

Blind Prediction Contest for Wave Loading on a Steel Frame Structure

Michael H. Scott
PEER Annual Meeting
August 24, 2023

Recent PEER Blind Prediction Contests



2022 Steel MRF



2021 Thick Foundation (Deep RC Beam)



2021 RC Column



2018 Liquefied
Soil

Other BPCs since 2017:

<https://peer.berkeley.edu/blind-prediction-contests>

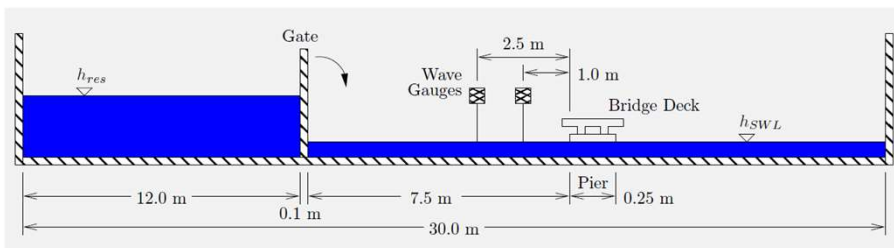
2014 PEER Tsunami Modeling Workshop



- Open prediction of wave loads on a bridge deck
- Tests conducted at PWRI in Japan
- Workshop held at OSU



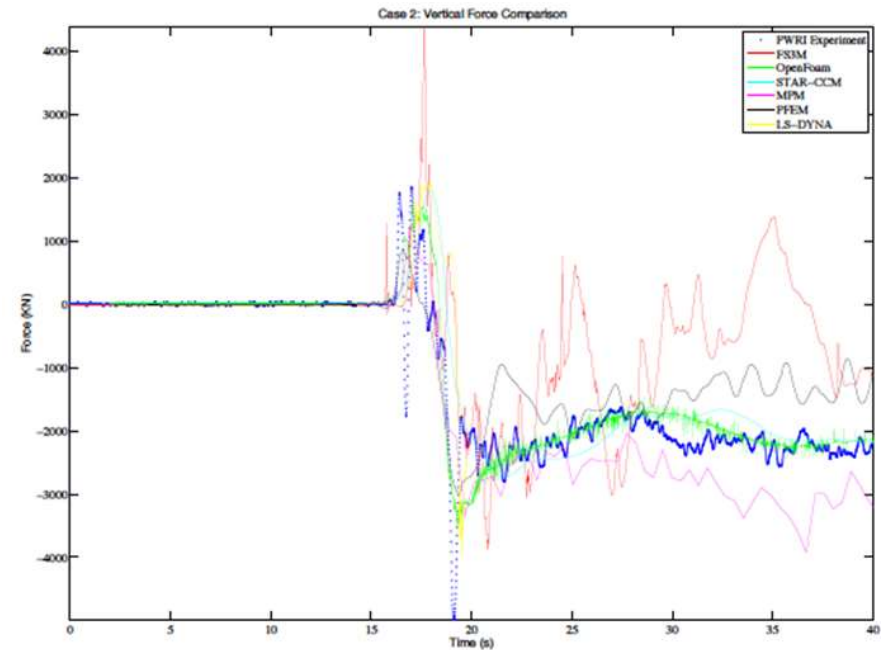
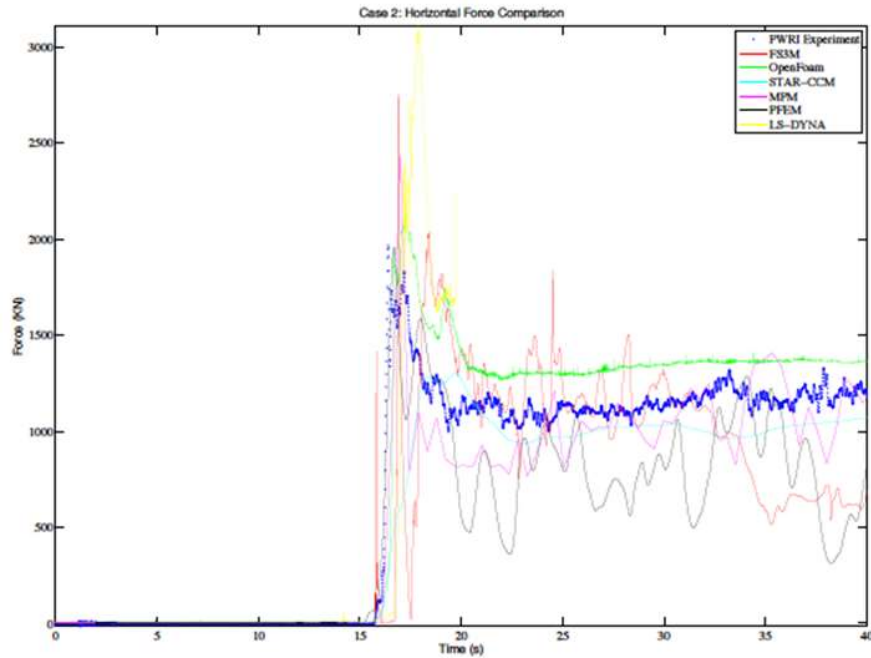
PWRI Experiments



