SnT 2023
CTBT: SCIENCE AND TECHNOLOGY CONFERENCE
HOFBURG PALACE - Vienna and Online
19 TO 23 JUNE

Successes in the Monitoring of Noble Gas Backgrounds at the Release Source

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INTRODUCTION

Backgrounds of xenon isotopes arise from industrial and civil processes. The IMS detects radioactive xenon every day from these processes that make radionuclide screening difficult. Improvements can be made to the IMS by measuring background emissions at the source.

METHODS/DATA

The Source Term Analysis of Xenon (STAX) Project consists of voluntary partnerships with facilities to install commercially available stack monitoring systems, develop data sharing agreements with facilities and NDCs to control access to data, and develop tools to view, access, and use the data.

START

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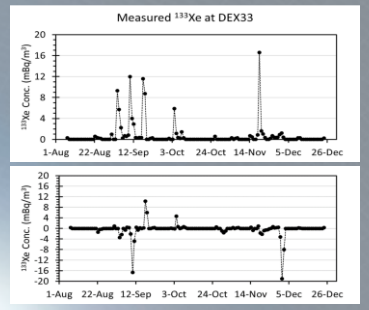
RESULTS



STAX data from IRE (Belgium) is used to subtract off background at IMS station DEX33

CONCLUSION

A number of NDCs and experts are developing tools to process STAX data and create a “net signal” that subtracts the effect of emissions on IMS stations.

Current STAX project installations and data flows will continue to be maintained and new ones initiated.

STAX project progress and related topics are planned for discussion at WOSMIP 2023

XenonQuest

Backgrounds of Xenon Isotopes Arise from Industrial and Civil Processes

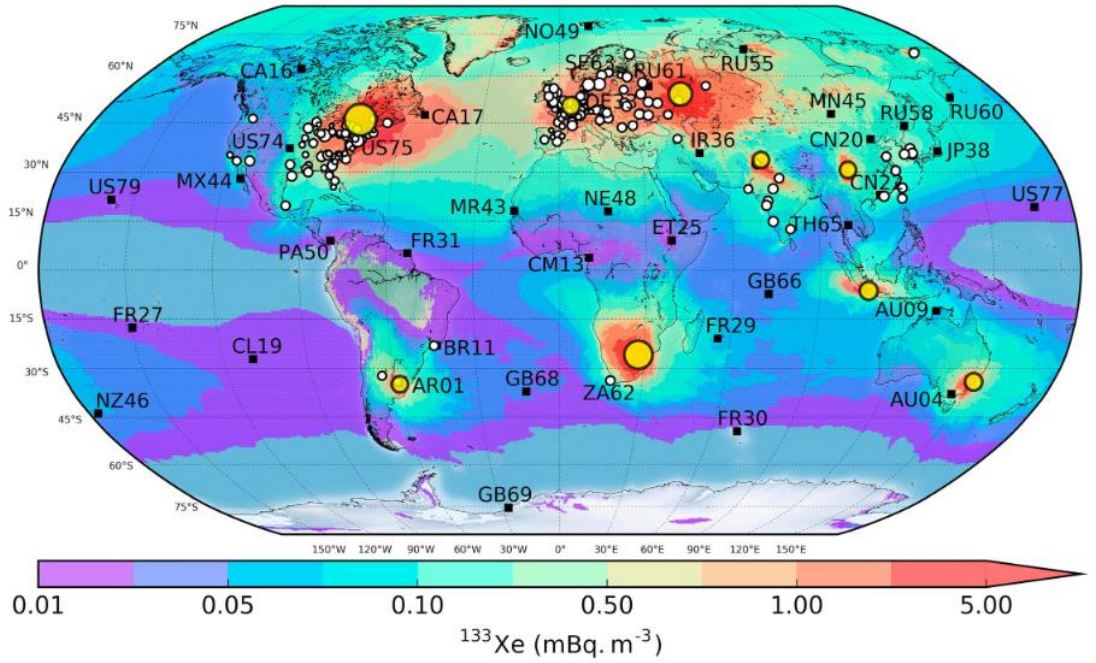
- Since the late 1990's, large concentrations of radioactive xenon isotopes have been detected in many measurements

- It was proposed that the one of the major sources was from the dissolution of nuclear targets used to make radioisotopes for medical treatments

- Further investigation showed backgrounds to be a worldwide phenomena

- The International Monitoring System detects radioactive xenon every day from civil and industrial processes that make radionuclide screening difficult

