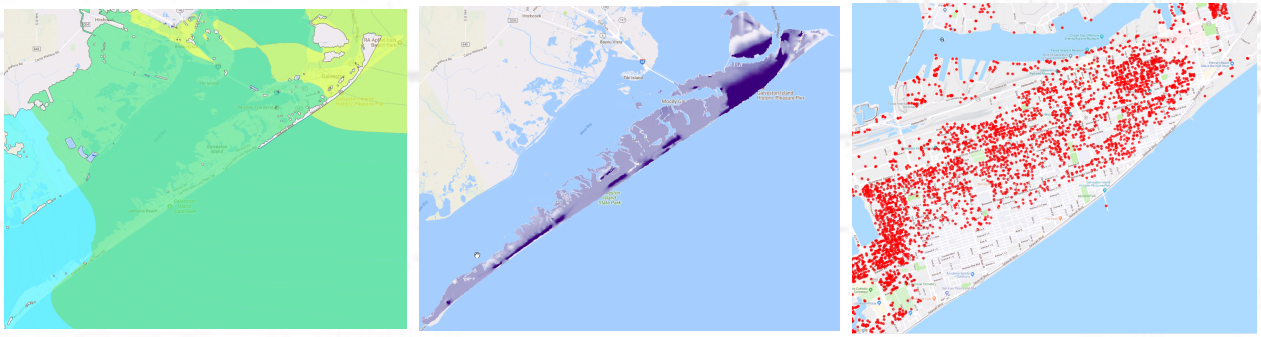
DesignSafe Workflow Example

What addresses will be inundated on Galveston Island by storm surge from the impending hurricane?

- Compute storm surge water levels with ADCIRC
- Convert output to shapefile format
- Import results into a GIS along with elevation and property data
- Identify addresses that are inundated by simulated water levels



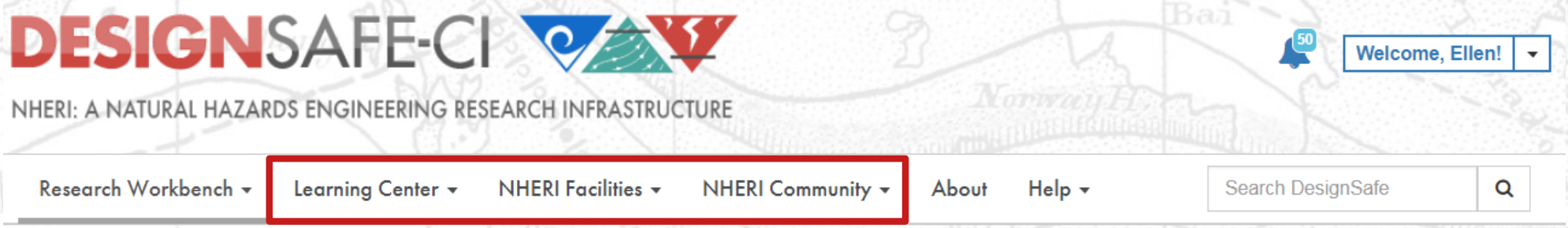
Kalpana python script used to convert ADCIRC output files to shapefiles. Executed within a Jupyter notebook in DesignSafe



HPC Allocation Policy

- **Base allocation**: 8000 SUs and 50GB of storage. Automatically given to each user.
- **Startup allocation**: 50,000 SUs and 1TB of storage. Requires fast track internal review.
- **Research allocation:** up to 2,000,000 SUs and 100TB of storage. Requires a proposal.
- Allocations last for one year, then you can request a renewal or extension.
- www.designsafe-ci.org/rw/support/allocations-policy