- Dam break, tsunami wave
- Response histories of total horizontal and vertical loads
- Bridge deck essentially a rigid obstacle



Variance in Simulations



Workshop Takeaways

- 3D simulations generally worth the additional effort
- Turbulence models important for breaking waves and high speed steady flows
- Initial / boundary conditions of gate release for wave generation

2015 Steel Frame Experiments at OSU



Dan Borello
(JTBorello)



Pedro Lomonaco
(OSU)



Nick Wierschem
(Univ. Tennessee)

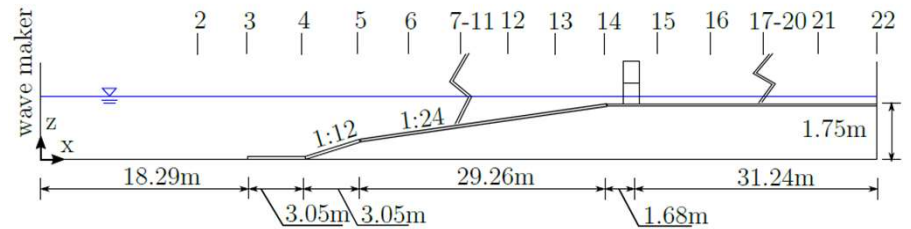
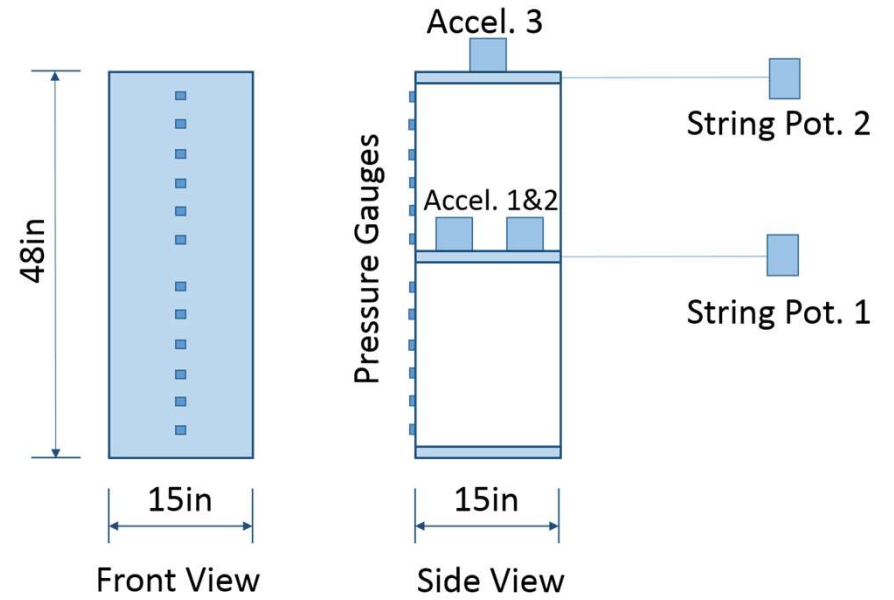
Objectives

- Measure the dynamic properties of flexible, inundated structures
- Measure the forced response of flexible structures to various wave conditions

