Secondary: Far Field Infrasound

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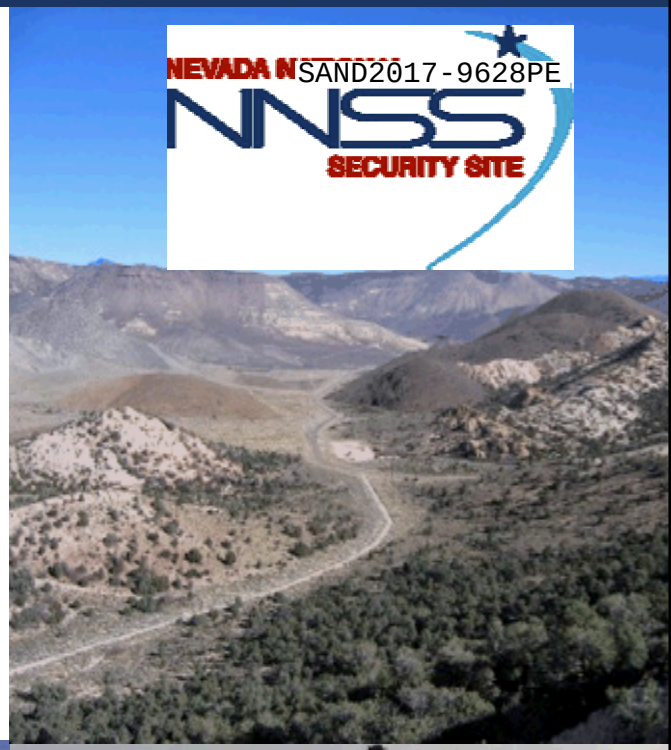
9-13-17

SAND2017-9628PE



Outline

- System Design Description
- Readiness
- Risk
- Operations
- Post-Shot Deliverables
- Lessons Learned
- Next Steps

