SnT 2025 8 SEPTEMBER ONLINE DAY 9 TO 12 SEPTEMBER AT HOFBURG PALACE, VIENNA & ONLINE
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE

Applications in nuclear explosion monitoring using predictive source models for radioxenon discharges from nuclear facilities

Martin Kalinowski[1], Matthias Auer[1], Ted Bowyer[2], Matthew Cooper[2], Charlie Doll[2], James Ely[2], Paul Eslinger[2], Judah Friese[2], Sid Hellman[1], Lori Metz[2], Mihaela Rizescu[1], Ramesh Sarathi[2], Brian Schrom[2], Cari Seifert[2]

[1]Instrumental Software Technologies, Inc. (ISTI)
[2]Pacific Northwest National Laboratory (PNNL)

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INTRODUCTION AND MAIN RESULTS

Data collected by the Source Term Analysis of Xenon (STAX) project are used to create source models for medical isotope production facilities and nuclear power plants.

This presentation provides example source models for three model categories: Discharge characterizing parameters, patterns, and distributions.

The source models' usefulness in nuclear explosion monitoring is demonstrated by showing which isotopes can be expected to be seen at an IMS station.

This Low Yield Nuclear Monitoring (LYNM) research was funded by the National Nuclear Security Administration, Defense Nuclear Nonproliferation Research and Development (NNSA DNN R&D). The authors acknowledge important interdisciplinary collaboration with scientists and engineers from LANL, LLNL, NNSS, PNNL, and SNL.

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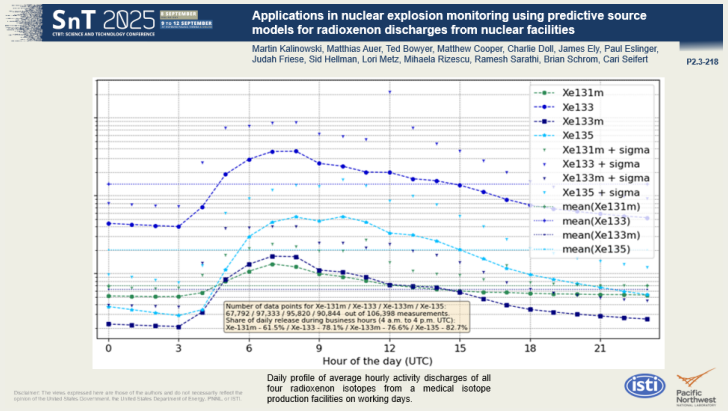
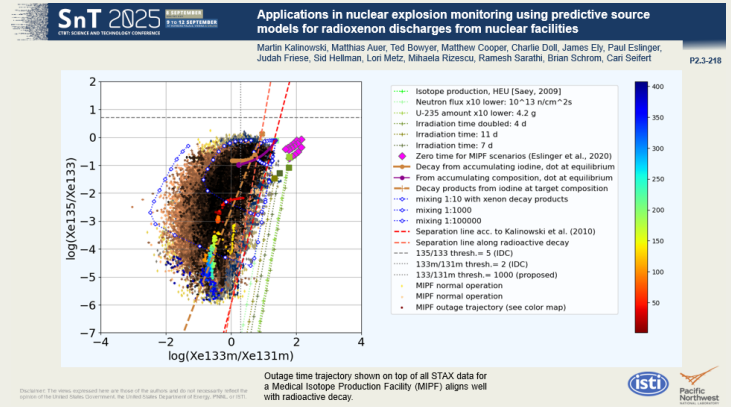
Pattern

Daily profile of average hourly activity discharges of all four radioxenon isotopes from a medical isotope production facilities on working days.

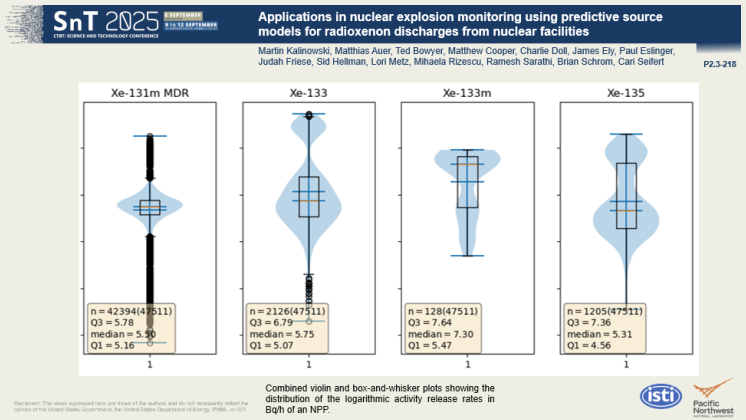


Outage time trajectory shown on top of all STAX data for a Medical Isotope Production Facility (MIPF) aligns well with radioactive decay.

