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of Xe-135 observations at IMS noble gas systems generated by neutron activation and its relevance for nuclear explosion monitoring

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Strong neutron sources may generate significant amounts of radioxenon by activation of stable xenon. Radioxenon emission from some nuclear research reactors and from spallation neutron sources are dominated by neutron activation as the production process. The isotopic ratios are different from fission gases. Activation generates Xe-135 to Xe-133 activity ratios like fission but the activated gases may escape from the facility faster than fission products that are initially contained within fuel cladding. Therefore, less Xe-135 has decayed and a comparatively higher activity is emitted. When detected at an IMS station, the Xe-135 to Xe-133 activity ratio can even exceed the threshold for raising the screening flag that indicates it appears like a prompt release from a nuclear explosion. It may also happen that Xe-135 is observed without simultaneous detection of Xe-133 in the same sample. This presentation investigates activation sources that could possibly be observed at IMS sites. These include the HFIR reactor and strong spallation neutron sources. The conclusions of this study have important implications for assisting States in identifying the source of a specific event and for the decision whether interference corrections for non-traditional radioxenon isotopes generated by activation needs to be introduced to the operational software.

Promotional text

This presentation investigates whether radioxenon generated by activation may be observed by IMS noble gas systems. This is important for Expert Technical Analysis and possibly for making IDC software robust against interference from non-traditional radioxenon isotopes.

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