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Seismic Hammer Shakedown (MAGNI)

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U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

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The Survey

- Designed as a shakedown test for the full acquisition (anticipated March-April, 2015)
- Parameters:
  - Wheeled crane for hammer
  - 11 planned source points with 32-64 hits each
  - 200 “Short Line” stations with 3C 2-Hz geophones
  - Additional 20 stations > 2 km to 13 km. Mix of 3C sensor types

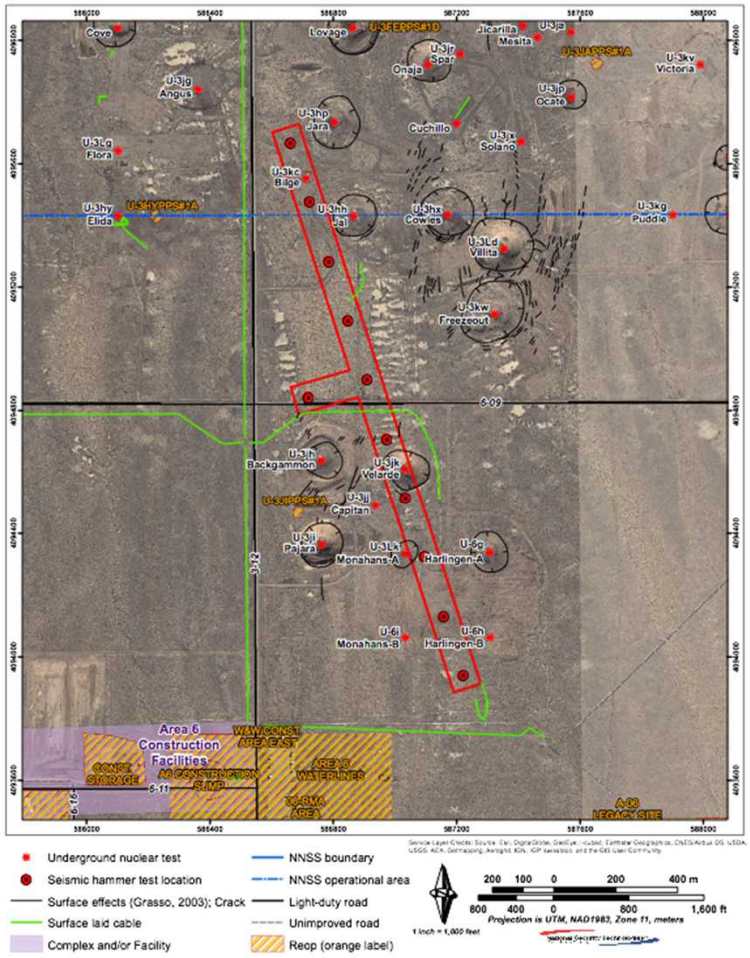

Figure 3 Proposed 150 foot Offset Area for Seismic Hammer Tests in Southern Yucca Flat

