



Martin KALINOWSKI and Halit TATLISU

CTBTO, IDC (martin.kalinowski@ctbto.org)

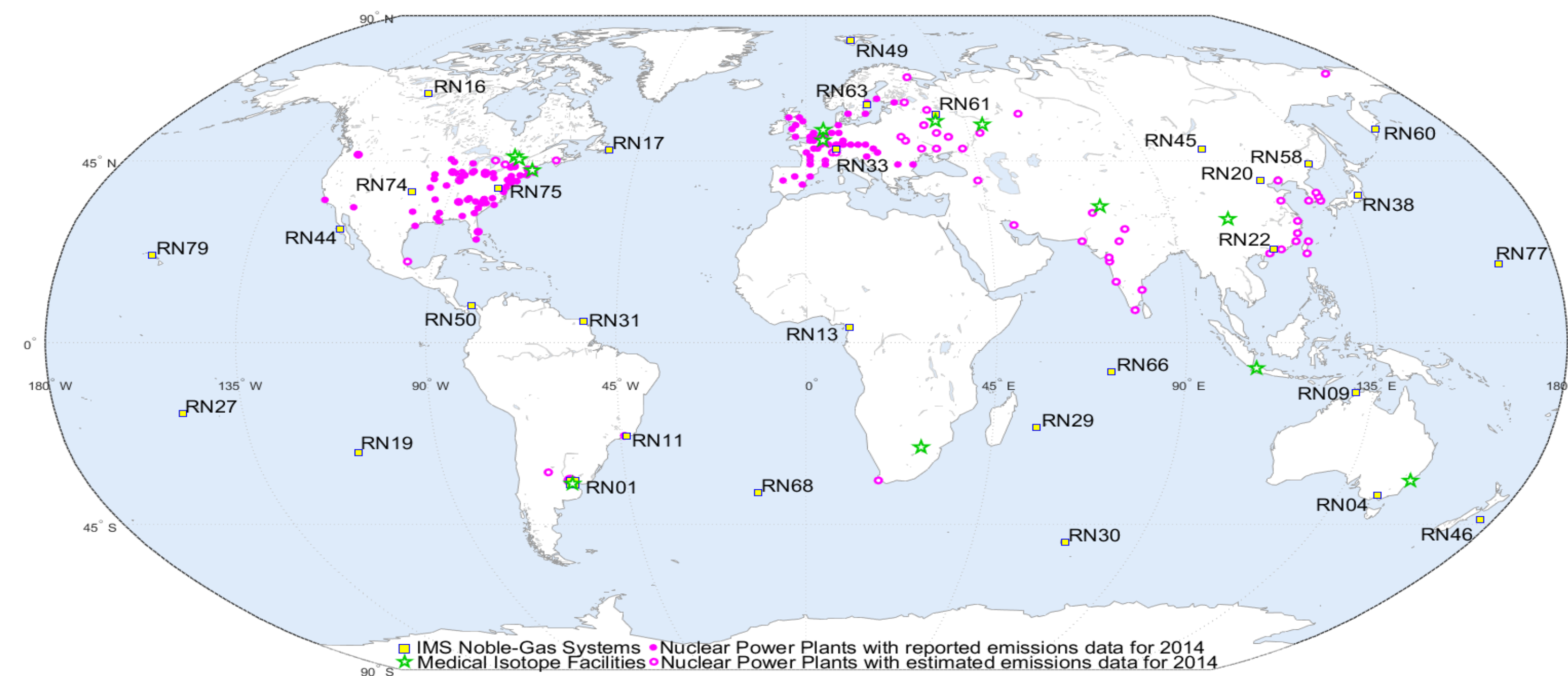
INTRODUCTION

Global radioactivity monitoring for the verification of the Comprehensive Nuclear-Test-Ban Treaty (CTBT) includes the four xenon isotopes ^{131m}Xe , ^{133}Xe , ^{135m}Xe and ^{135}Xe . These four isotopes are serving as important indicators of nuclear explosions.

