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Rock Evaluation for Geological Modeling Using Electrical Conductivity and P Wave Velocity Measurements

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Detection of radionuclides generated from underground nuclear explosions depends, first and foremost, on the movement of nuclides from source to detector. The subsurface environment therefore has a critical role in determining how and when material signatures become detectable. Field-scale tracer experiments are essential to furthering scientific understanding of how the subsurface contains nuclear explosion signatures. However, the inaccessibility of the below ground environment remains a significant hurdle in using such experiments to validate material transport models. Scientists at the Pacific Northwest National Laboratory have collected a large geological site characterization data set using a dense multi-phenomenological sensor network with the objective of testing new methods for evaluating rock properties needed for validating subsurface transport models. By combining electrical conductivity tomography and seismic velocity measurements of this site, three-dimensional maps of the testbed porosity, permeability and water saturation were estimated. These mappings served as the framework for transport modeling at the site. Results of these simulations have been compared to experimental injections of nitrogen gas in the field to evaluate the joint inversion methodology.

E-mail

justin.lowrey@pnnl.gov

Promotional text

The multi-phenomenology joint inversion method presented here offers a novel way to directly image and evaluate underground features like fracture networks that critically influence how materials migrate.

Oral preference format

in-person

Primary author: LOWREY, Justin (Pacific Northwest National Laboratory (PNNL))

Co-authors: Ms JOHNSON, Christine (Pacific Northwest National Laboratory (PNNL)); Mr FELDMAN, Joshua (Pacific Northwest National Laboratory (PNNL)); ROCKHOLD, Mark (Pacific Northwest National Laboratory (PNNL)); LUO, Xiao (Pacific Northwest National Laboratory (PNNL))

Presenter: LOWREY, Justin (Pacific Northwest National Laboratory (PNNL))

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