

## **Intermediate-scale Testing for Process Understanding, Model Validation and Up-scaling of Flow and Transport in the Heterogeneous Subsurface**

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**Abstract.** Geologic heterogeneity plays a significant role in water flow and complex behavior of chemicals and waste products in the subsurface. A complete knowledge of the governing processes and how they are affected by the heterogeneity are difficult to obtain at field sites due to cost constraints and limitations of currently available technologies and methods for subsurface characterization. Characterization data limitations and lack of access and control at field sites make it difficult to validate theories and prediction models simulating complex flow and transport processes. Intermediate-scale, physical models provide cost effective alternatives that allows for the generation of accurate and high-resolution data at a range of observational scales, under controlled conditions in synthetically created aquifers that are highly instrumented for automated data acquisition. Examples involving numerical and conceptual model validation, data assimilation in model calibration, detection of buried objects, water retention in the shallow subsurface affected by land/atmospheric interface boundary conditions, tsunami affected coastal aquifer contamination, evaluation of remediation technologies for NAPL contaminated sites, up-scaling from laboratory to field systems and development of new wireless sensor networking technologies for subsurface monitoring will be presented.

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