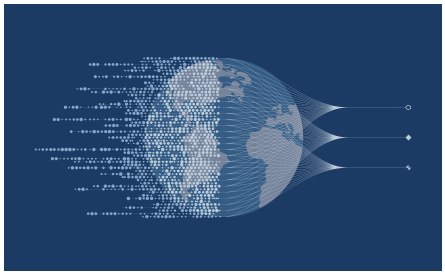

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Applying Radioxenon Isotopic Ratio for Nuclear Explosion Monitoring: Determination of Origin Time

Thursday 11 September 2025 09:00 (1 hour)

The isotopic ratio of radioxenon is crucial for distinguishing between civilian sources and nuclear explosions. This study focuses on using the Xe-135/Xe-133 ratio to precisely determine the origin time of detected radioxenon. Due to the shorter half-life of Xe-135 compared to Xe-133, this ratio decreases over time, serving as a reliable indicator for estimating the sample's age.

At the initial release, the ratio is approximately 2, consistent with the expected fission yield, providing a solid reference for analysis. Observed data indicate that most radioxenon detections occur between 20 and 60 hours after release, a critical timeframe for nuclear explosion monitoring and verification.

By refining isotopic ratio interpretation, this method improves the ability to assess the timing of nuclear events, supporting global treaty verification efforts. Future work will focus on enhancing detection sensitivity and integrating this approach into international monitoring systems.

These findings will be summarized using box-and-whisker plots to highlight outliers and the isotopic ratio decay curve to illustrate the temporal evolution.

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