Piles in Liquefied Soils

Boris Jeremić, Zhao Cheng,
in collaboration with
Mahdi Taiebat, and Yannis Dafalias

University of California, Davis
and
EarthMechanics Inc. Fountain Valley

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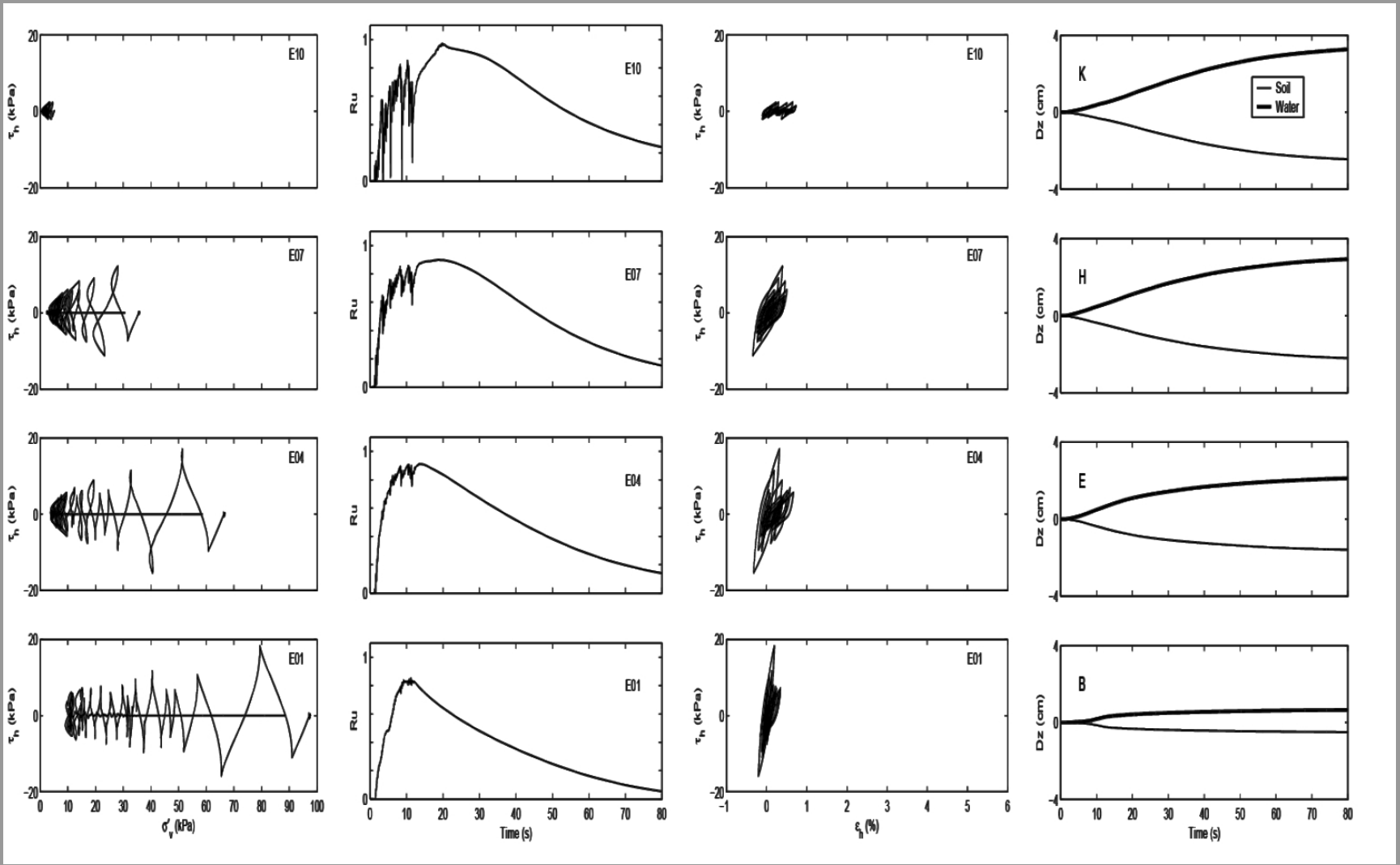
Outline