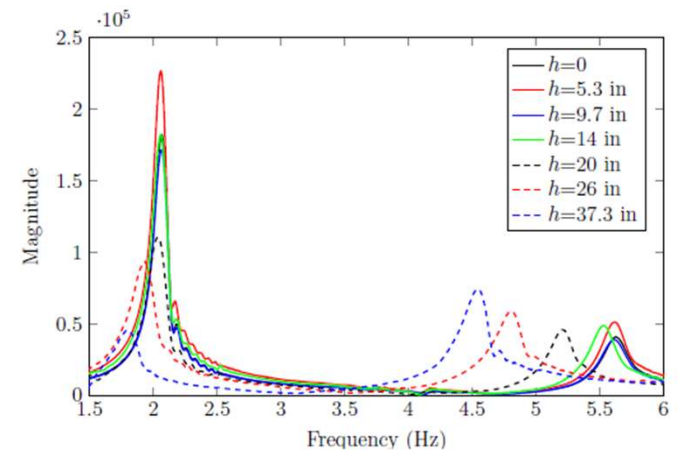
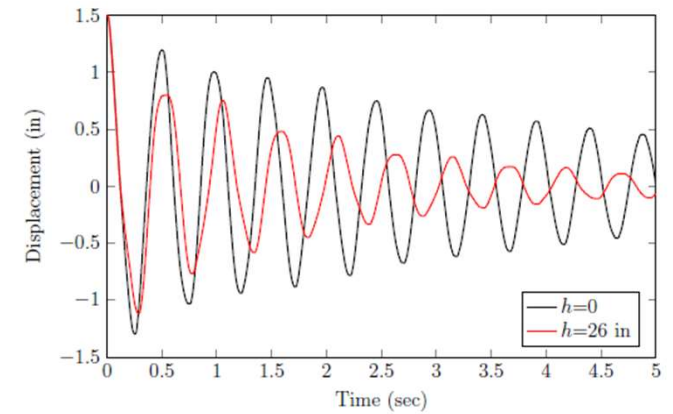
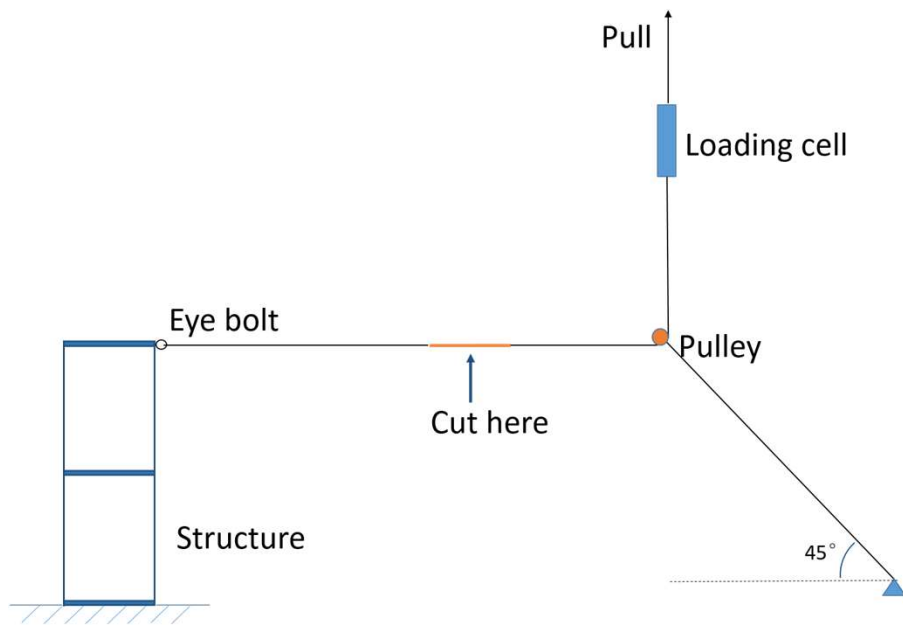
Large Wave Flume



