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Isotopic Ratios: From Civil Facilities to Nuclear Explosions

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The global atmospheric background of anthropogenic radionuclides hinders the ability of the Treaty monitoring community to identify possible signatures of a nuclear explosion. In particular, the atmospheric radioxenon background, produced and sustained by civil nuclear facilities such as isotope production facilities (IPFs) and nuclear power plants (NPPs), causes detections on the International Monitoring System (IMS) every day. Discriminating between the signatures of the civil background and those of nuclear explosions is essential to improve the analysis and interpretation of samples collected by monitoring facilities. To do this effectively, a better understanding of the possible emission profiles from NPPs is required. Based on simulations performed at the UK National Data Centre, we discuss the potential stable xenon isotopic signatures of NPPs, as well as how this stable gas composition differs from both the natural background and from an expected nuclear explosion signature. An assessment of the effects of the operational parameters of an NPP on the stable gas composition is also discussed.

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