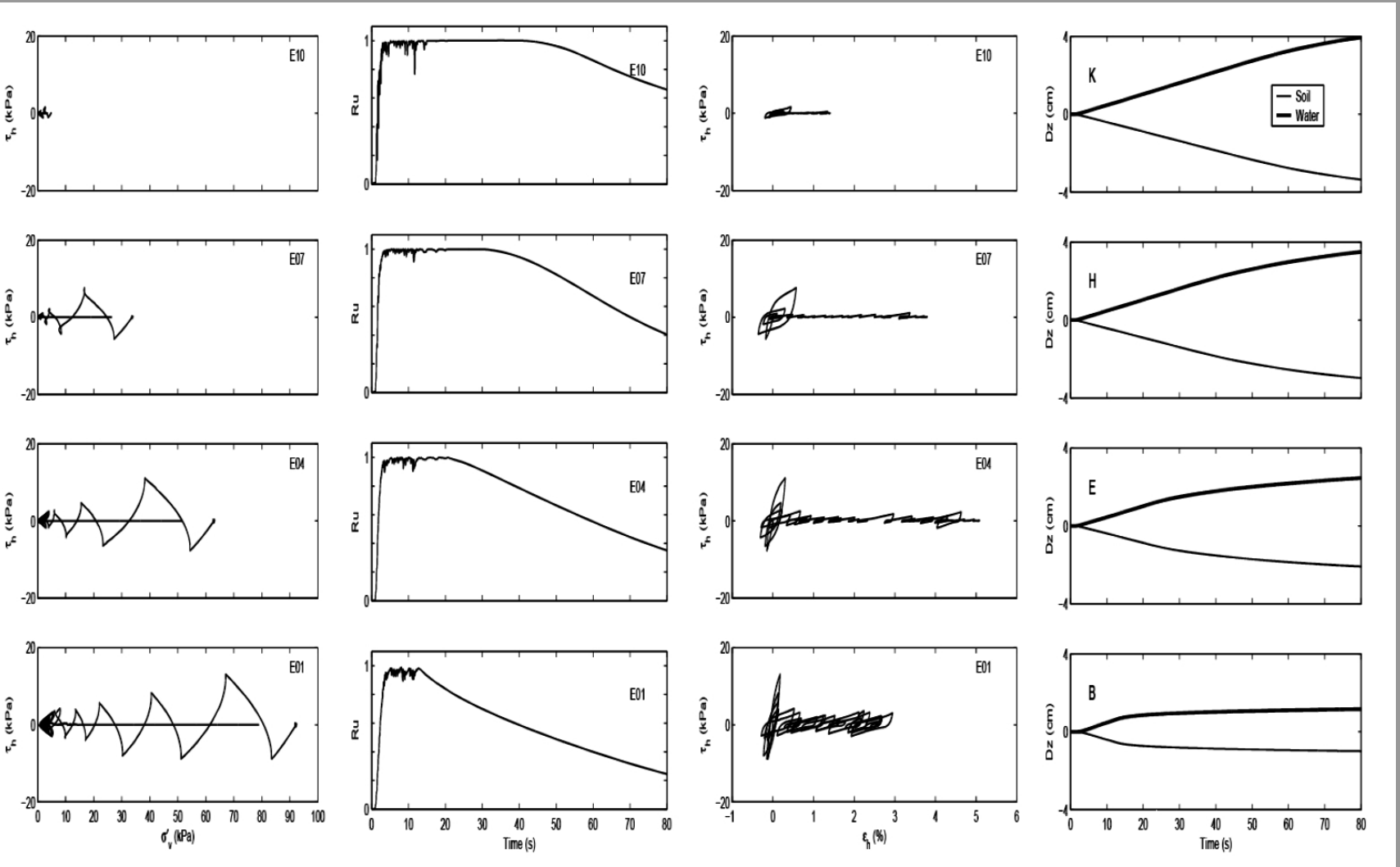
Formulation and the Implementation

- Fully coupled $u - p - U$ formulation and 3D implementation
- Physical, velocity proportional damping from solid–fluid interaction (not using Raleigh damping)
- Accelerations of pore fluid not neglected
- Formulation and implementation verified on a number of available closed form solutions
- Stable implementation for near incompressible (physical) pore fluid
- Dafalias Manzari (2004) material model used
- Single set of elastic–plastic parameters for all stages of loading (self weight, shaking, dissipation)