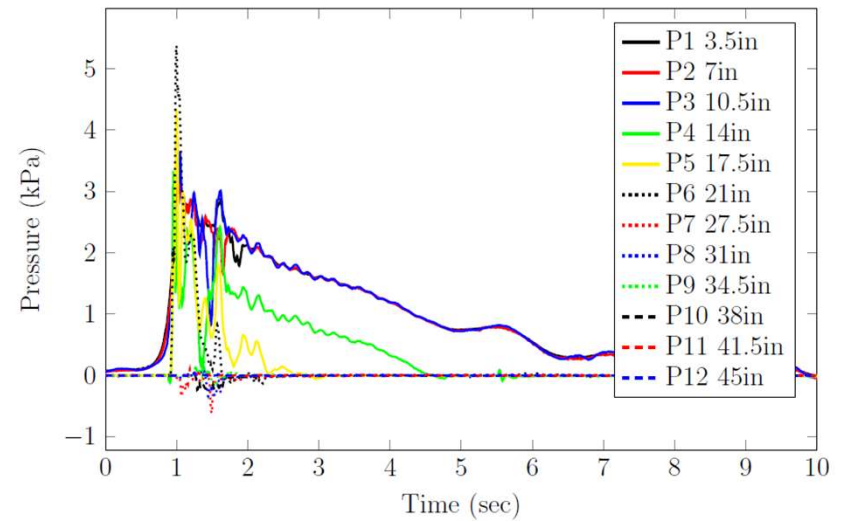
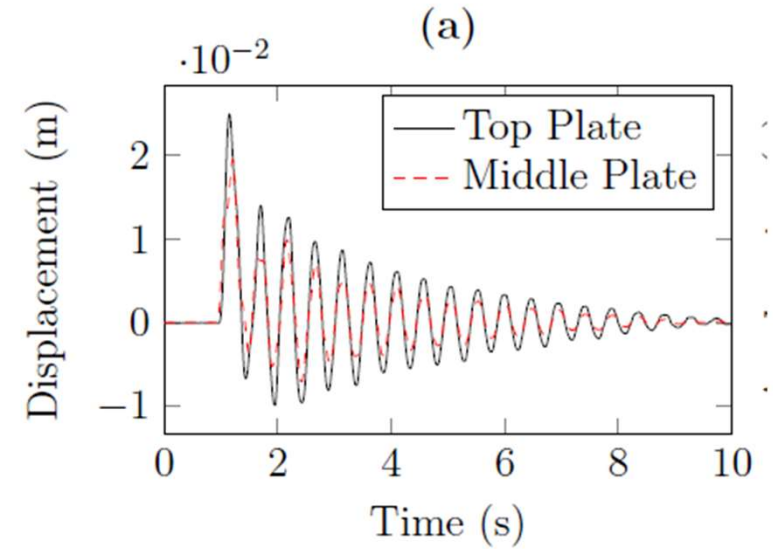
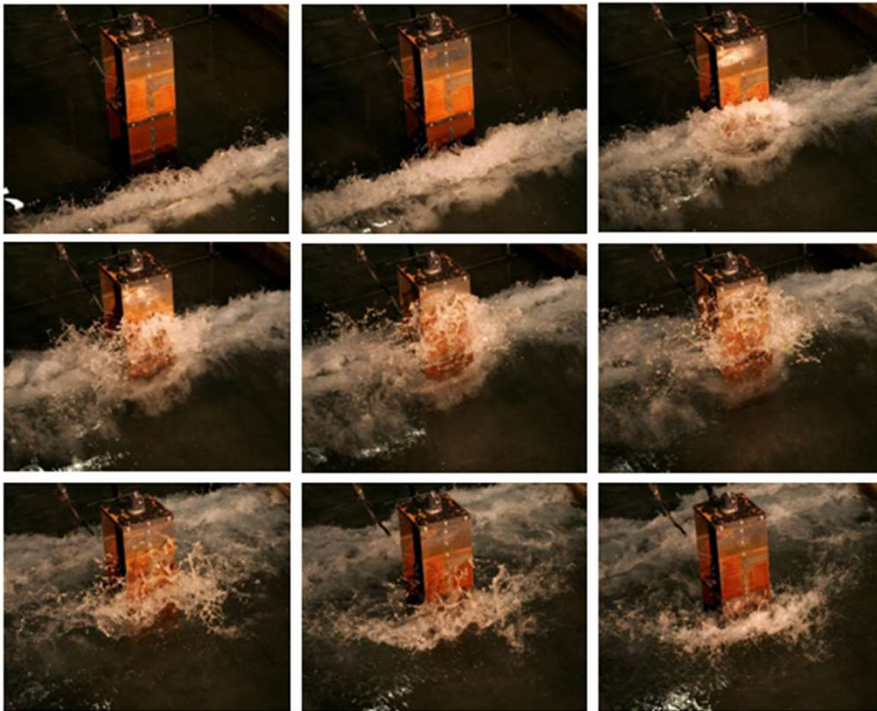
Experimental Setup



Free Vibration (Pluck Tests)



Solitary Wave



Open Prediction

To calibrate numerical models, the following data will be made available on DesignSafe or similar repository with DOI

- Free Vibration
 - Plate displacement, acceleration response histories
 - Seven inundation depths (zero and six depths)
- Solitary Wave
 - Plate displacement, acceleration response histories
 - Pressure response histories (12 gauges)
 - Seven combinations of inundation depth and wave height

Closed (Blind) Prediction

Submissions will predict responses for the following cases

- Regular Waves
 - Plate displacement, acceleration response histories
 - Pressure response histories
 - Waves at $T=1.6$ sec interval
- Random Waves
 - Plate displacement, acceleration response histories
 - Pressure response histories



One wave from Open Prediction, but how well can the impacts of subsequent waves be predicted?

Contest Information

Details remain, but tentative timeline:

- December 2023 - Contest website open, data available via DOI
- June 2024 - Submissions due
- September 2024 – Winners announced

Submissions will be scored on the following criteria:

- Open Prediction (25%) – free vibration and solitary waves
- Closed Prediction (50%) – regular and random waves
- Submission Report (25%) – simulation details, clarity, reproducibility