ID: **P2.4-361** Type: **E-poster**

Signatures from Complex Releases of Vented Fission Products

Thursday, 22 June 2023 11:25 (1 minute)

Following an underground nuclear explosion, fission products may be vented to the surface and transported through the atmosphere. Traditional requirements for nuclear explosion monitoring systems have focused on simple release scenarios. A more rigorous evaluation of radionuclide inventory releases will provide better requirements for measurement systems and improve analysis of detections. The goal of this work was to compare isotopic signatures reaching monitoring stations under different venting scenarios. First, a radionuclide inventory of fission products was developed using the SCALE code system based on the fission of U-235. The release of fission products to the surface was modeled in two components: prompt and delayed releases. Both the prompt and delayed components were varied to produce 63 total scenarios (example: 0.1% gas vent prompt release and no delayed release). Dilution factors for the resulting plume reaching a selected subset of IMS monitoring stations were found using HYSPLIT, and the simulation was repeated over a period of 366 days. Detection frequency and ratios for multi-isotope detections are presented for the various release scenarios.

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Promotional text

The contribution of prompt and delayed fission product releases from underground nuclear explosions were quantified using a test case repeated over a one-year timeframe.

Oral preference format

in-person

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Session Classification: Lightning talks: P2.4

Track Classification: Theme 2. Events and Nuclear Test Sites: T2.4 Atmospheric and Subsurface Radionuclide Background and Dispersion