The Hammer

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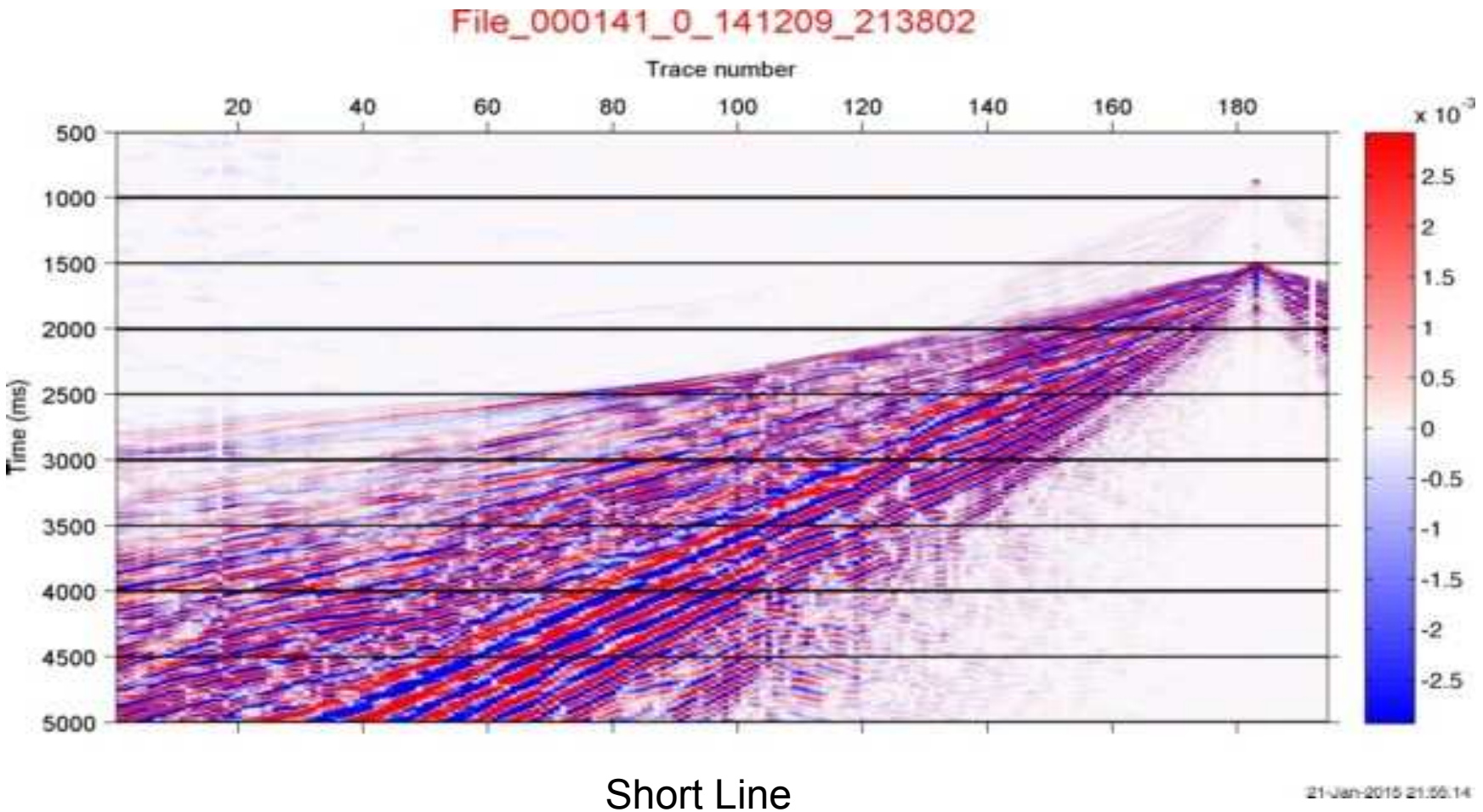
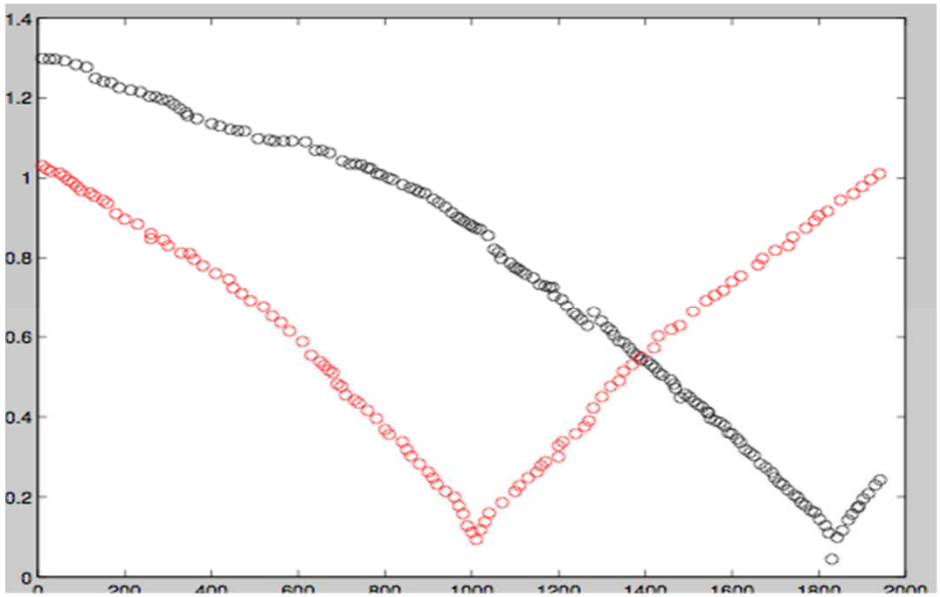
Single-Hit Source Gather