Average backgrounds of radioactive xenon in the atmosphere



From Generoso, 2017

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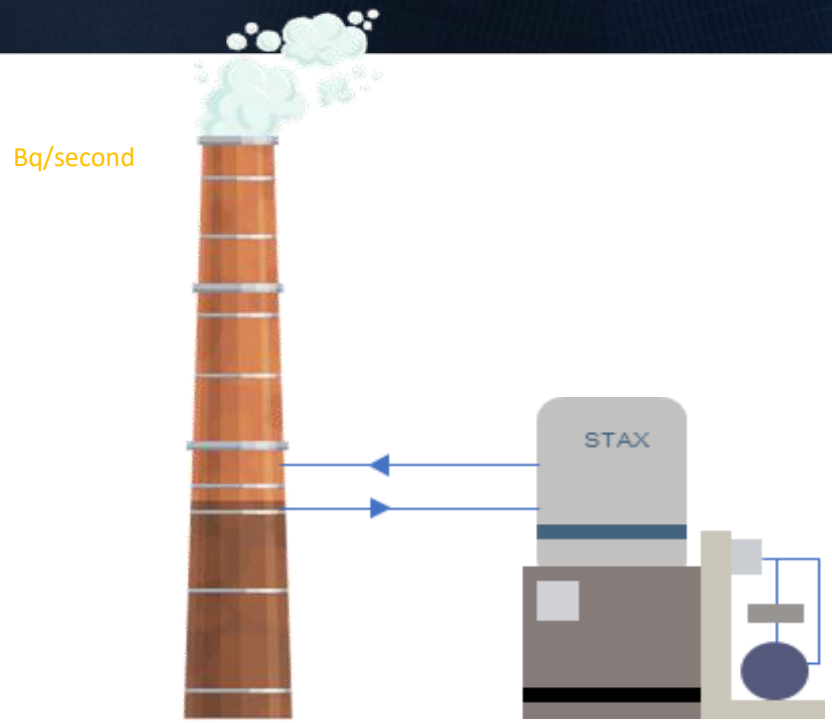
Improve IMS by Measuring Background Emissions at the Source

- Measure emissions at the point they are created

- Use a mathematical model (atmospheric transport model) to determine the expected concentration at the IMS station



Measurement at station
A Bq/m³

Stack measurement
B Bq/second → C Bq/m³
ATM calculation

Net Signal ~ A – C

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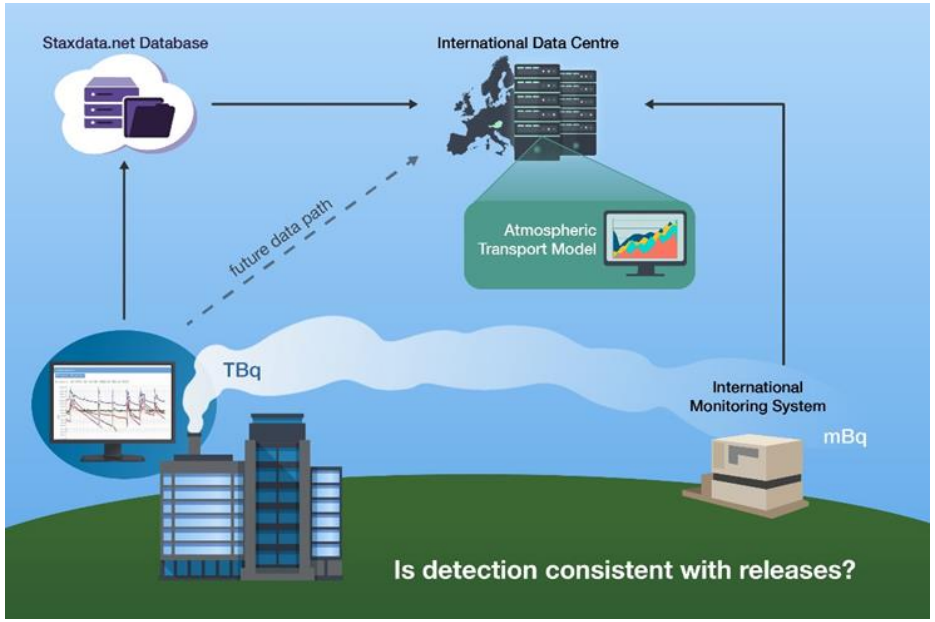
The Source Term Analysis of Xenon (STAX) Project Concept



- STAX consists of voluntary partnerships with facilities
- We provide and install commercially available stack monitoring systems in facilities
- Developed data sharing agreements with facilities and NDCs to control access to data
- Developing tools to view, access, and use the data


IRE in Belgium


CNEA in Argentina


ANSTO in Australia


Hartlepool in UK


Niowave and SHINE in U.S.