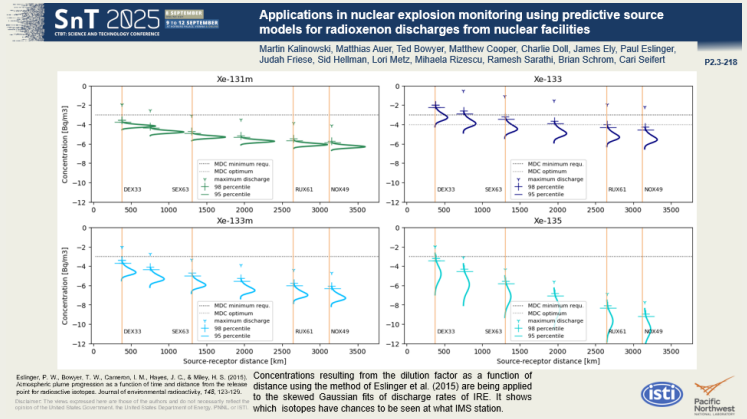


Distributions

Combined violin and box-and-whisker plots showing the distribution of the logarithmic activity release rates in Bq/h of an NPP.

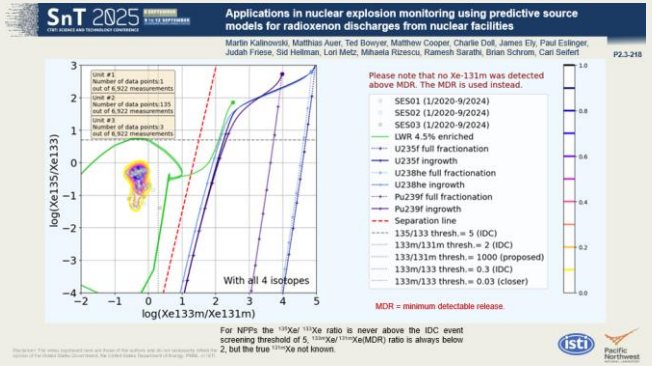


Concentrations resulting from the dilution factor as a function of distance are being applied to the skewed Gaussian fits of discharge rates of IRE. It shows which isotopes have chances to be seen at what IMS station.



Parameters

For NPPs the $^{135}Xe/^{133}Xe$ ratio is never above the IDC event screening threshold of 5, $^{133m}Xe/^{131m}Xe$(MDR) ratio is always below 2, but the true ^{131m}Xe not known.



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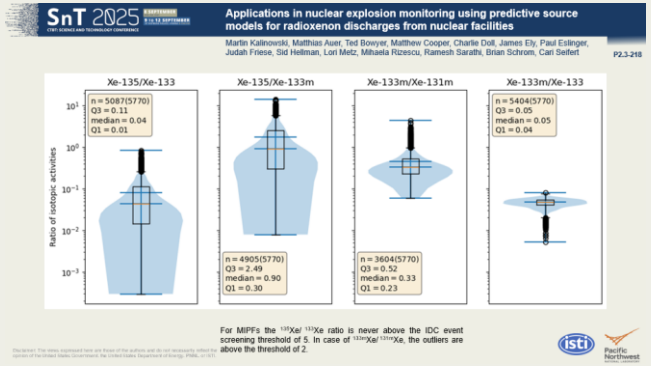