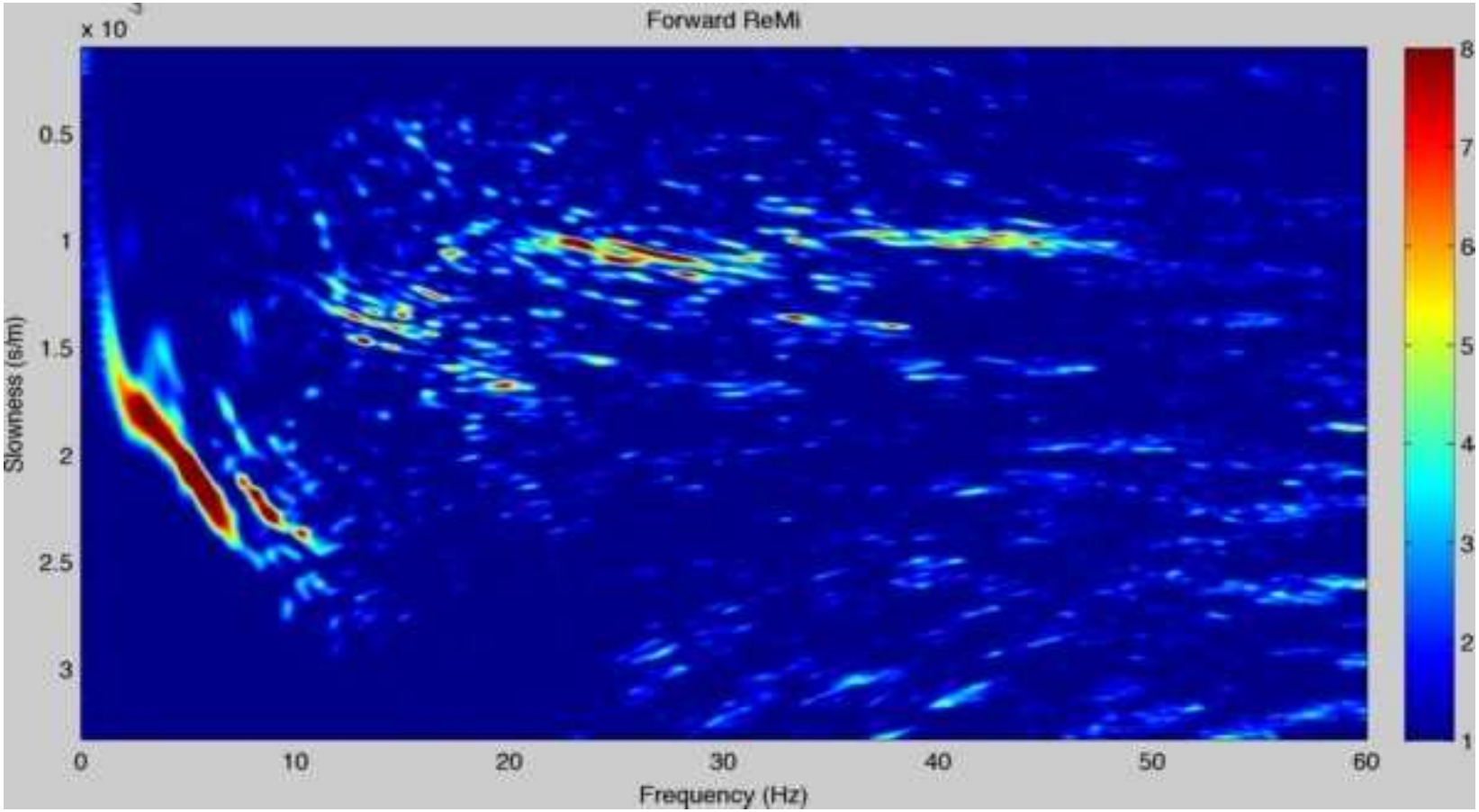
Short Line

First Arrivals at Two Source Points



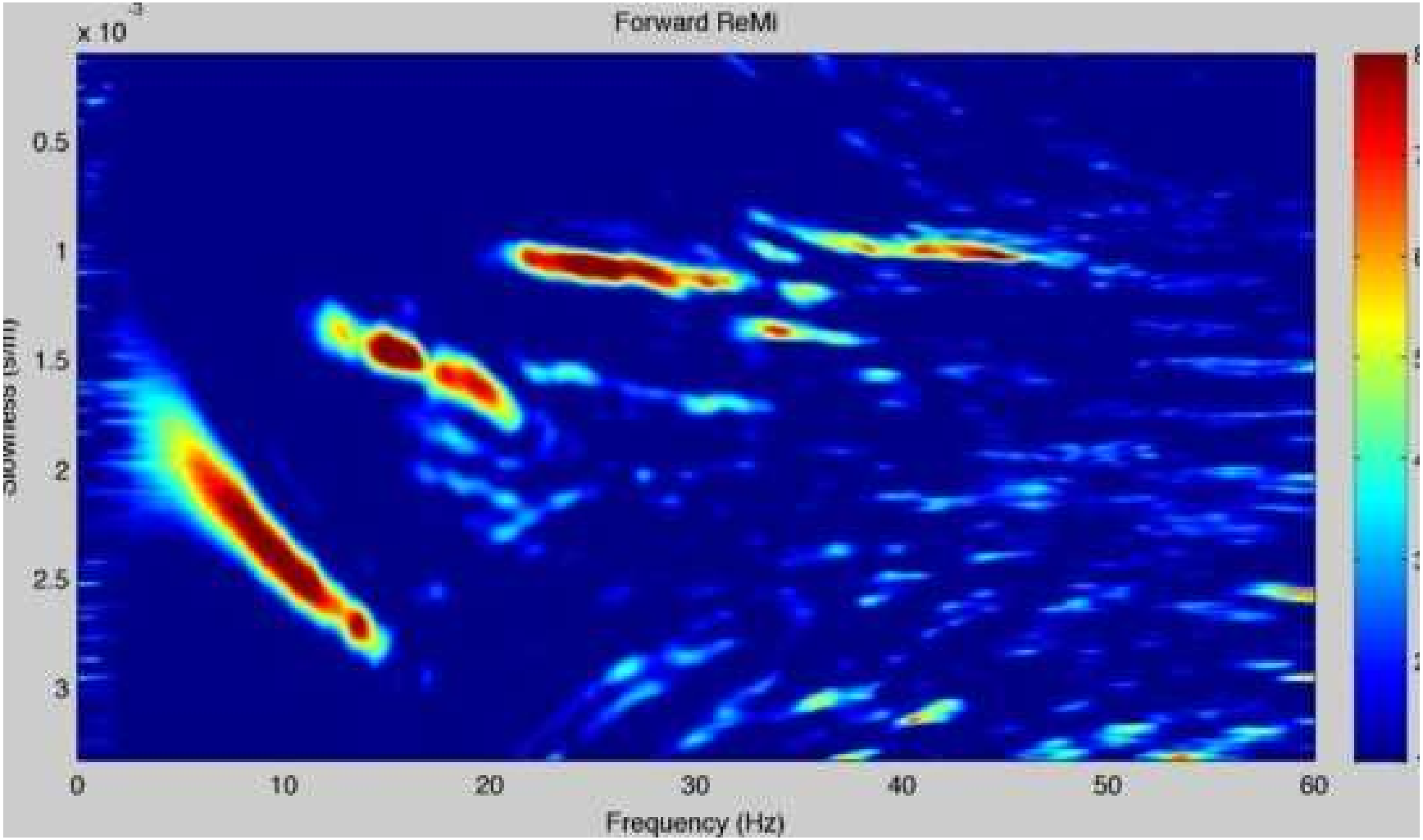
- Very gentle refractions
- Extremely linear close-in raypaths
- 3 (?) layers (1000-2200 m/s)