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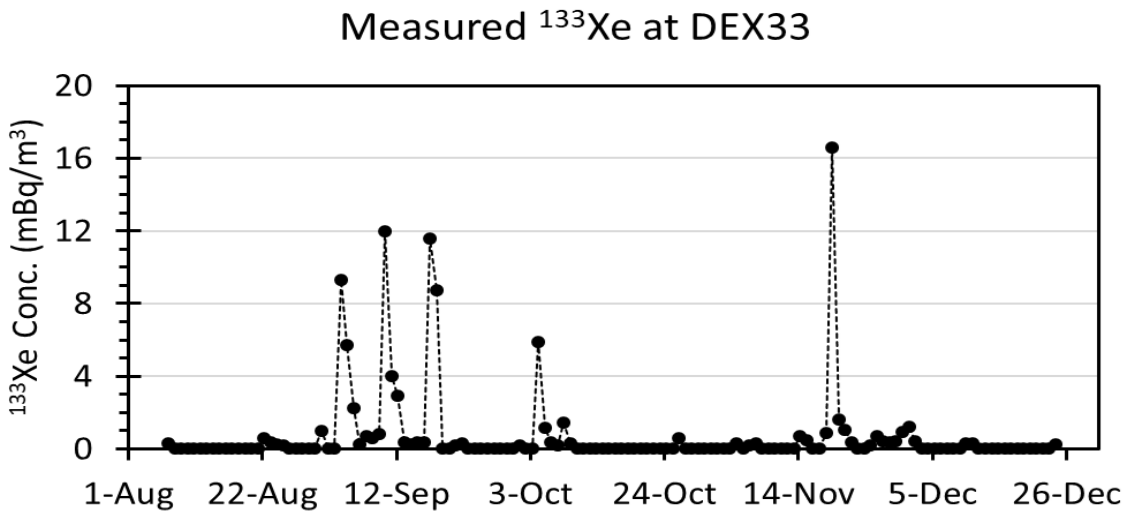
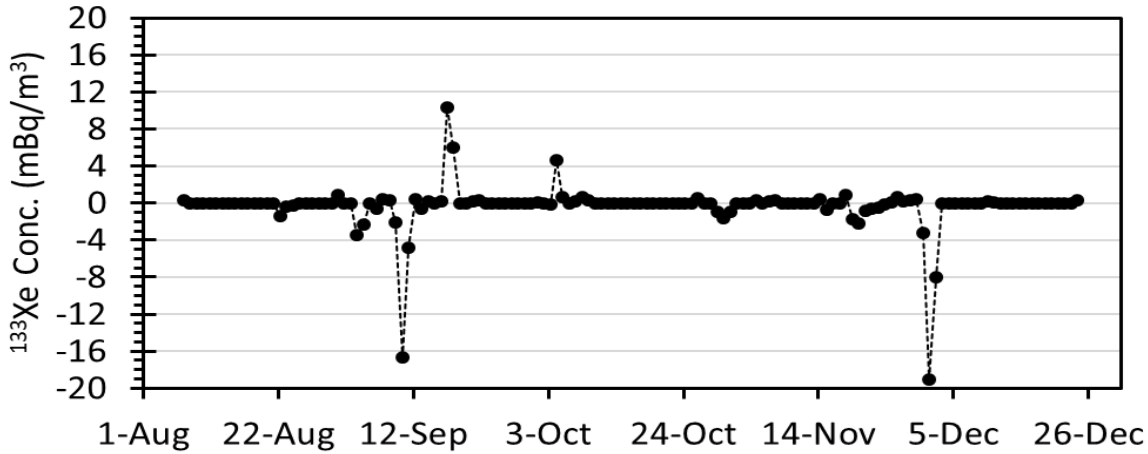
Use of STAX Data to Remove Background

- The use of data collected at known facilities may prove useful to remove the effect of these sources
- For example, using data from IRE (Belgium), one may subtract off its effect at DEX33
- Many IMS station detections can be screened out





Use IRE stack release rate
ATM: HYSPLIT & NOAA's 0.25°, 3-hr global met data. Difference between the measured and modeled

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Conclusion

- A number of NDCs and experts are developing tools to process STAX data and create a "net signal" that subtracts the effect of emissions on IMS stations
  - Belgium, Canada, France, Germany, U.S., UK, Palau, Sweden
- Current installations and data flows will be maintained and new ones initiated
  - Installation planned at CCHEN in Chile later this year
- STAX project progress and related topics planned for discussion at WOSMIP 2023 (https://www.wosmip.org/)

STAX
Source Term Analysis of Xenon

wosmip
WORKSHOP ON SIGNATURES OF MAN-MADE ISOTOPE PRODUCTION

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