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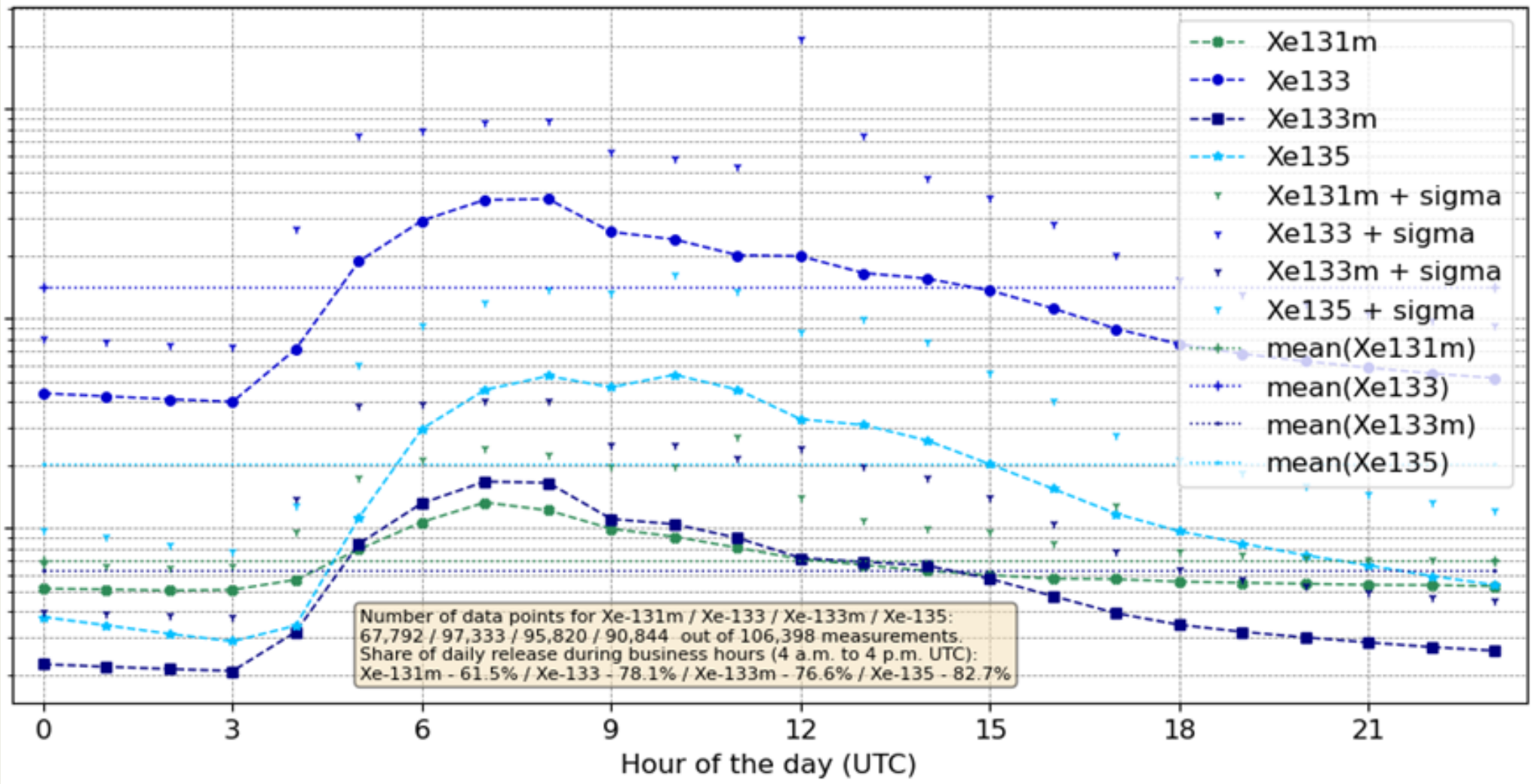

