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modelling applied to the Xe-133 background

Inverse atmospheric transport modelling allows to locate the origin of airborne radionuclides. Worldwide, the International Monitoring System (IMS) monitors for the presence of specific airborne radionuclides in order to verify compliance with the Comprehensive Nuclear-Test-Ban Treaty. Certain radioactive noble gases such as Xe-133 are attractive tracers as they are more likely to be detected after an underground nuclear explosion than particulates. The regular IMS detections of Xe-133 that originate from civil sources, in particular medical isotope production facilities, complicate Treaty verification. In this study, we make use of these Xe-133 detections (and non-detections) at specific stations in the Northern Hemisphere and apply inverse modelling. We compare the results, such as location and emission, with the properties of a major medical isotope production facility. As such, our study allows to test the inverse modelling capability in a real-world environment, with a single dominant source but where detections are contaminated by contributions from other radioxenon emitters, in particular other medical isotope production facilities and nuclear power plants. We have selected several time-consecutive cases covering a long period of time. Therefore, our results benefit from a wider applicability compared to studies dealing with a specific case only.

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