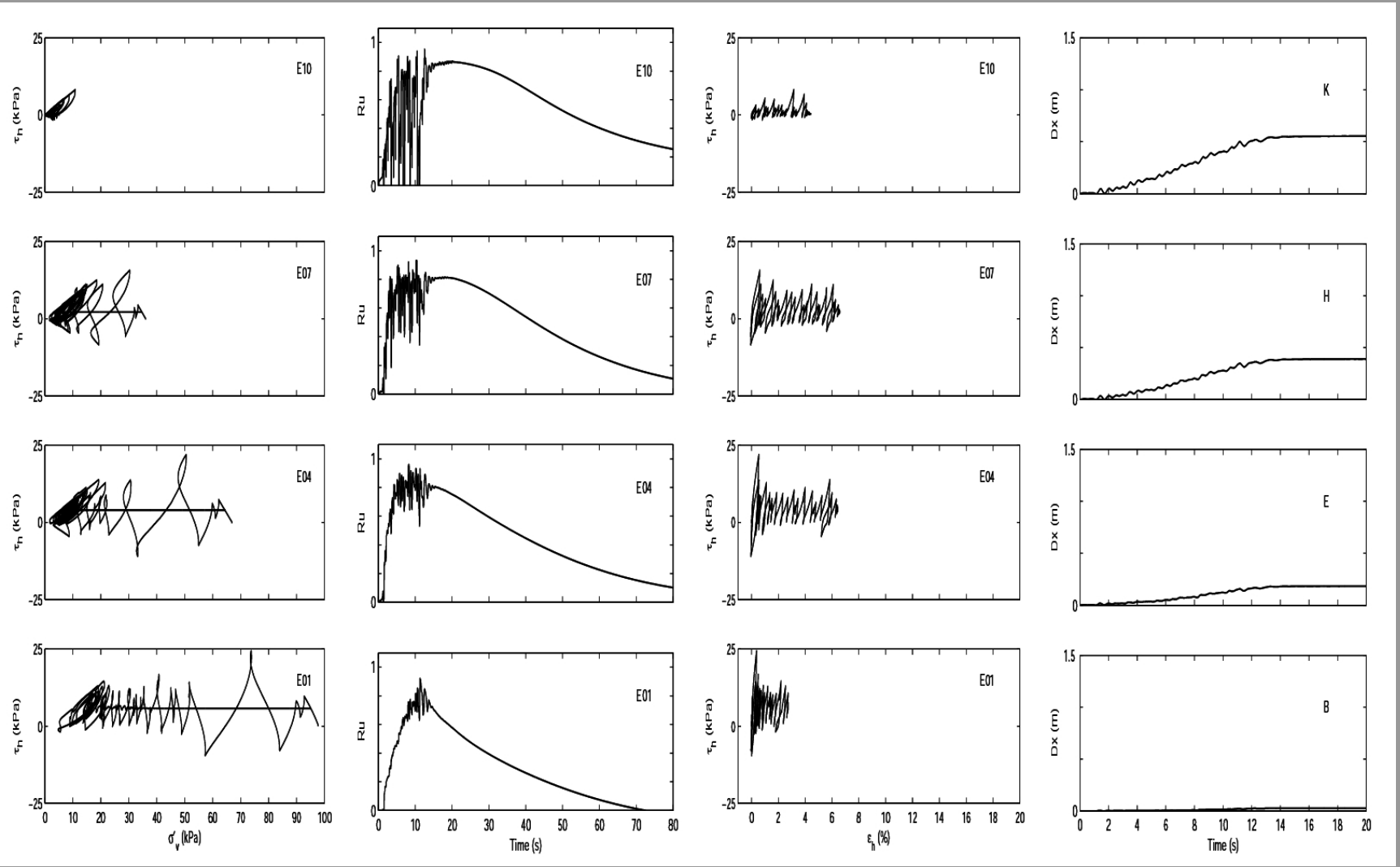
Level Ground, Dense Sand



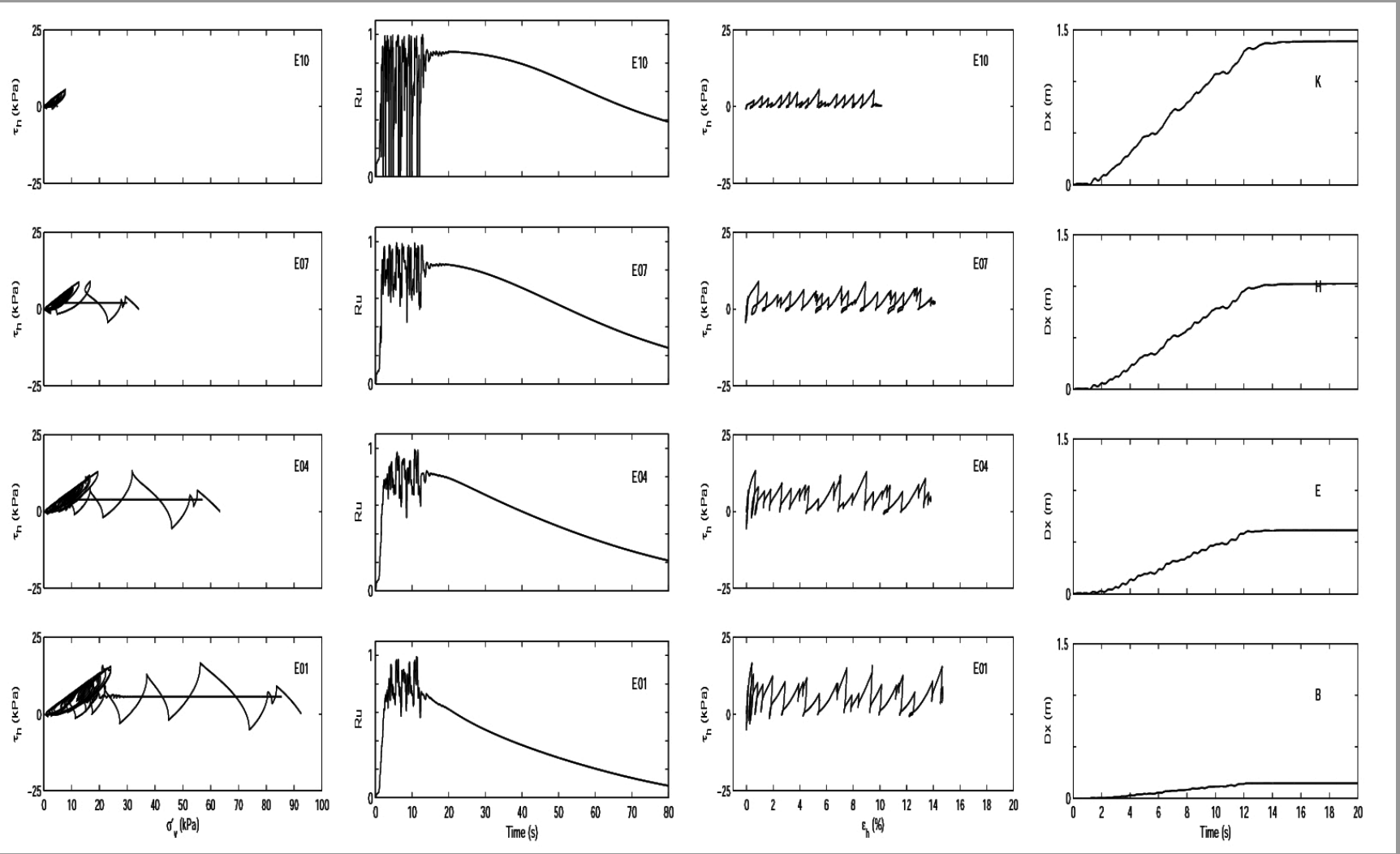
Level Ground, Loose Sand



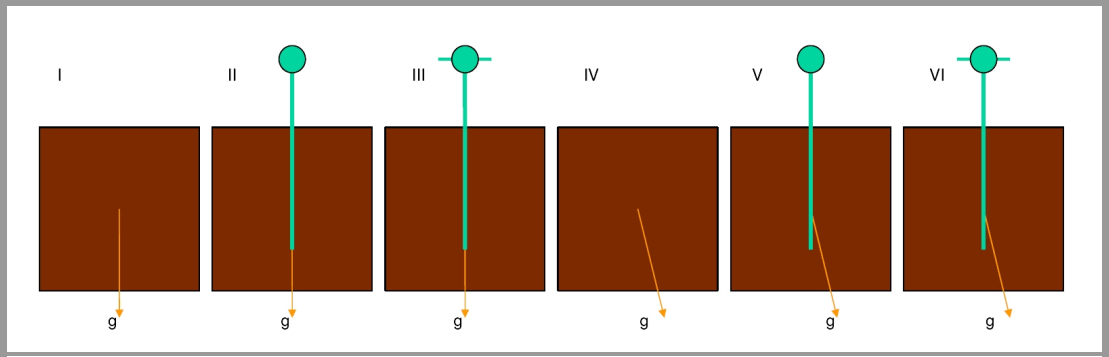
Sloping Ground, Dense Sand

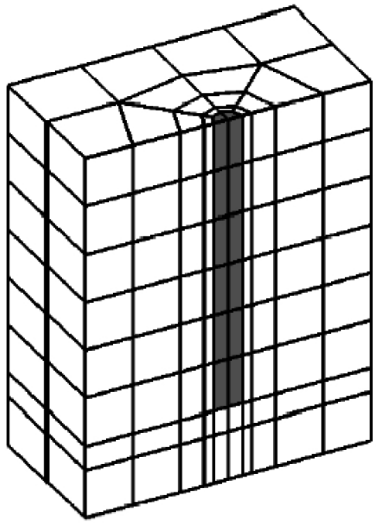


