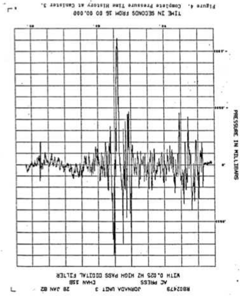
U.S. DEPARTMENT OF ENERGY

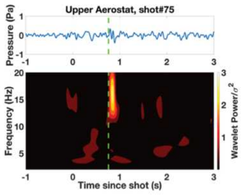
SPE Infrasound

SAND2020-2852C

Infrasound from DAG-4 recorded on a stratospheric balloon

Background/State of the Art





Ground motion signals recorded from the air

Studied at local ranges and low altitudes

Radiation pattern is unknown

Detection range is unknown

Innovation

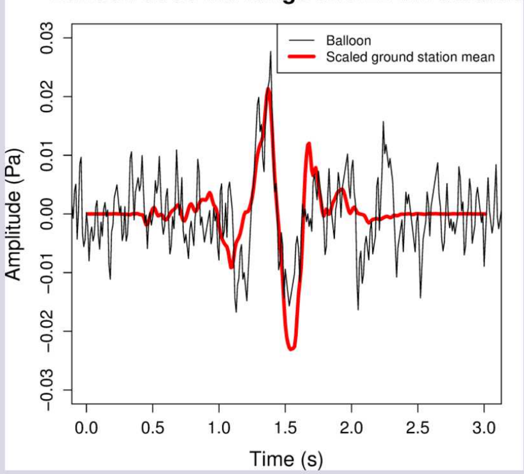
Capture infrasound from the stratosphere using a Heliotrope balloon

- Target the DAG series

Approach, Metrics and Outcomes

MAIN ACHIEVEMENT

- DAG-4 signal recorded in the lower stratosphere



HOW IT WORKS

- Gem microbarometer on Heliotrope balloon
- Launch into opposing winds to allow overflight of target
- Recover payload and download data

RESULTS

- Demonstrated the first recording of a direct arrival from ground point source at stratospheric elevations
- Showed that the waveform preserves features proximal to the source
- Proved that geometric ray tracing techniques successfully predict detection range and pressure amplitude

Impact

- Locations of interest can be observed using balloon borne microbarometers
  - Trajectory modeling constrains time of overflight
  - Acoustic propagation modeling delineates target region
- Near-source signal characteristics can be transmitted to 50+ km range and 20+ km altitude
  - This is seldom possible on the ground
- Propagation modeling is reliable in this regime

Goals/Action Plan

- Search for signal from seismic waves passing beneath balloon
  - LLNL to provide simulations
- Publish results of overflight
  - JASA Express Letters or similar
- Continue to collaborate with NASA JPL to capture infrasound from earthquakes via balloons
  - JPL is analyzing results of Ridgecrest overflight

Team

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