Surface Wave (ReMi Analysis)



2 Km Long Line

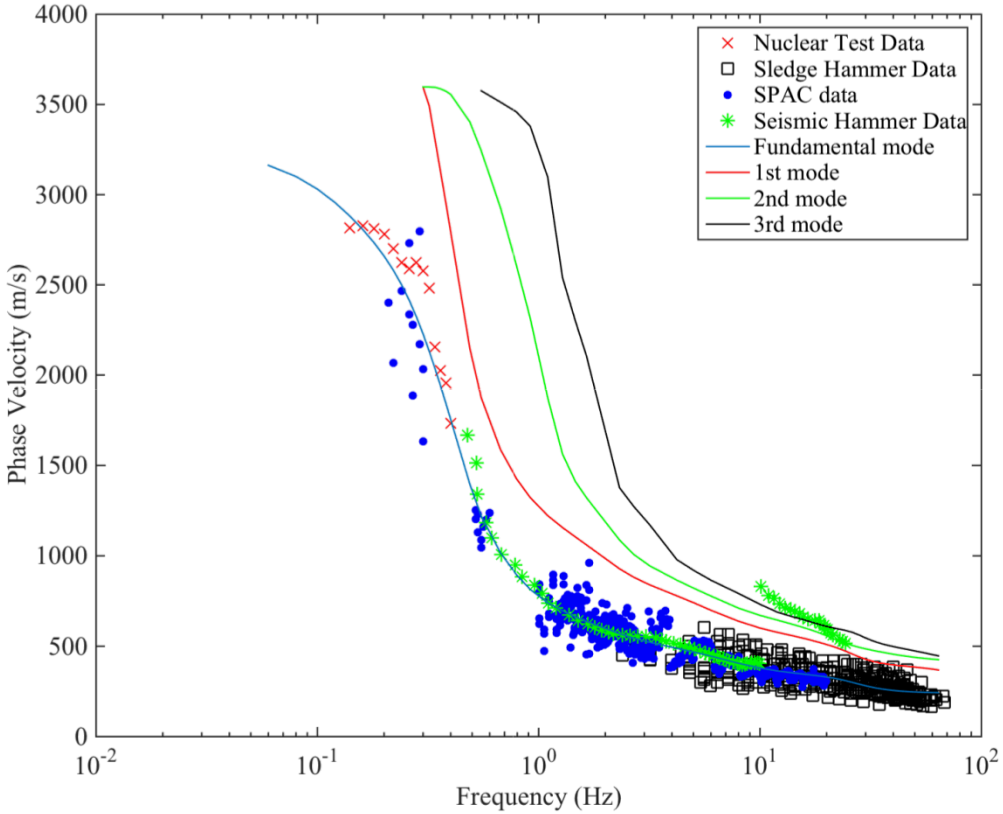
Surface Wave Analysis



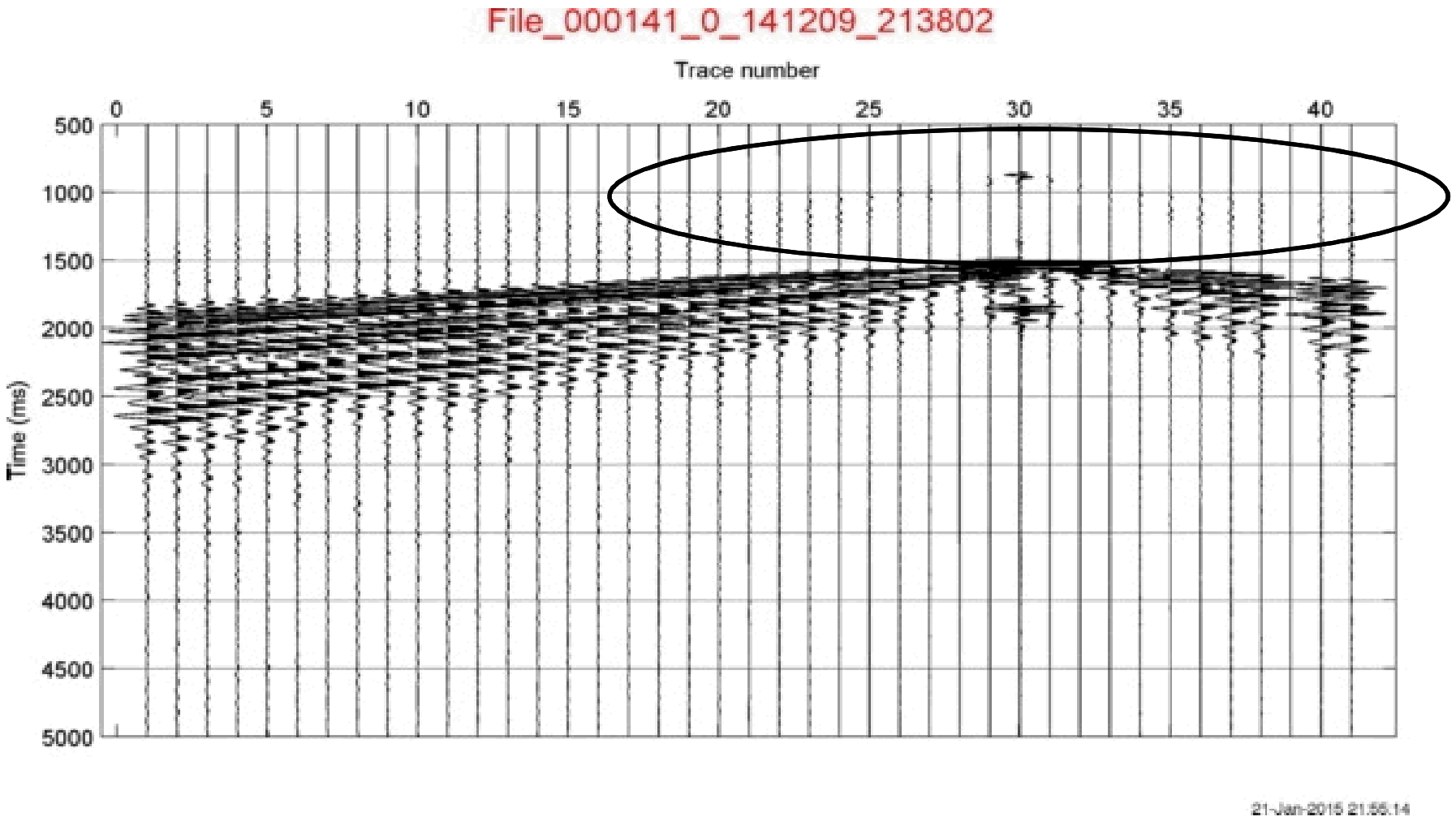
480-m, near source line

Comparison to Previous Study

- Schramm et al. (2012) Yucca Flat Dispersion
- Fundamental matches well and fills in low-frequency gaps
- “Higher-Mode” does not fit well

