

# Discrete Element Modeling of a rocking podium structure subjected to biaxial shake-table test

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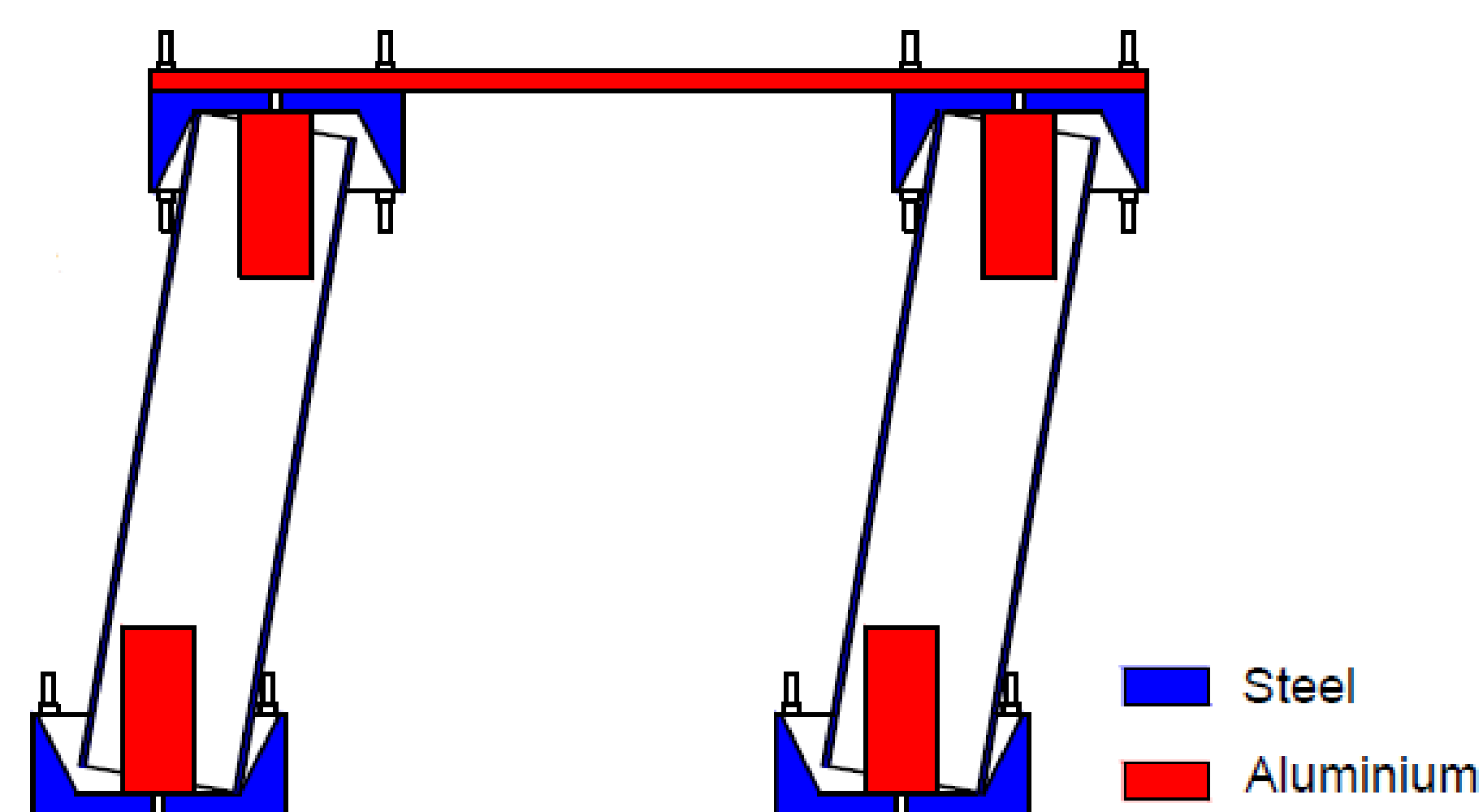
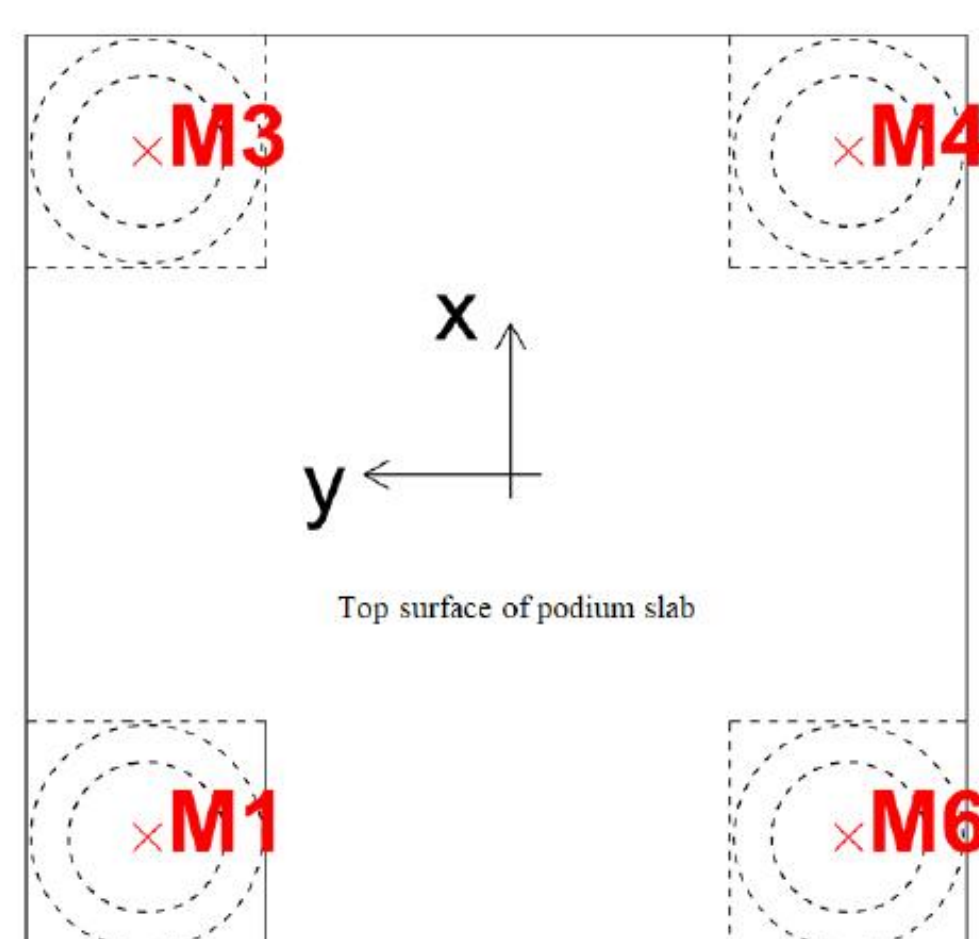
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## Introduction