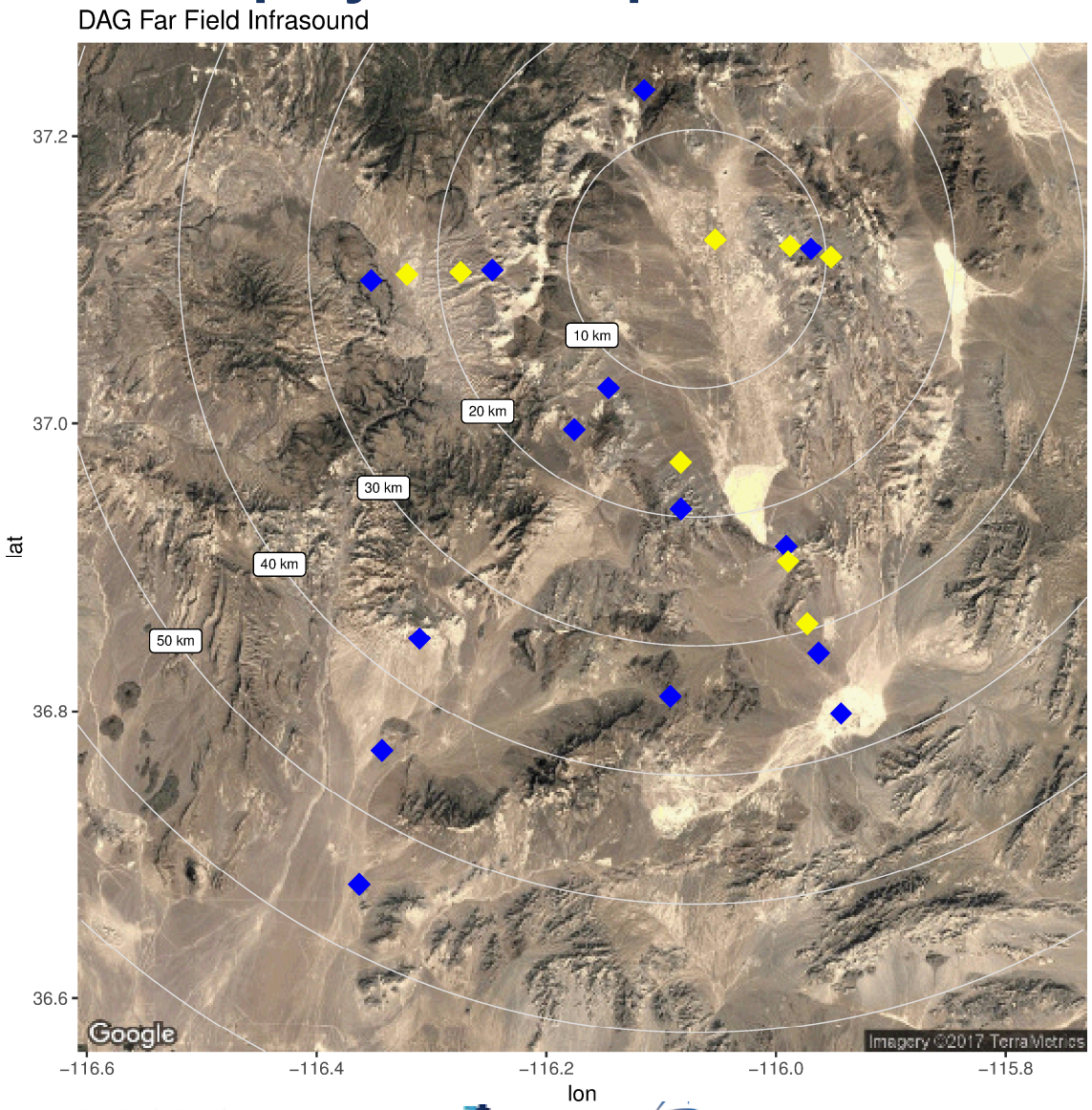
Diagnostics System Design

- Science objective of document: Detectability of buried explosion infrasound at tens of kilometers
- Secondary Diagnostic
- Summary of Sensors & Systems
  - Hyperion Digital, Hyperion Ultralight, and Gem infrasound sensors
  - Solar panel + battery + crate
  - Occupies the same site as broad band stations but relies on its own power
- Deployment
  - Place after DAG – 1, recover data after each DAG shot, remove stations after DAG – 4.

Hyperion Station

Gem Stations

Deployment Map: Co-located with broadbands



Blue Diamonds: Infrasound

Yellow Diamonds: No Infrasound

Readiness

- Technical
  - Hardware/Assembly: Hyperion sensors + solar panels already at Sandia, Gems delivered Fall 2017
  - Qualification/Demonstration: Ground test at Sandia prior to shipping to NSTec to ensure sensors are operating correctly
- Hardware
  - Hyperions: Legacy octocopter sensors from SPE Phase 1
  - Gems: New
- Procedures/Checklists
  - Install after DAG –1 (this shot will not produce far field infrasound)
  - Data recovery run after each subsequent shot
  - Remove stations after DAG – 4

Readiness

- Installation Needs from the NNSS
  - Accompany Sandia staff to broadband sites for installation
  - 8 car batteries
- Training: No additional training required

Risk

- Sensor/System Risks
  - Wildlife
  - No telemetry (possible data loss)
- Weather Risks
  - High wind levels obscuring subtle infrasound signal
  - Flooding/wind damage
- Risks to participation
  - Infrasound stations are entirely independent of co-located broadband stations, thus minimal risk to other diagnostics

Operations

- Access needed before shots: no access to DAG region required
- Location of personnel during shots: BEEF
- Timeline of Fielding Activities:
  - After DAG 1 and before DAG 2: install stations
  - After DAG 2 and 3, download data
  - After DAG 4, remove stations
- Fielding Team: Danny Bowman and Sarah Albert
- Resources needed from Execution Team
  - 8 car batteries
- Frequencies provided to NNSS: None
- Dry Run and Shot Expectations: Minimal
- ES&H Concerns: Remote field work
- Go/No Go Criteria: None after successful installation

Post Shot Data Deliverable

- Required deliverable: Data uploaded to UNR
- Timeline for delivery: 3 weeks post-recovery
- Quality analysis: Signal to noise level investigation
- Written documentation: Final report after DAG – 4 describing detections, travel times, comparisons to intermediate range infrasound array, and effects of atmospheric conditions on signal recovery.

Lesson Learned from Past Experiments

- Cables were chewed during a several week deployment at NNSS in November
- Care must be taken to avoid exposed cables on the ground
- Infrasound detections at 10-60 km range are extremely sensitive to atmospheric conditions and ground winds.

Next Steps

- Describe next steps
  - Verify availability of proposed sites
  - Determine if cables can be buried (ground disturbance)
  - Test stations at Sandia
  - Ship to NSTec and deploy in early summer 2018