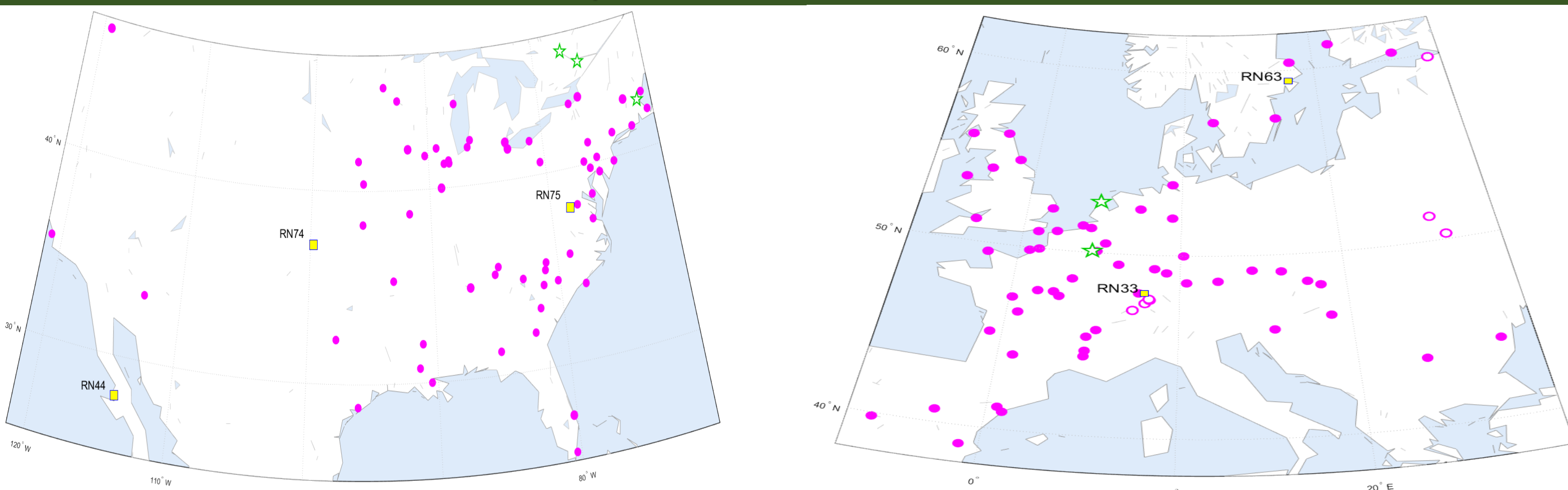
The best estimate of the global emission inventory for the year 2014 was presented Gueibe et al. (2017). The paper focused on the year 2014 but only with annual total release values based on peer-reviewed publications. The only information specifically valid for 2014 is the operational status of known sources. In the updated emission inventory presented here the real 2014 emissions with variations over time as reported by the facility operators were used whenever available.

Kalinowski/Tuma (2009) establishes the best estimate for normal operational releases from NPPs for a generic year. Gueibe et al. (2017) used the operational status to update the release estimate for the year 2014.

In 2014, there were 385 nuclear power plants (NPPs) at 174 sites in operation. Twelve (12) medical isotope production facilities (MIPFs) were included in this study.



This study uses real emission reports for 2014 as reported by NPPs:



REFERENCES:

Achim P., Generoso S., Morin M., Gross P., Le Petit G., & Moulin C. (2016) Characterization of Xe-133 global atmospheric background: Implications for the International Monitoring System of the Comprehensive Nuclear-Test-Ban Treaty. *Journal of Geophysical Research: Atmospheres*, 121(9), 4951-4966. <https://doi.org/10.1002/2016JD024872>

Gheddou A., Kalinowski M., Kusmierczyk-Michulec J., Bourguoin B.: Progress over 2014 baseline on the match between observations and simulations of radioxenon concentrations at IMS stations. SnT2019, poster T2.4-P46.