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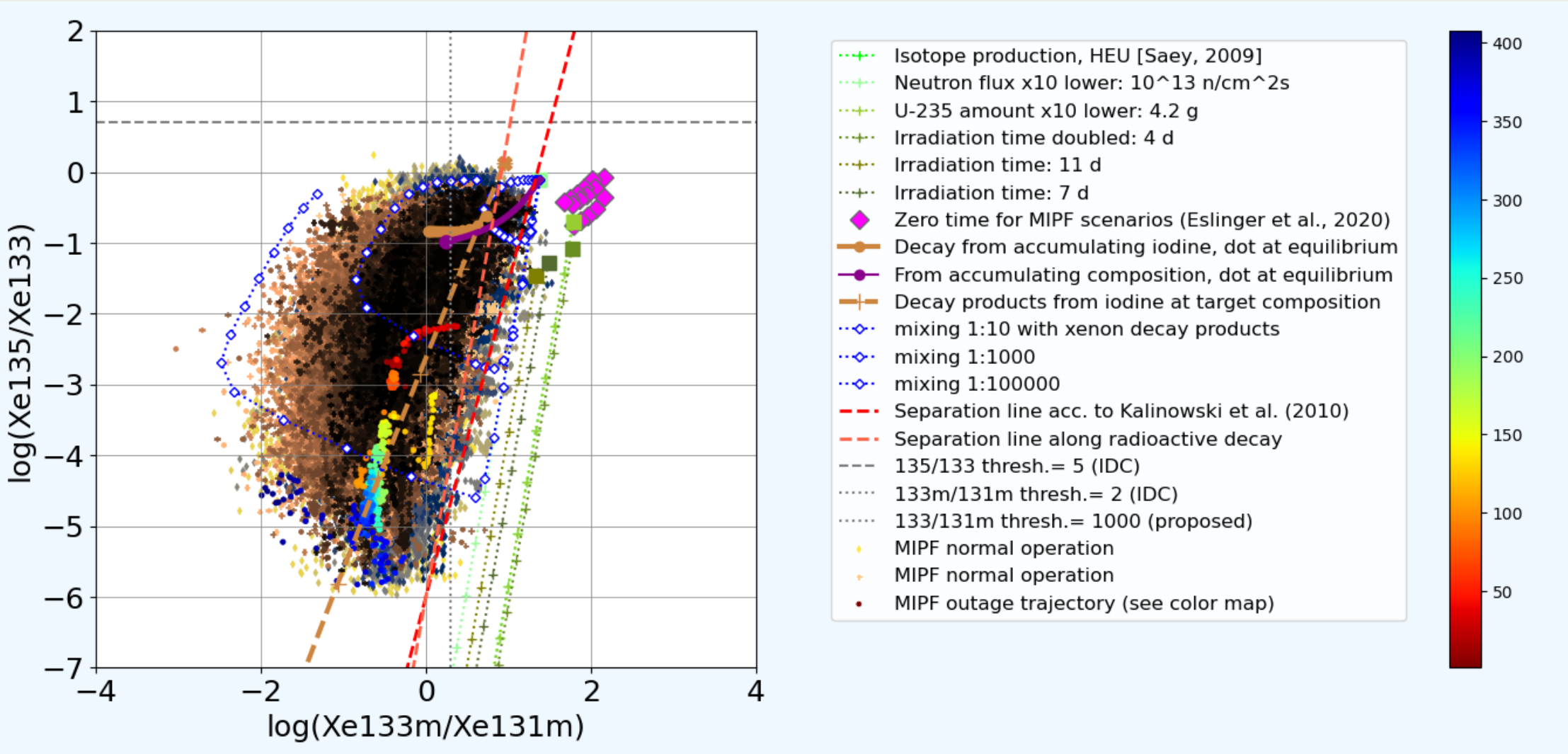

