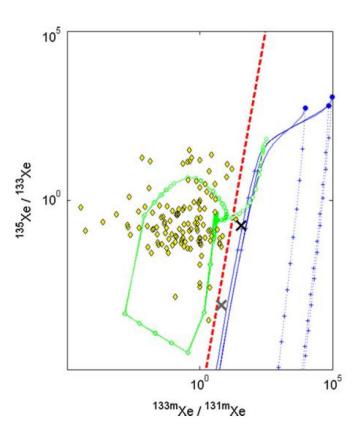


Radioxenon Isotopes, Ratios, and Discrimination: Challenges and Opportunities

James Ely, Paul Eslinger, James Hayes, Harry Miley, Ramesh Sarathi Pacific Northwest National Laboratory



- Radioxenon backgrounds from medical isotope production (MIP) facilities and nuclear reactors are observed frequently and are increasing with new facilities
- Four-isotopes ratio plots a main method for discrimination
- How likely is it to detect all four isotopes at regional distances from prompt and delayed emission from an underground nuclear explosion?
- Are there other options besides the four-isotope ratio plots?



Legend

 Fission of ²³⁵¹U, ²³⁹¹Pu and ^{238he}U at t=0 f = fission energy neutrons, he = high energy neutrons
Evolution of fission products in time with in-growth (+ at 1, 2, 3, 4 days)
Evolution of fission products for xenon separated at t=0 (+ at 24h steps)

O-O LWR burnup, 3.2% enrichment (evolution through 3 reactor cycles)

- Reactor release data from quarterly or annually reports
 - Xenon as byproduct of breeding ⁹⁹Mo in HEU targets:
- × Irradiation time: 5 days, decay: 2 days
- Irradiation time: 10 days, decay: 5 days
- -- Separation line for screening