Gueibe, Christophe, Martin B. Kalinowski, Jonathan Baré, Abdelhakim Gheddou, Monika Krysta, and Jolanta Kusmierczyk-Michulec (2017) Setting the baseline for estimated background observations at IMS systems of four radioxenon isotopes in 2014. *Journal of Environmental Radioactivity* 178, 297-314. <https://doi.org/10.1016/j.jenvrad.2017.09.007>

Kalinowski, M.B.; Tuma, M.P. (2009) Global radioxenon emission inventory based on nuclear power reactor reports. *Journal of Environmental Radioactivity* 100, 58-70. <http://dx.doi.org/10.1016/j.jenvrad.2008.10.015>

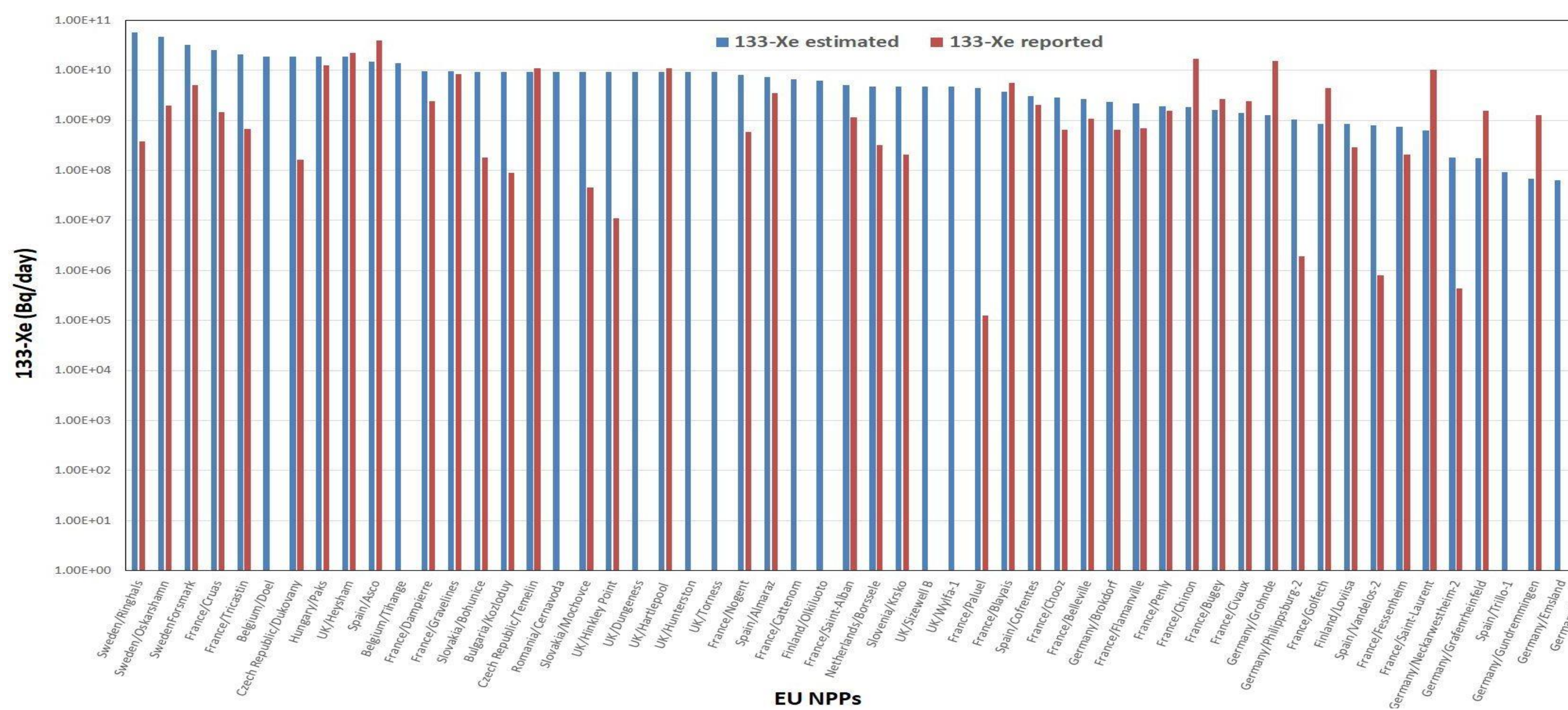
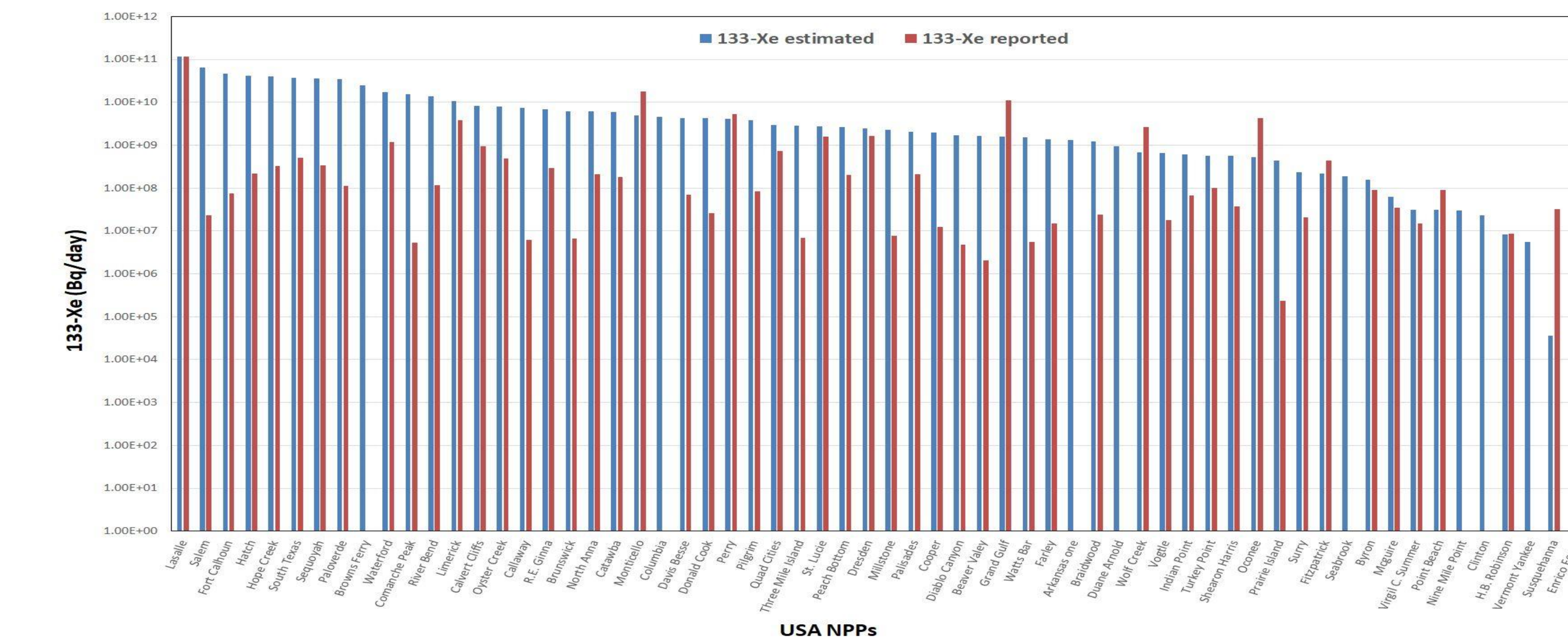
Kalinowski, M.B.; Grosch, M.; Hebel, S. (2014) Global Xenon-133 Emission Inventory Caused by Medical Isotope Production and Derived from the Worldwide Technetium-99m Demand. *Pure and Applied Geophysics: Volume 171, Issue 3*, 707-716. <https://doi.org/10.1007/s00024-013-0687-5>

