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Noble gas signature adsorption in a UNE – bridging the gap between laboratory and field scale models

In an effort to better understand the processes that impact noble gas transport in the subsurface, the Underground Nuclear Explosion Signatures Experiment (UNESE) conducted multiple field campaigns in which tracers such as Xe-127, Ar-37 and chemical surrogates were released underground and monitored as they migrated toward the surface. A significant result was that the tracers reached sampling locations with different dilutions, indicating that these "largely non-interacting" gases were being differentially influenced by the environment. These results have spurred a number of laboratory scale experiment efforts to improve models of how UNE-relevant noble gases and common surrogates interact with geologic material under variable conditions. This presentation focuses on bridging the gap between models based on small-, even pore-scale transport physics and field-scale radionuclide signature migration models. Specifically, laboratory experiments demonstrating the capacity of volcanic tuff to variably adsorb xenon and argon gas versus chemical surrogates are used to inform field-scale models and ultimately depict how even small effects can result in large radionuclide signature discrepancies over large distances.

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