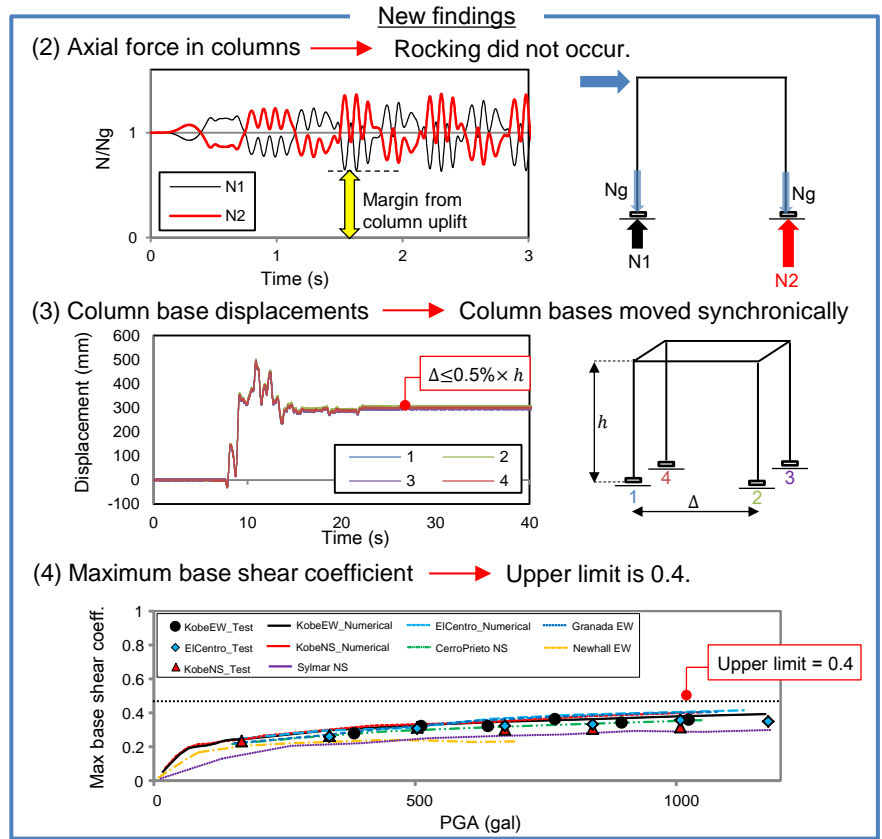
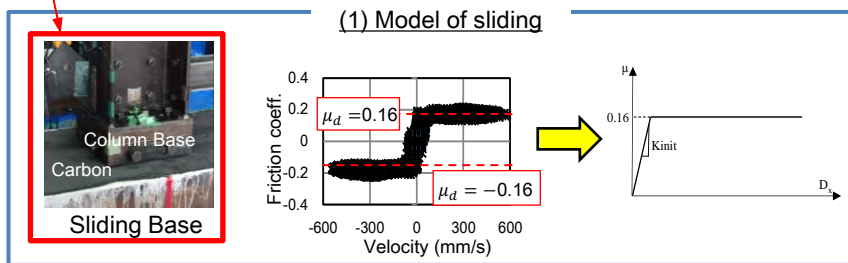
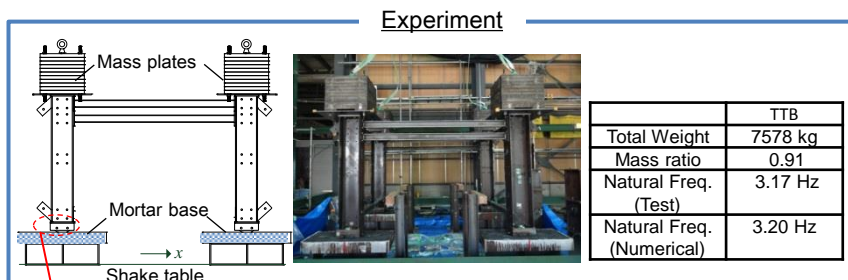
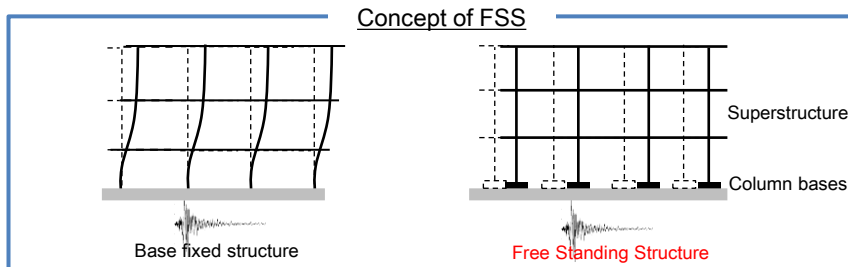


Characteristics of Free-Standing Structures

Background and Objectives: Recent earthquakes demonstrated that the collapse prevention of the structures in case of extremely strong ground motions is still a serious societal concern. One approach is to cap the seismic forces applied to structure by separating the superstructure from the foundation and allowing the superstructure to slide. The forces transmitted to the superstructure are controlled by the friction coefficient of the sliding surface, which can be properly reduced by graphite lubrication. This study aims at evaluating the efficiency of the lubricated sliding system on realistic specimens, taking into account the possible influence of the overturning moment, and the level of synchronization in movement of separated column bases.

Methodology and research plan: The characteristics of the sliding systems evaluated using numerical simulations and shake table tests are: (1) friction coefficient; (2) axial forces in columns; (3) column base displacements; (4) maximum base shear coefficient.



Conclusions: (1) The graphite lubrication realized a stable dynamic friction coefficient, which was close to 0.16 and weakly dependent of velocity. (2) The overturning moment did not trigger any rocking at the considered loading levels. (3) The column bases without the foundation beams displaced simultaneously, and relative column displacements were lower than 0.5% of the column height. (4) For large PGA, the maximum base shear coefficient showed an asymptotic behaviour towards 0.4, almost independently from the input features.