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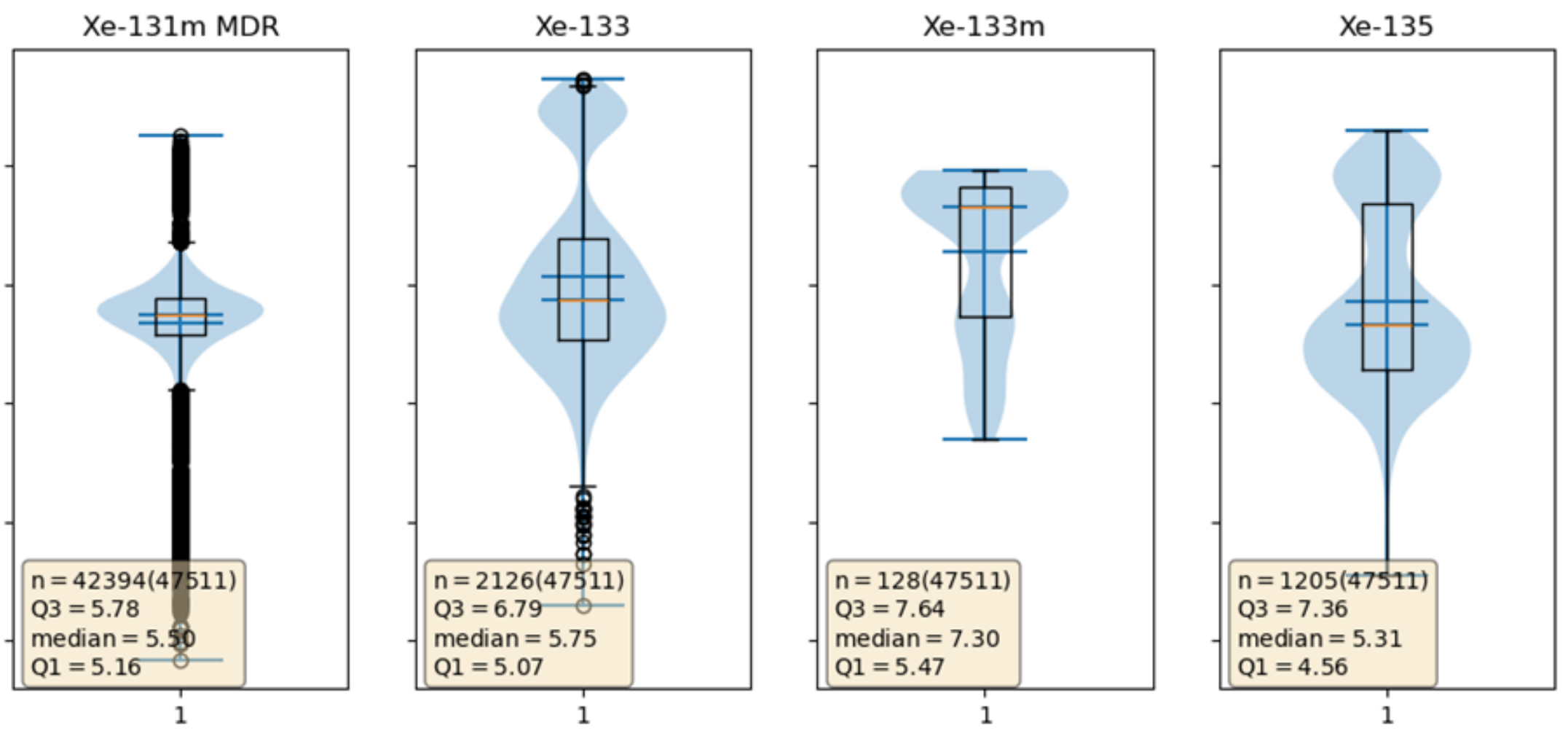

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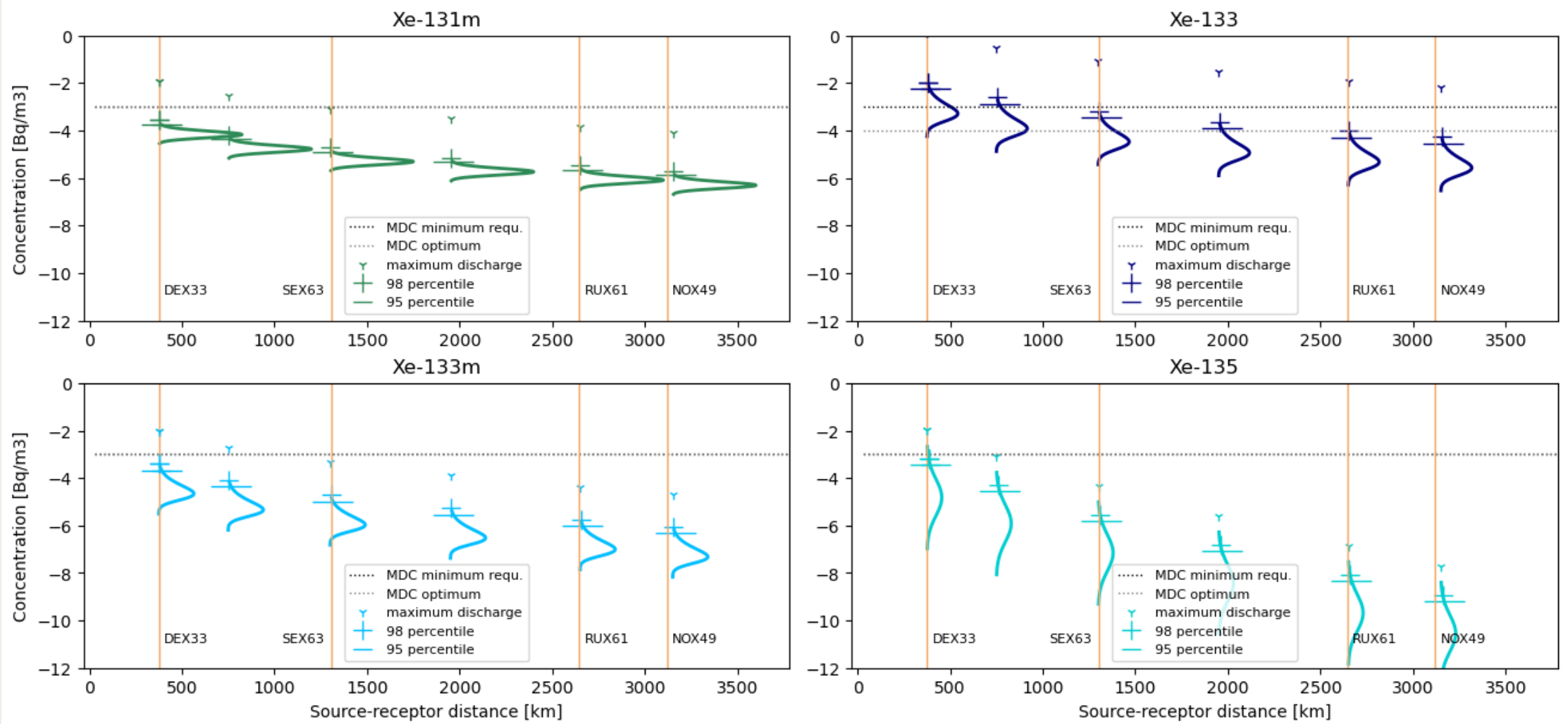