Maurer, Christian et al. (2018) International challenge to model the long-range transport of radioxenon released from medical isotope production to six Comprehensive Nuclear-Test-Ban Treaty monitoring stations. *Journal of Environmental Radioactivity* <https://doi.org/10.1016/j.jenvrad.2018.01.030>

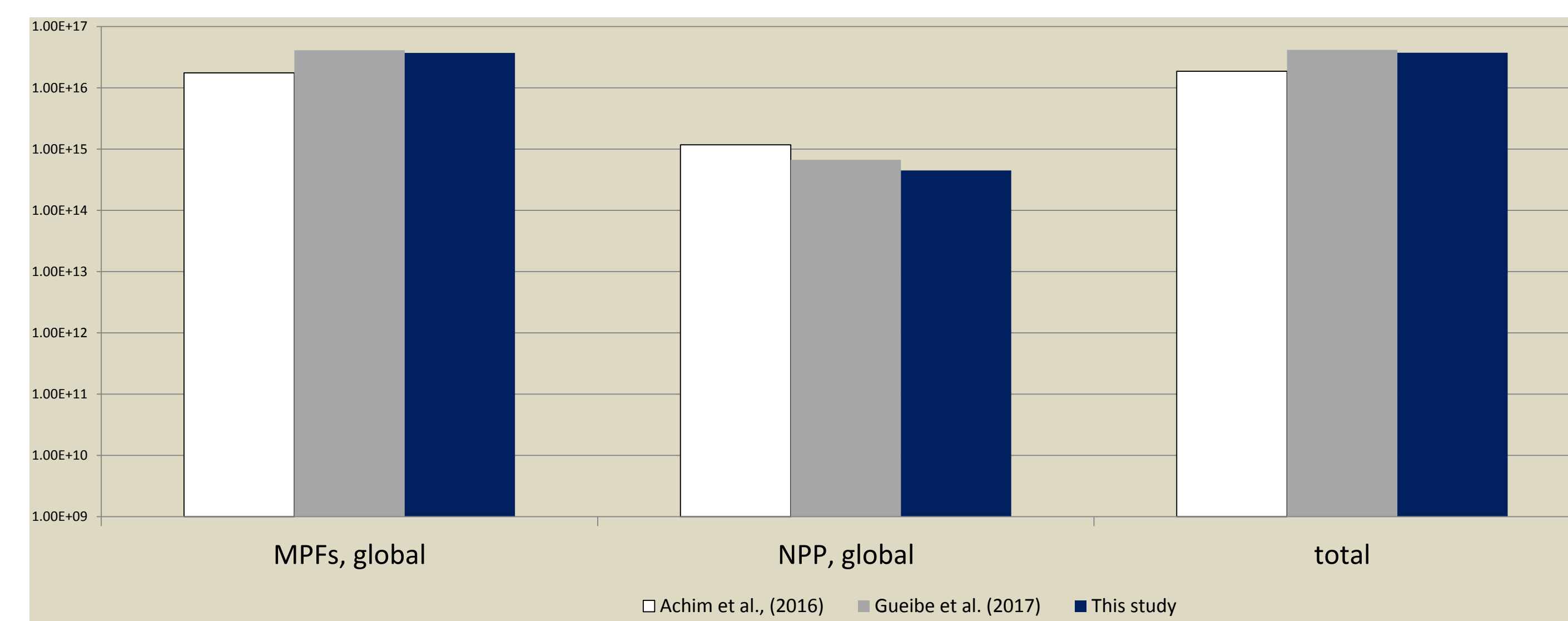
Disclaimer: The views expressed on this poster are those of the author and do not necessarily reflect the view of the CTBTO

Comparison by reactor sites:

Red histogram bars show the real emission reports of nuclear power plants (NPPs) for 2014 in comparison with and ordered by decreasing source strength as estimated by Gueibe et al. (2017) (blue histogram bars):



The update for 2014 made in this study is very close to previous best estimates made by Achim et al. (2016) and by Gueibe et al. (2017).



CONCLUSIONS

- For several NPP sites the reported Xe-133 release in 2014 is up to 4 orders of magnitude different from the best estimate.
- The estimated globally aggregated emission inventory is very close to the update based on real reported emissions in 2014.
- The comparison of the simulated and observed radioxenon concentrations at IMS noble gas systems is compared to the baseline set by Gueibe et al. (2017) in the companion poster of Gheddou et al. (2019).
- The updated 2014 emission inventory can be used for source-receptor studies with atmospheric transport models.

Aggregated by region:

Yellow histogram bars showing real emissions reported by nuclear power plants (NPPs) for 2014 in comparison with best estimates, ordered by region Gueibe et al. (2017) (blue histogram bars):

