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

Portable Modular Gas Samplers for Nuclear Explosion Monitoring

Khiloni Shah, Nathan Anderson, John Lyle, Ian Sepdham, Ethan Fowler, Derek Haas
The University of Texas at Austin

INTRODUCTION

The Wireless Independent Noble Gas Samplers (WINGS) are inexpensive, autonomous, portable sampling systems that allow for multiple units to be placed in-field for improved temporal and spatial resolution.

METHODS/DATA

The sampler design consists of 14 commercial off-the-shelf empty compressed gas cylinders and an air compressor using a Wi-Fi communications network for autonomous sampling.

START

RESULTS

WINGS was deployed in a large-scale field experiment to collect gas samples during a tracer release.

CONCLUSION

Use of charcoal traps present the possibility of future iterations of the WINGS design to collect and analyze samples in-field using a large NaI detector.

Please do not use this space, a QR code will be automatically overlayed

P3.3-356

PNNL-SA-186214

Introduction

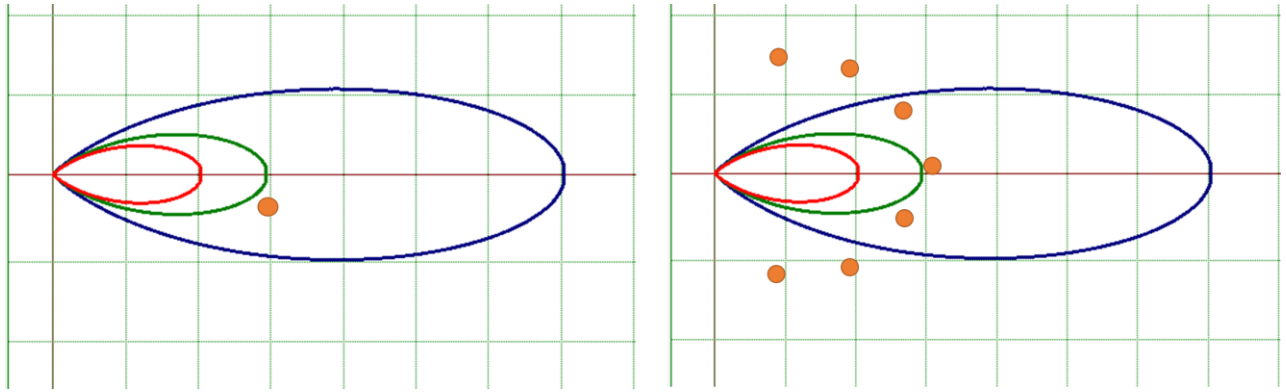
Goal: acquire data on tracer dispersal through a local environment

How can we improve existing technology?

- Reduce complexity
- Lower cost
- Portability

How do we verify device performance?

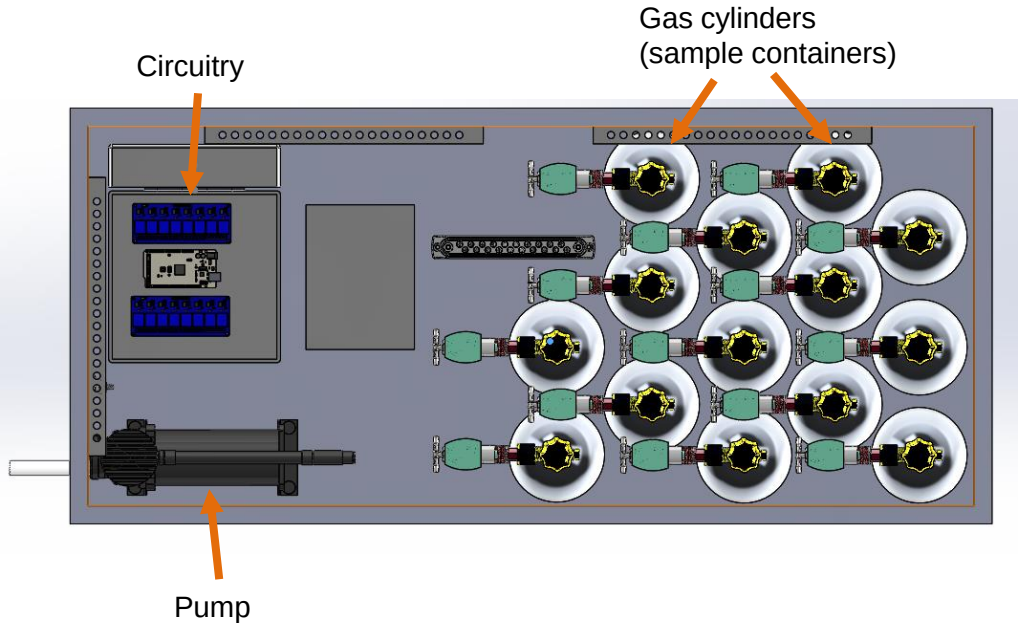
- Pressure and containment testing
- Introduce NaI detectors for near-field labs
- Simulate field experiments with noble gases (stable and radioactive)



INTRODUCTION
OBJECTIVES
METHODS/DATA
RESULTS
CONCLUSION

WINGS Design and Testing

Final Design



Charcoal Trap Design

Samples collected in the cylinders are run through charcoal traps before analysis.

Benefits:

- Easier counting geometry
- An improved minimum detectable activity
- The potential for near-field detection.

