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Measurement of Radioxenon and Argon-37 Released into a Nuclear Explosion Cavity for Development/Evaluation of OSI Field Sampling Methods

Detection of radioactive noble gases during an On-Site Inspection (OSI) can be strong evidence that a nuclear weapons explosion occurred at that location. The expected subsurface concentrations of radioactive noble gas signatures during an OSI, however, have not been fully established. To begin understanding how to best estimate the radioxenons and 37Ar concentrations at the subsurface after a nuclear explosion, a field experiment was conducted to release radiotracers (127Xe and 37Ar) into an existing nuclear explosion cavity then monitor for the gases at surface locations. The first phase of the project was to inject chemical tracers to determine optimal sampling locations. Based on the concentrations of the chemical tracer injected into the explosion cavity and the levels measured at various locations at the surface, dilution factors and favorable sampling locations were determined. The final phase of the field experiment will be conducted in the spring of 2013 when 127Xe and 37 Ar will be produced in a nuclear reactor then injected into the shot cavity produced by an historical nuclear test. Soil gas sampling will be conducted at various locations to determine transit time and concentrations after transport from a nuclear explosion cavity to the subsurface.

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