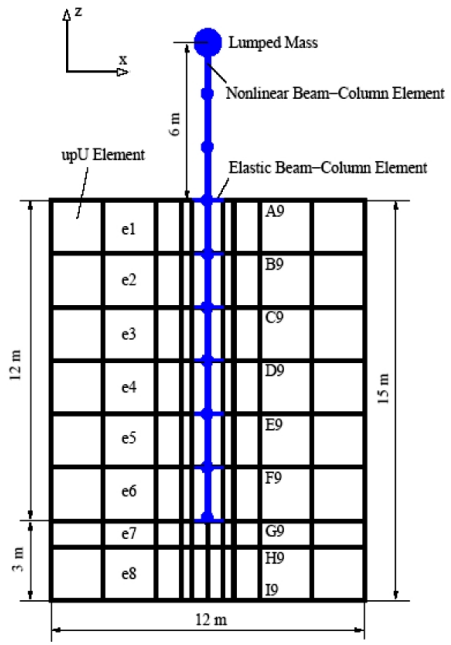
Sloping Ground, Loose Sand



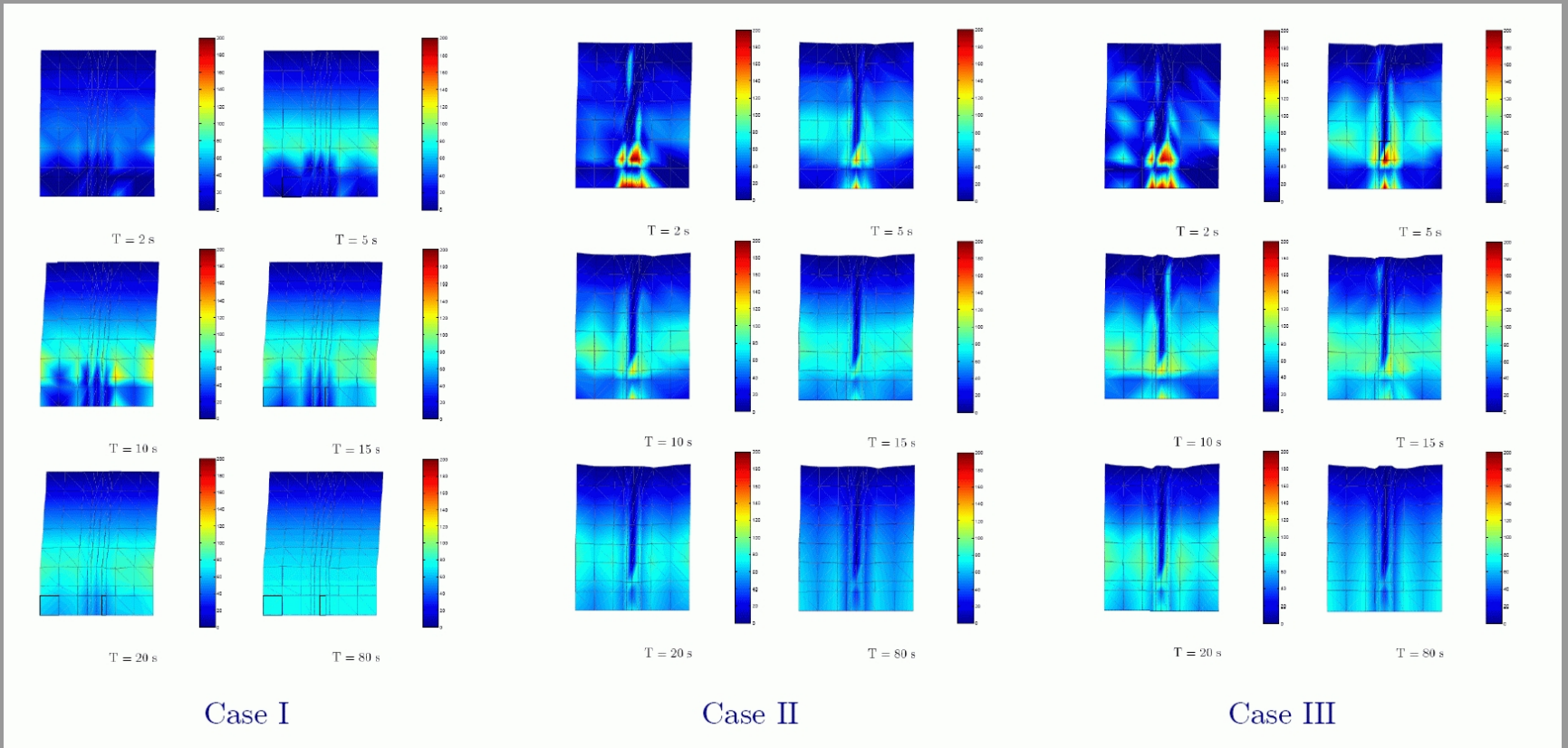
Bridge Pier–Pile Model



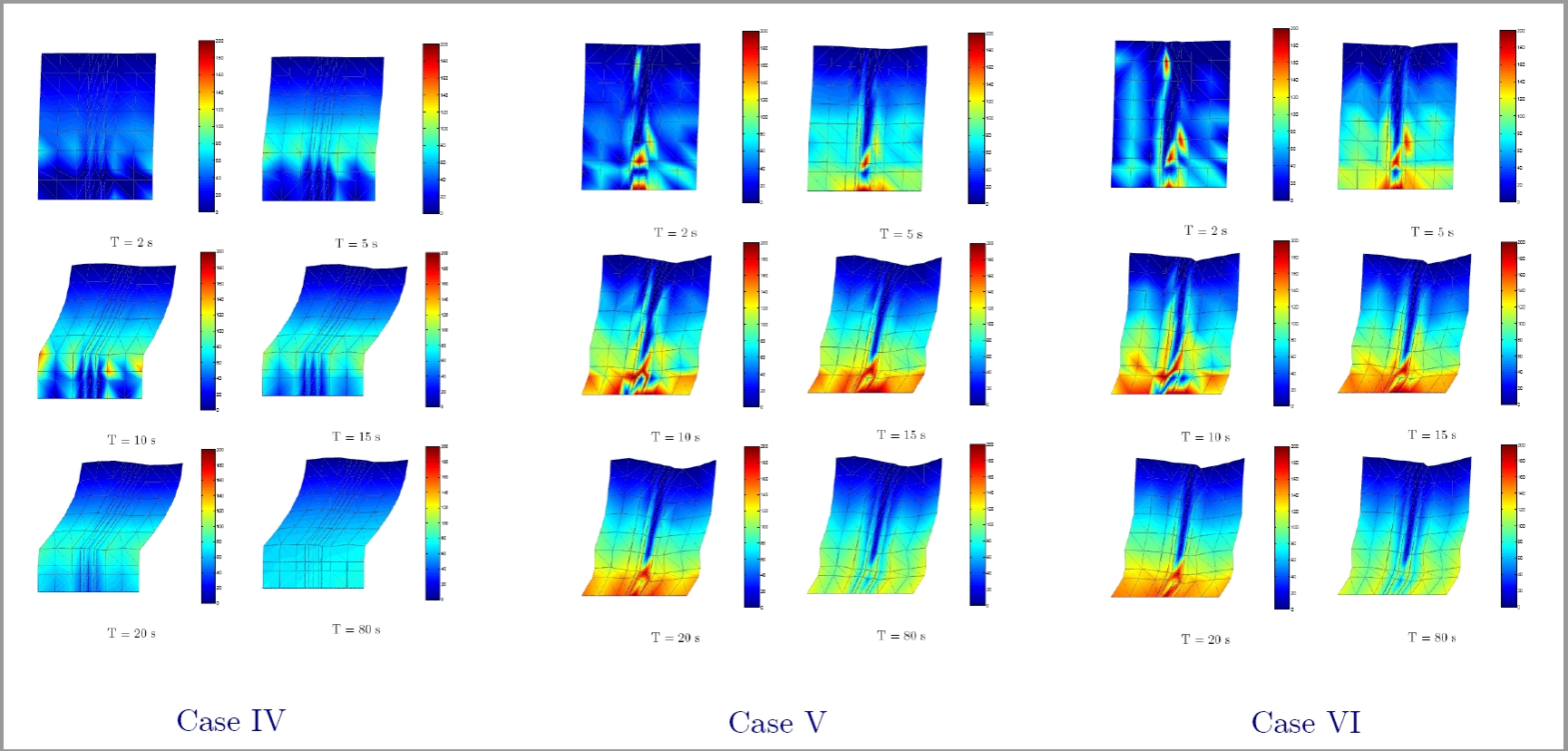




Bridge Pier in Level Ground



Bridge Pier in Sloping Ground



Case IV Case V Case VI

Summary

- Verification: the process of determining that a model implementation accurately represents the developer's conceptual description and specification. Mathematics issue. *Verification provides evidence that the model is solved correctly.*
- Validation: The process of determining the degree to which a model is accurate representation of the real world from the perspective of the intended uses of the model. Physics issue. *Validation provides evidence that the correct model is solved.*
- Prediction: use of computational model to foretell the state of a physical system under consideration under conditions for which the computational model has not been validated