



# **Soil-Foundation-Structure Interaction during Near-Fault Ground Motions**

**Chia-Han Chen**

**NCREE**

# Foundation Failures in Disastrous Earthquake

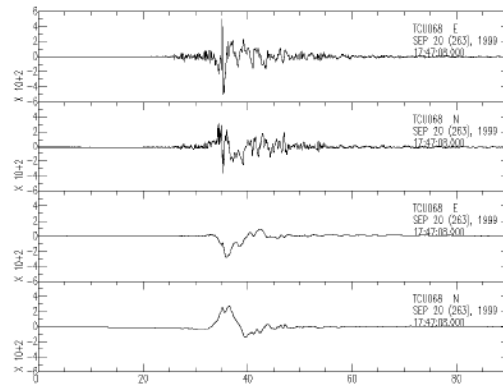


# Near-Fault Ground Motions

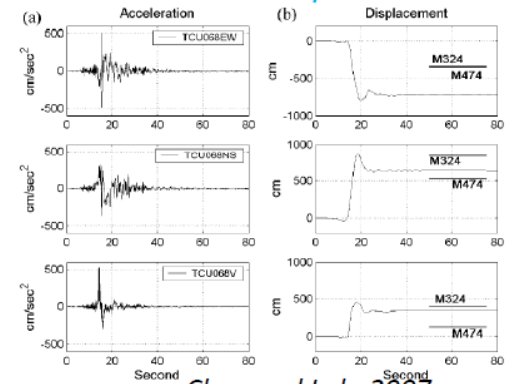
## Characteristics of near-fault ground motion

- Velocity pulse (velocity, long period)
- Fling effect (permanent displacement )
- Forward and backward directivity
- Vertical motion...

Velocity Pulse



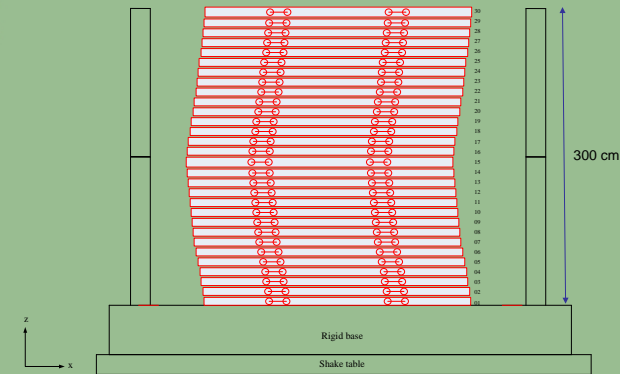
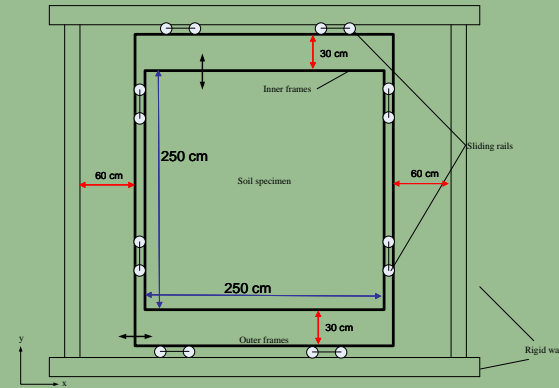
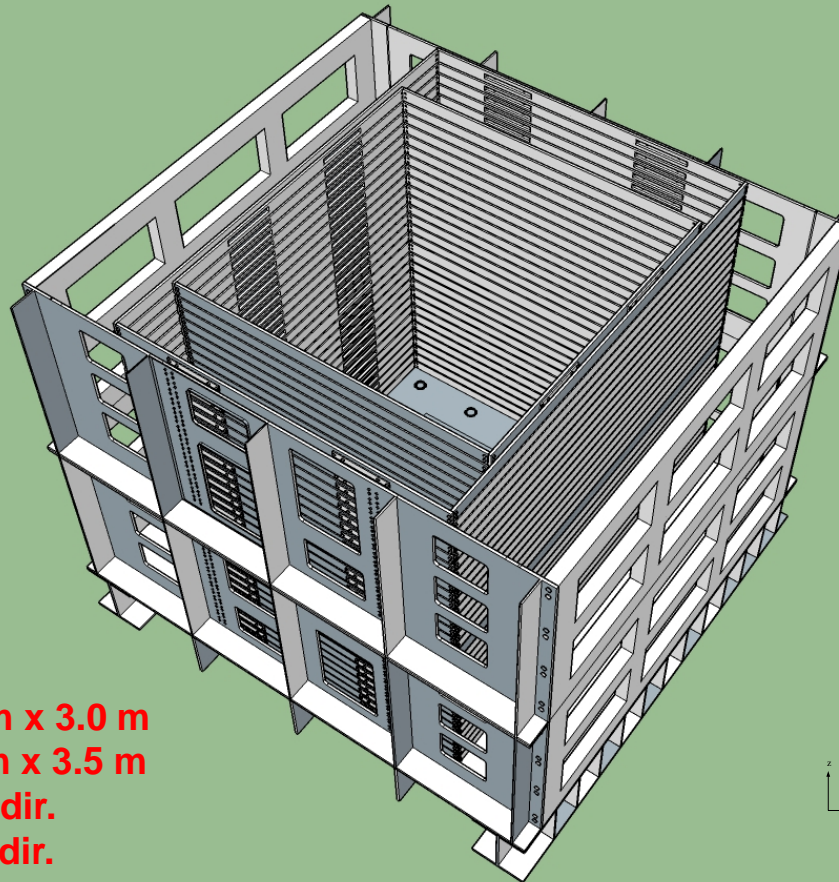
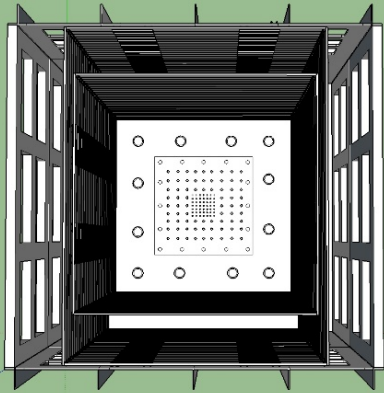
Permanent Displacement



