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source location analysis of high ^{135}Xe observations at IMS noble gas systems to test the hypothesis of light water reactors being the source

Whenever ^{135}Xe is observed, it must originate from a fresh release due to its short half-life (9.2 hours). An activity ratio of ^{135}Xe to ^{133}Xe above 5 is an indicator for a possible nuclear test release. Therefore, it is important to fully understand observation of very high activity ratios of ^{135}Xe to ^{133}Xe in atmospheric air and even ^{135}Xe without simultaneous observation of ^{133}Xe as they occasionally occur at a few IMS stations (AUX04, JPX38, SEX63, NOX49, USX75, USX77). However, the nuclear processes causing such observations remain unexplained. One hypothesis of a possible source is power ramping down and the restart of light-water reactors (LWRs). For the mentioned IMS stations, the field of regard in the past 24, 48 and 72 hours are studied to identify a possibly common source region. The time of possible releases is compared with begin and end of outages reported in the Power Reactor Information System. The hypothesis is tested whether LWRs can explain some or all occurrences of high ^{135}Xe concentrations. This has significant bearing on event screening for nuclear explosion monitoring. Specifically, conclusions will be drawn on the application of the ^{135}Xe to ^{133}Xe screening threshold.

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