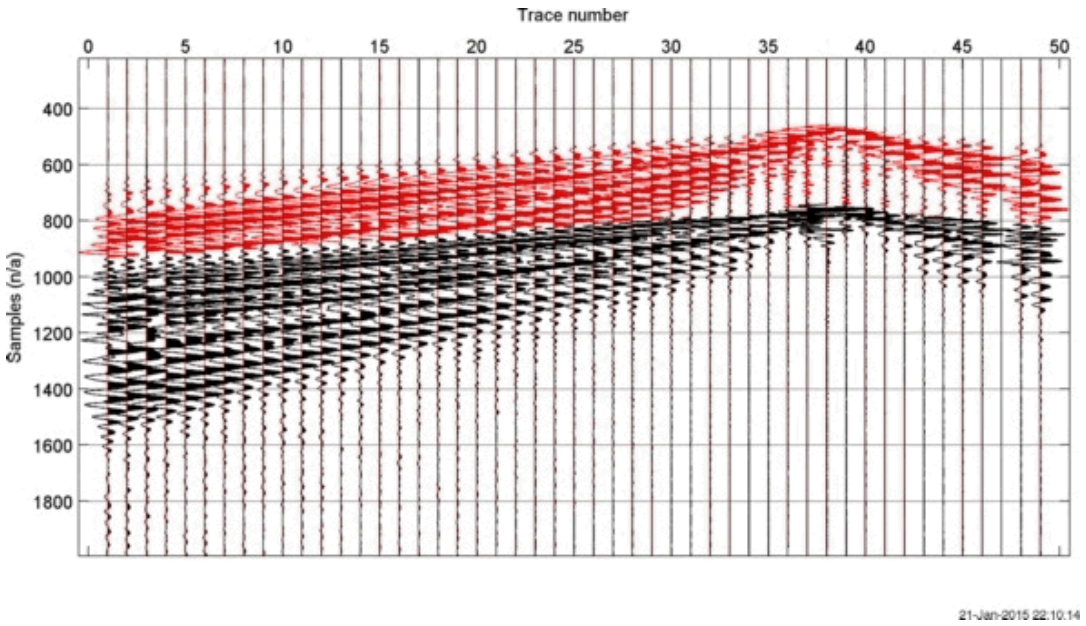


Unloading Precursor



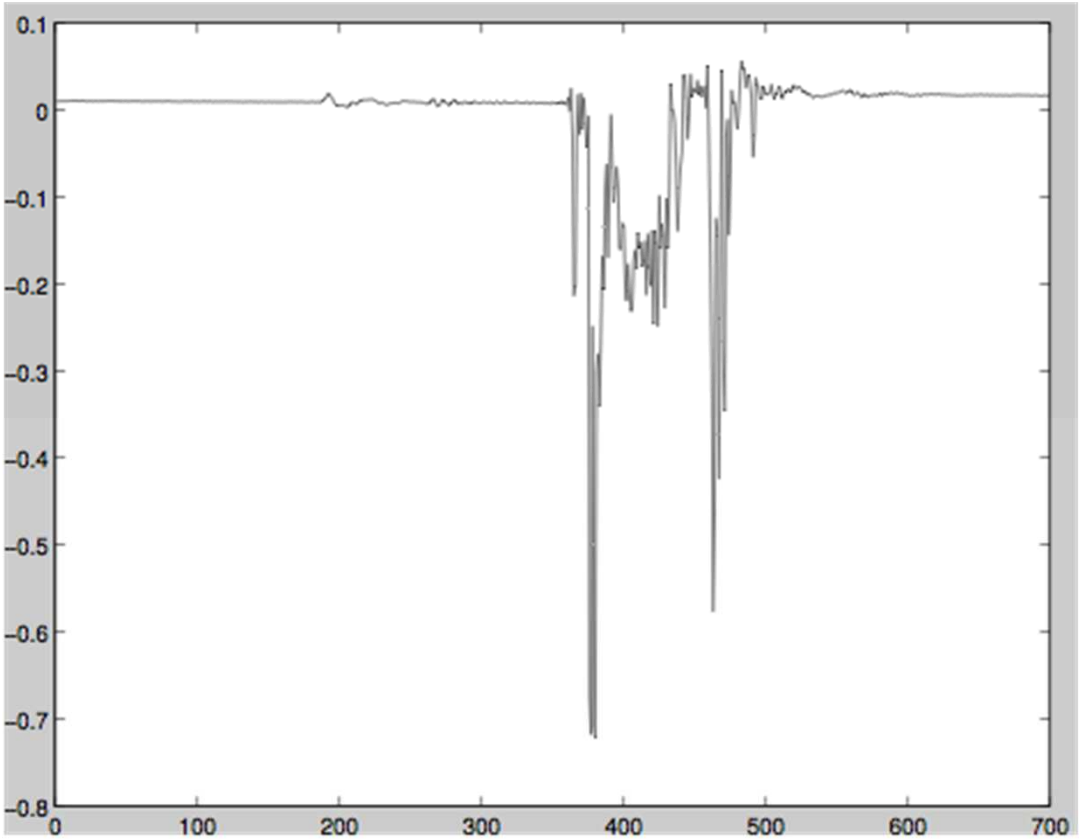
Elastic Rebound Seismic Source

- Red is independently scaled precursor
  - Represents ground elastic-rebound of 13,000 kg unloading
- Black starts at hammer-plate impact



