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Affecting the Vertical Distribution of Backgrounds at International Monitoring System Stations

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The backgrounds of radionuclides in the environment from natural and human made phenomena are well known to interfere with detection of nuclear explosions. International Monitoring System (IMS) stations perform measurements at ground level; however, little has been published regarding the vertical distributions of radionuclides expected from nearby and distant sources and if there is a large enough difference expected that could be exploited to increase signal-to-noise ratios. For example, local and regional topography, energy of injection, height of release, vertical shear, ground resuspension, building wake effects, convective mixing and other effects can have a significant impact on the vertical distributions of radionuclides detected at an IMS station. In this work, we present a set of calculations and experiments that could be conducted near and distant from known emission sources to test whether it is viable to decrease the effect of backgrounds at IMS stations. We also characterize the tradeoff between the vertical dilution of radionuclides and increased spatial representativeness of higher elevation samples and estimate the potential to use vertical gradients to better constrain background emissions.

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Promotional text

Identify opportunities and methods to improve nuclear-test-ban monitoring and on-site inspection. This study addresses the objective of SnT2023 by proposing a set of experiments and calculations that could significantly improve monitoring by increasing the signal to background

Oral preference format

in-person

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