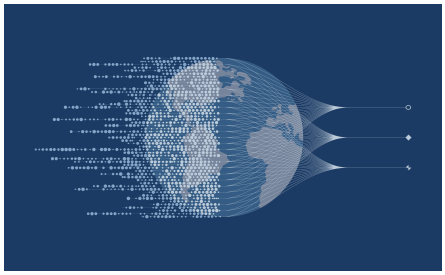

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Salt Reactor (MSR) Off-Gas System Efficiency and Its Possible Impact on Radioxenon Release Trajectory Estimations

This study examines the efficiency of off-gas systems in Molten Salt Reactors (MSRs) and their influence on radioxenon release trajectories, with implications for the International Monitoring System (IMS) under the Comprehensive Nuclear-Test-Ban Treaty Organization (CTBTO). Expanding on previous work analyzing radioxenon dispersion from the TMSR-LF1 reactor in China (Retnoasih, 2023), this study models radioxenon trajectories using HYSPLIT with GFS0p25 meteorological data (0000Z, 7 June 2023) over 48 hours.

Results from 28 trajectory simulations reveal that lower off-gas efficiency leads to higher radioxenon concentrations and wider dispersion, increasing the likelihood of detection at multiple IMS stations, such as RN21 in Lanzhou. Reduced efficiency also raises the probability of releasing additional radionuclides, including multiple radioxenon isotopes, which could complicate source attribution and increase the background signal at monitoring stations. Conversely, higher efficiency limits both dispersion and isotopic emissions, reducing detection probabilities and aiding in differentiating MSR releases from nuclear explosions. These findings underscore the role of off-gas systems in controlling radionuclide transport. Understanding the relationship between reactor emissions, isotope signatures and IMS detections is essential for refining source discrimination and improving nuclear explosion monitoring under the CTBT framework.

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