Chen and Loh, 2007

- Higher strain rate,
  - Larger amplitude level
  - Longer duration
- ➔
- ## Dynamic soil behavior ?

# Laminar Shear Box



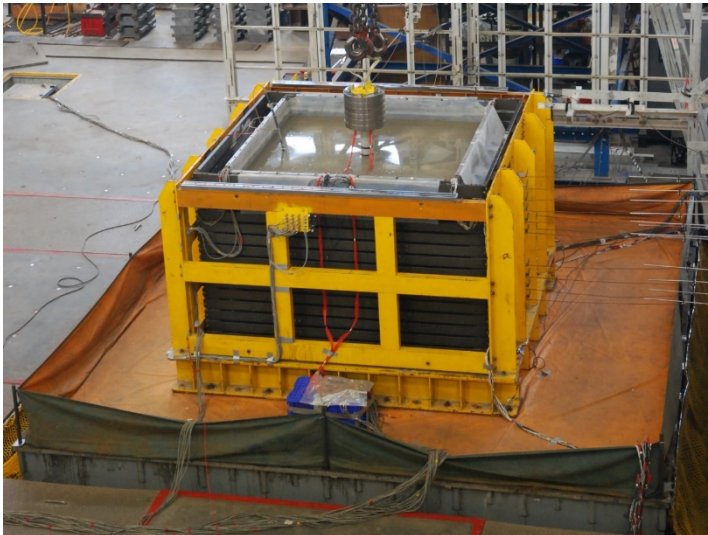
- **2 D Mechanism**
- **Spec. dim. : 2.5 m x 2.5 m x 3.0 m**
- **Total dim. : 5.0 m x 4.5 m x 3.5 m**
- **Stroke : ± 0.6 m in X dir.**  
**± 0.3 m in Y dir.**

Laminar box (2D)	Year	Spec. Dim. (m)	Spec. Vol. (m <sup>3</sup> )	Max. Disp. (mm)
1 <sup>st</sup> Box	1999	1.88 × 1.88 × 1.52	5.37	±150
New Box	2018	2.50 × 2.50 × 3.00	18.75	±300 / ±600



# *Related Researches*

- Near-fault effect on ground response analysis
- Soil-pile-structure interaction in a liquefiable ground under near-fault ground motion excitation



Level ground



Sloping ground

*Thank you and discussions*