- Shake-table test on a full-scale four-column rocking podium structure tested in 2019 by Vassilou et al.
- 200 different bi-directional artificial seismic excitations derived by ChiChi and EICentro records imposed (horiz. X-Y directions)
- Specimen constituted by four 1m-height and 0.25m-diameter hollow steel columns rocking on conical restraints, connected by 3cm-thick top slab



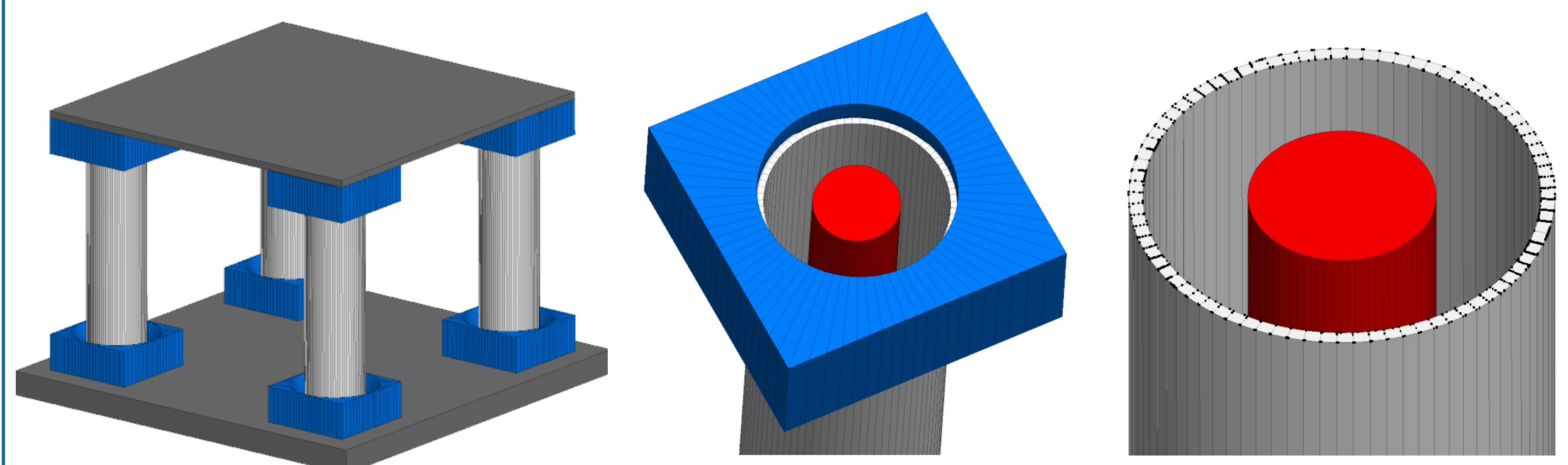
- Main goal: to predict, prior to the test, the actual dynamic response of the specimen in terms of MAVE parameter

$$Mave = \max_t \left[ \text{abs} \left( \frac{M1(t) + M3(t) + M4(t) + M6(t)}{4} \right) \right]$$

- where M1, M3, M4, and M6 are the horiz. top displacements of the columns

## Modeling strategy

- Distinct Element (DE) Method-based numerical model was developed in the 3DEC computational platform
- Structural components explicitly reproduced numerically as an assembly of rigid blocks, connection provided by nonlinear springs with normal ( $k_n$ ) and shear stiffnesses ( $k_s$ )



- Columns/restraints frictional mechanisms modeled using a simplified Mohr-Coulomb criterion with friction angle ( $\phi$ ), zero dilation ( $\psi$ ), tensile strength ( $f_t$ ) and cohesion ( $c$ ).

| $k_n$ [Pa/m] | $k_s$ [Pa/m] | $c$ [Pa] | $\phi$ [°] | $\psi$ [°] | $f_t$ |
|--------------|--------------|----------|------------|------------|-------|
| 1e9          | 1e9          | 0        | 11.31      | 0          | 0     |

## Results and Conclusions

- The employed modeling strategy enabled to obtain adequate results in a reasonable timeframe
- Numerical accuracy will be assessed as soon as experimental outcomes become available