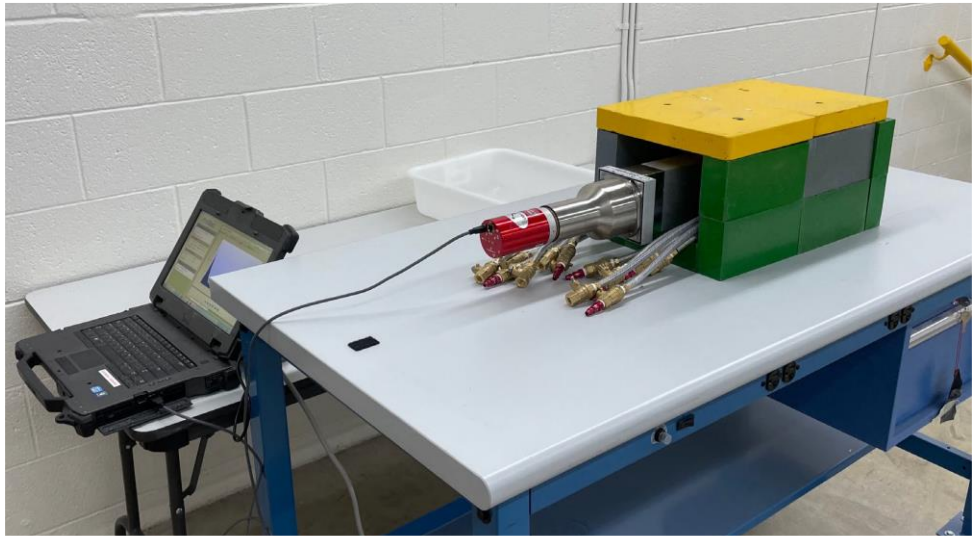
INTRODUCTION
OBJECTIVES
METHODS/DATA
RESULTS
CONCLUSION

Field Deployment

Four samplers were deployed in a large-scale field experiment to collect gas samples during a tracer release.

➡

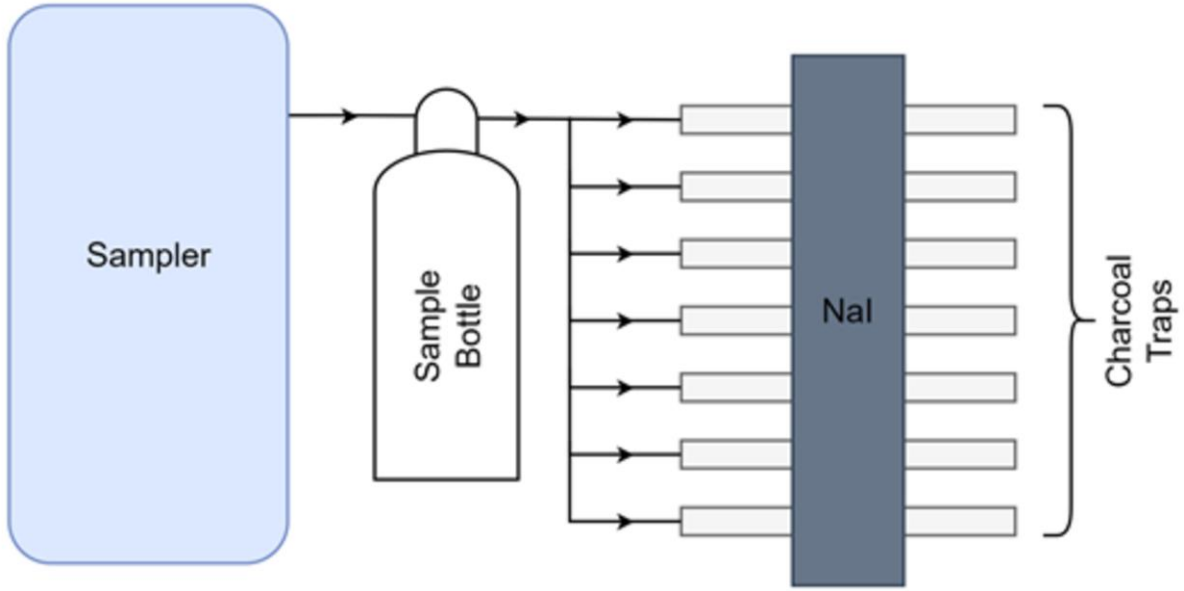
Collected samples were analyzed in a field lab and in an off-site lab to compare the results and calculate the dilution factor of the tracer.



INTRODUCTION
OBJECTIVES
METHODS/DATA
RESULTS
CONCLUSION

Conclusion

Future iterations of the WINGS design could utilize a NaI detector for real-time in-field measurements



Acknowledgments

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.

This research was also funded by the National Science Foundation Graduate Research Fellowship under Grant No. DGE-1610403. Any opinion, findings, and conclusions or recommendations expressed in these materials are those of the authors and do not necessarily reflect the views of the National Science Foundation.

Related Publications

Shah, K.A., Gordon, E.M., Adhikari, P. *et al.* Portable modular gas samplers for nuclear explosion monitoring. *J Radioanal Nucl Chem* **331**, 5305–5310 (2022). https://doi.org/10.1007/s10967-022-08602-9

INTRODUCTION
OBJECTIVES
METHODS/DATA
RESULTS
CONCLUSION