Eslinger, P. W., Bowyer, T. W., Cameron, I. M., Hayes, J. C., & Miley, H. S. (2015). Atmospheric plume progression as a function of time and distance from the release point for radioactive isotopes. Journal of environmental radioactivity, *148*, 123-129.

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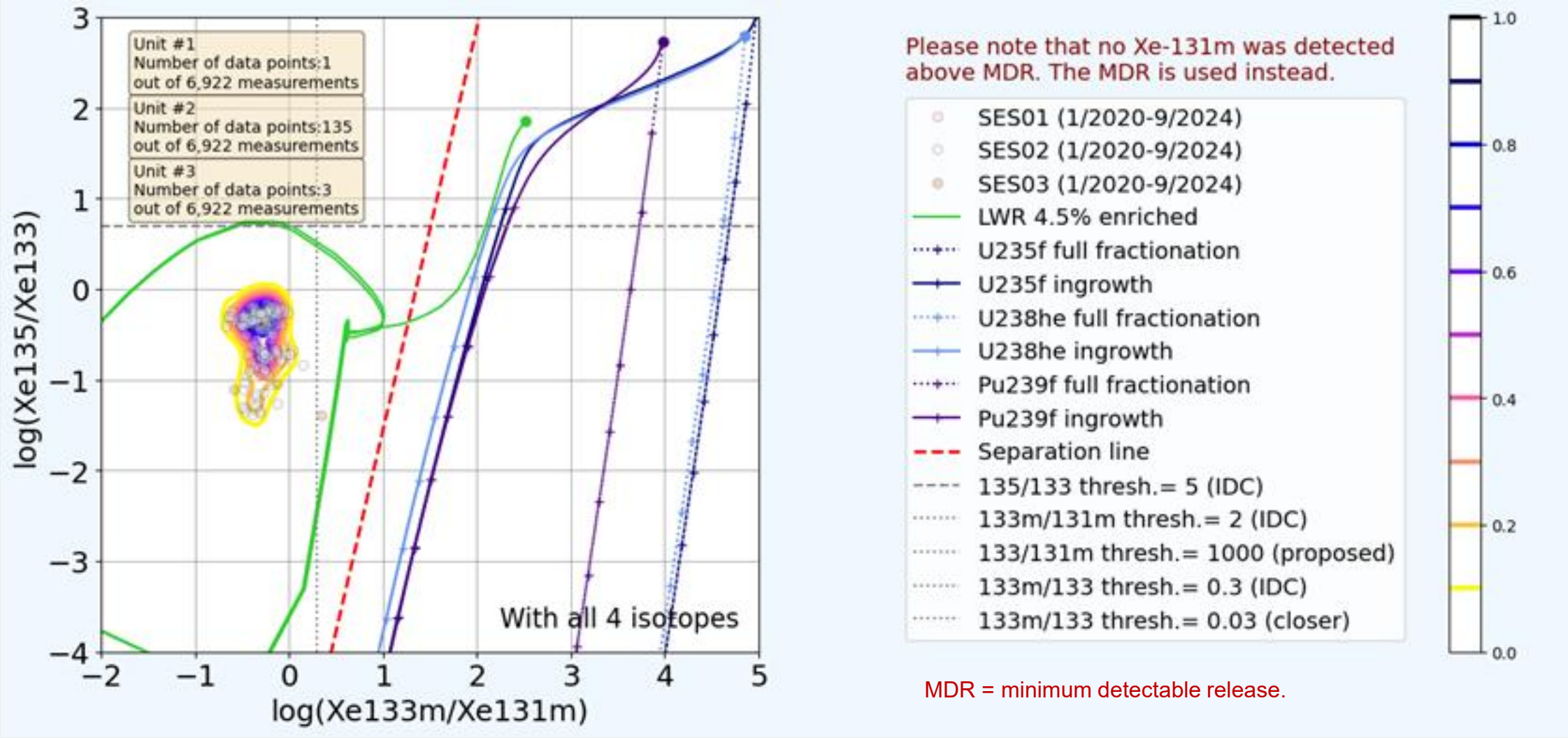