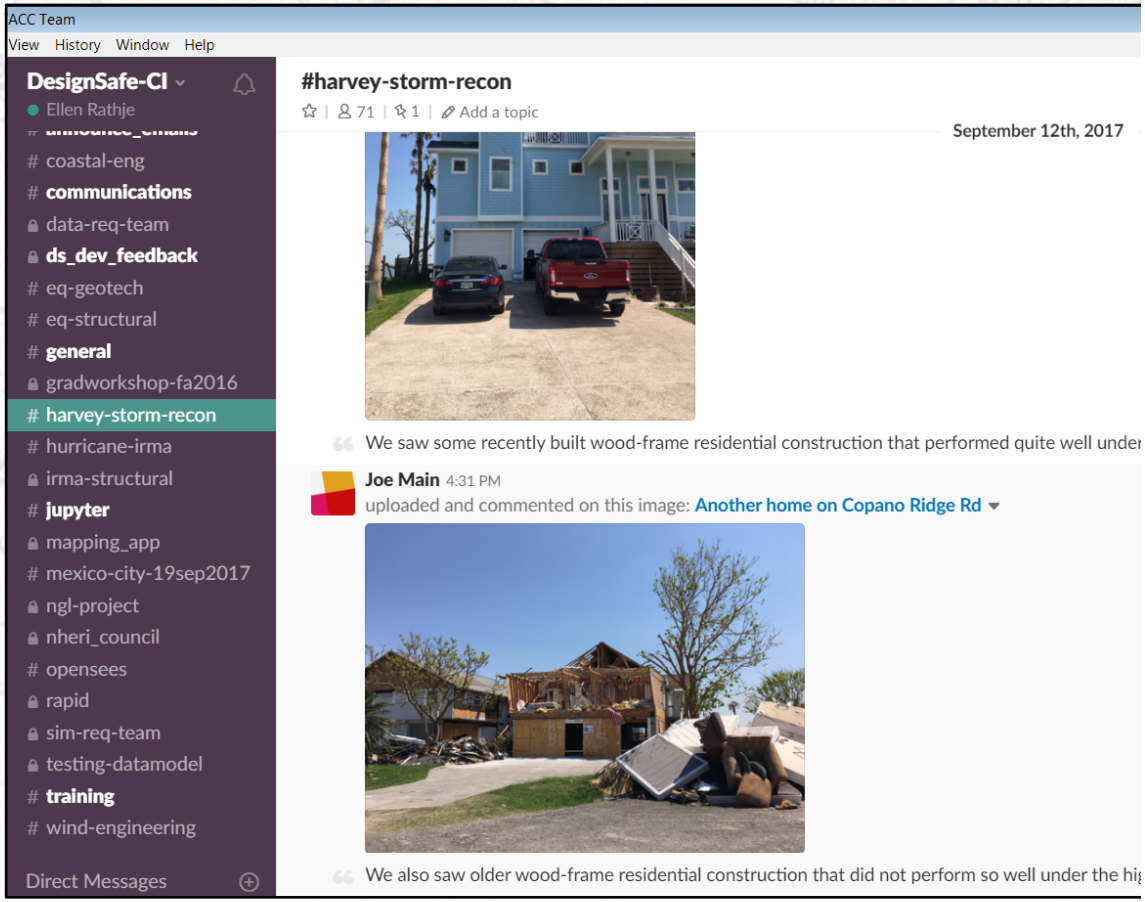
Other Components



- **Learning Center:** Access to webinars, information on REU, CODE@TACC DesignSafe for high school students, Summer Institute, FAQ
- **NHERI Facilities:** Web pages for NCO, EFs, SimCenter, and Facility Scheduler
- **NHERI Community:** News, access to Slack online collaboration

Slack Online Collaboration

- Online collaborative communication tool
- DesignSafe Slack Team (https://designsafe-ci.slack.com/) accessible via web browser or downloadable Slack app
  - 43+ topical channels
  - Active use with 27k+ posts



DesignSafe: Open for Business

www.designsafe-ci.org

- Capabilities available to the global natural hazards research community—account registration is free
- Training webinars
  - Overview webinars, as well as detailed training on Jupyter, etc.
  - Archived training webinars available at https://www.designsafe-ci.org/learning-center

Please share your feedback, ideas, experiences!

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