Hammer-Mounted Accelerometer

- Small positive (ground motion up) signal (elastic rebound)
- Large negative hammer impact



Elastic Rebound Seismic Source

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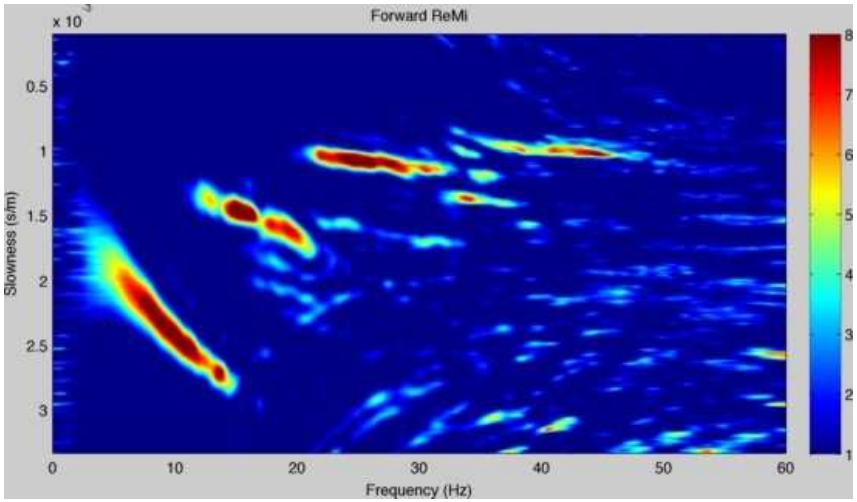
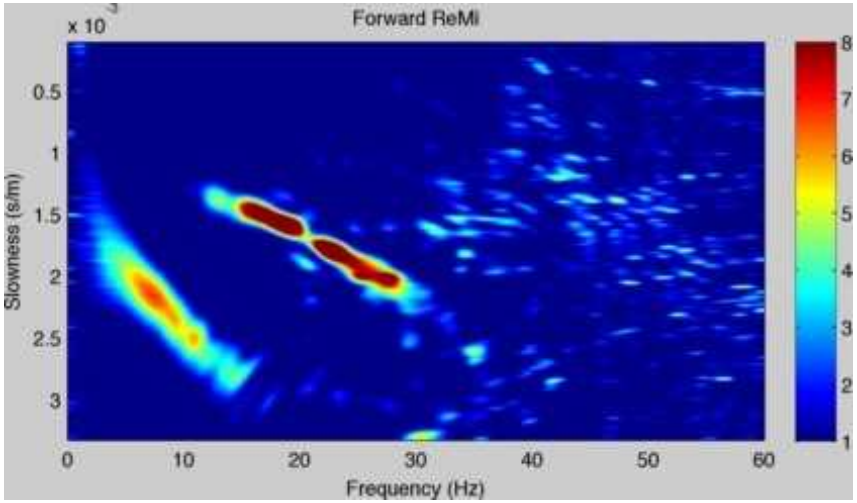
Including Hammer Hit



Excluding Hammer Hit



How Far Can We See?

- Surface Waves > 13 km
- First Arrivals ~8 km on "dumb" stacks
  - Probably greater than that with diversity stacking

To Do List

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- Get Data into industry standard Seg-Y files
  - This will greatly facilitate data analysis
- Pick all first arrivals and produce a refraction tomogram
- Figure out anomalous higher-mode data
  - Almost certainly a leaky guided wave (aka non-geometric wave)