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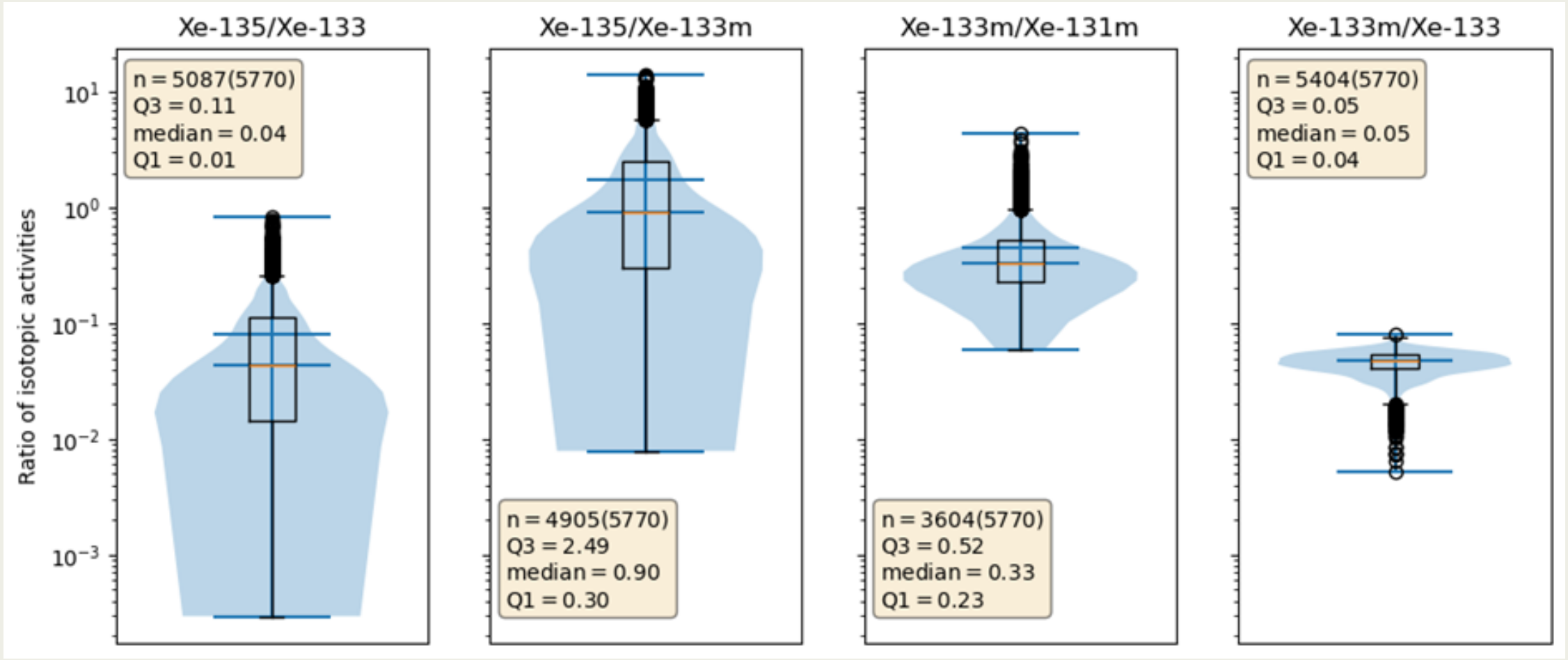

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