Analysis of explosion data collected on an airborne platform

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Introduction

- Multi-modal data collected by a smartphone carried by an airborne balloon over an explosive event
- Data analysis and comparison to ground-based stations

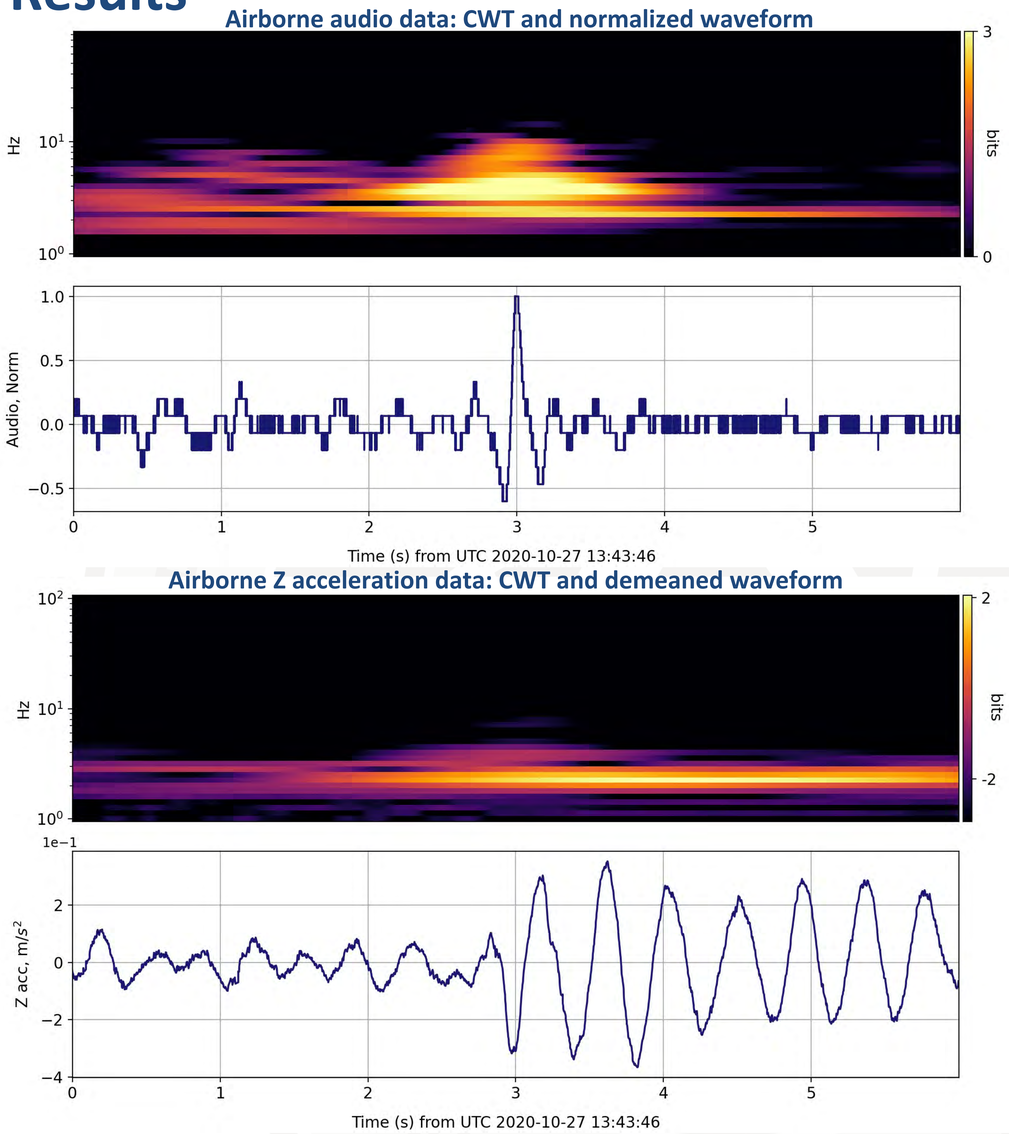
Mission Relevance

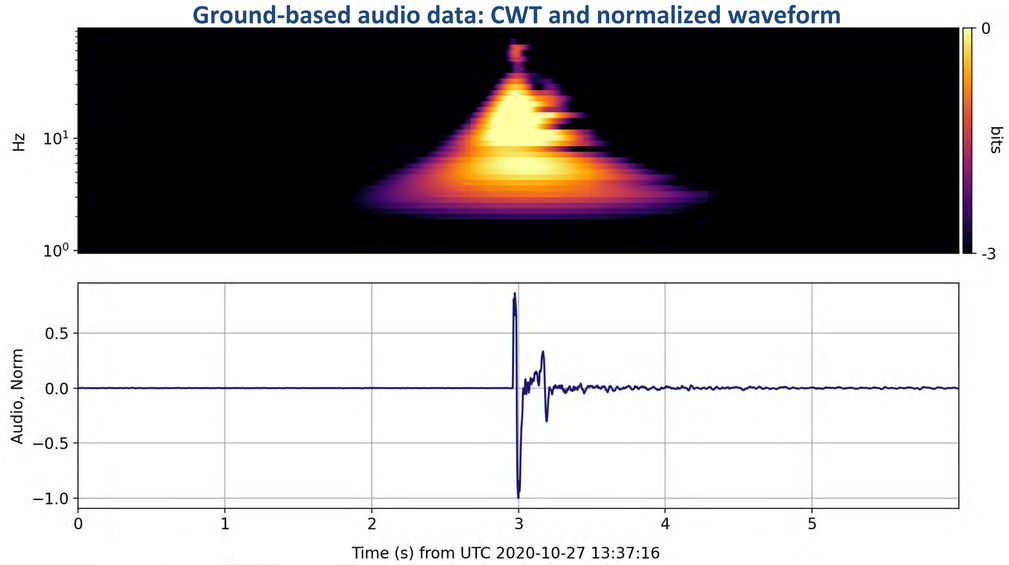
- Ability to detect explosive events from airborne platforms is valuable for explosion monitoring

Technical Approach

- A helium-filled mylar balloon carried the payload box containing a smartphone collecting internal sensor data at high rates
- Data were also collected by a network of smartphones on the ground
- Time-frequency analysis with the continuous wavelet transform (CWT)

Results





Conclusion

- Successful collection of explosion signal by microphone and accelerometer on a high-altitude balloon
- Significant loss of high-frequency energy in airborne acoustic data
- Faint acoustic signal was detectable due to low noise levels in the stratosphere
- Acceleration data suggests that acoustic wave arrival initiated underdamped oscillation of the payload box at the natural frequency of the system

Expected Impact

- Insight into possibilities and limitations of airborne collection platforms

MTV Impact

- Data collection and publication with SNL and NNSS
- Future collaboration with SNL on airborne collection platforms

Next Steps

- Collaboration with SNL and NNSS to collect airborne data from additional explosive events using new API 1000
- Collection of rocket launch signals from an airborne balloon in collaboration with SNL

This work was done by Mission Support and Test Services, LLC, under contracts DE-NA0003624, and DE-NA0003920, with the U.S. Department of Energy, and NNSA's Office of Defense Nuclear Nonproliferation Research and Development. **DOE/NV/03624--1140**

National Nuclear Security Administration