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Analysis of Aerial Radiological Overflights and Implications for Nuclear Testing Scenarios

Optimal use of on-site inspection radionuclide team resources requires an accurate understanding of the detection sensitivities of the equipment used for the various radionuclide measurement techniques. Parametric analysis of these sensitivities in terms of equipment design and measurement procedures can also provide input to help refine requirements for equipment, data processing, and operational strategies.

In this effort, we present an analysis of the expected minimum detectable concentrations (MDCs) of particulate radionuclides on the ground after a vented underground nuclear explosion. The MDCs are determined as a function of detector size, flight parameters, and data processing method. We find that the minimum fraction of particulate radionuclides that must be vented in order to detect their presence on the ground via aerial overflight is no greater than 10^-5 for a notional underground nuclear explosion, and even less venting can be detected under favorable conditions with simple data processing methods. The calculated values for minimum detectable venting imply that the presence of OSI-observable radioactive particulates on the ground is plausible based on historical radioactivity release data from U.S. underground nuclear tests.

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