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the Potential of Argon Detection Capabilities for Nuclear Explosion Monitoring

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Current noble gas detection systems for nuclear explosion monitoring are based on the detection of four radioxenon isotopes – Xenon-131m, -133, -133m and -135. The data provided by radioxenon detection could be enhanced by other radionuclide signatures, such as Argon-37. Activation of Calcium-40 in rock by neutrons produces Argon-37, and monitoring for this additional nuclide could help distinguish detections of nuclear explosions from background sources, like medical isotope production. This work studies the capabilities of a hypothetical Argon detection network. A 10 kt explosion was modeled using MCNP and SCALE to determine the inventory of Argon-37 created in a representative granite rock layer, assuming either 0.1, 1 or 10% of the total inventory was released. The Argon-37 inventory was combined with atmospheric transport data from HYSPLIT compiled in a previous study, along with the detection limits of standard Argon-37 detection systems, to determine how many hypothetical monitoring stations would detect Argon-37 from an explosion. This method was repeated for 365 HYSPLIT data sets to create a year's worth of hypothetical explosions, releases, and detections. The study quantified the average number of detections per release, the number of stations detecting Argon-37, and the possibility of detecting Argon-37 in coincidence with Xenon.

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Promotional text

Determining the capabilities of a hypothetical Ar-37 detection network is important in establishing its value as a supplement to the current radioxenon monitoring system for underground nuclear explosions.

Oral preference format

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