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on Characterization of a CTBT-Relevant Nuclear Event Using Isotopic Ratios Caused by the Radioxenon Background Subtraction at International Monitoring System Stations

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Radionuclide stations in the International Monitoring System (IMS) network routinely collect air samples and assess activity concentrations. Activities collected in samples are often caused by emissions from nuclear facilities, but they could also indicate a noble gas release from an underground nuclear explosion. A discrimination can be done by estimating and analysing activity ratios of CTBT-relevant radioxenon isotopes under assumed scenarios. One of the issues in the isotopic ratio estimation is whether the contribution of the radioxenon background at IMS stations needs to be subtracted. This work will investigate the impact of the radioxenon background subtraction on the discrimination of a nuclear release event. Simulations are performed with atmospheric transport modelling to determine the concentrations originating from hypothetical radioxenon releases of pre-defined underground nuclear explosions distributed over a global semi-regular grid at different times of the day. The latter are studied independently and in the form of synthetic concentrations on top of real observations to account for the radioxenon background. The ratios of detected radioxenon isotopes are compared between the real IMS observations (typical radioxenon background from 2014), simulated concentrations from hypothetical nuclear explosion sources (pure signals without radioxenon background) and synthetic ones.

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Promotional text

Radioxenon background at IMS stations might mask the signals from CTBT-relevant nuclear events resulting ability to discriminate a nuclear explosion source from releases of nuclear facilities.

Oral preference format

in-person

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