Acoustic Arrivals from Weak Explosive Sources Recorded on Distant Airborne Platforms

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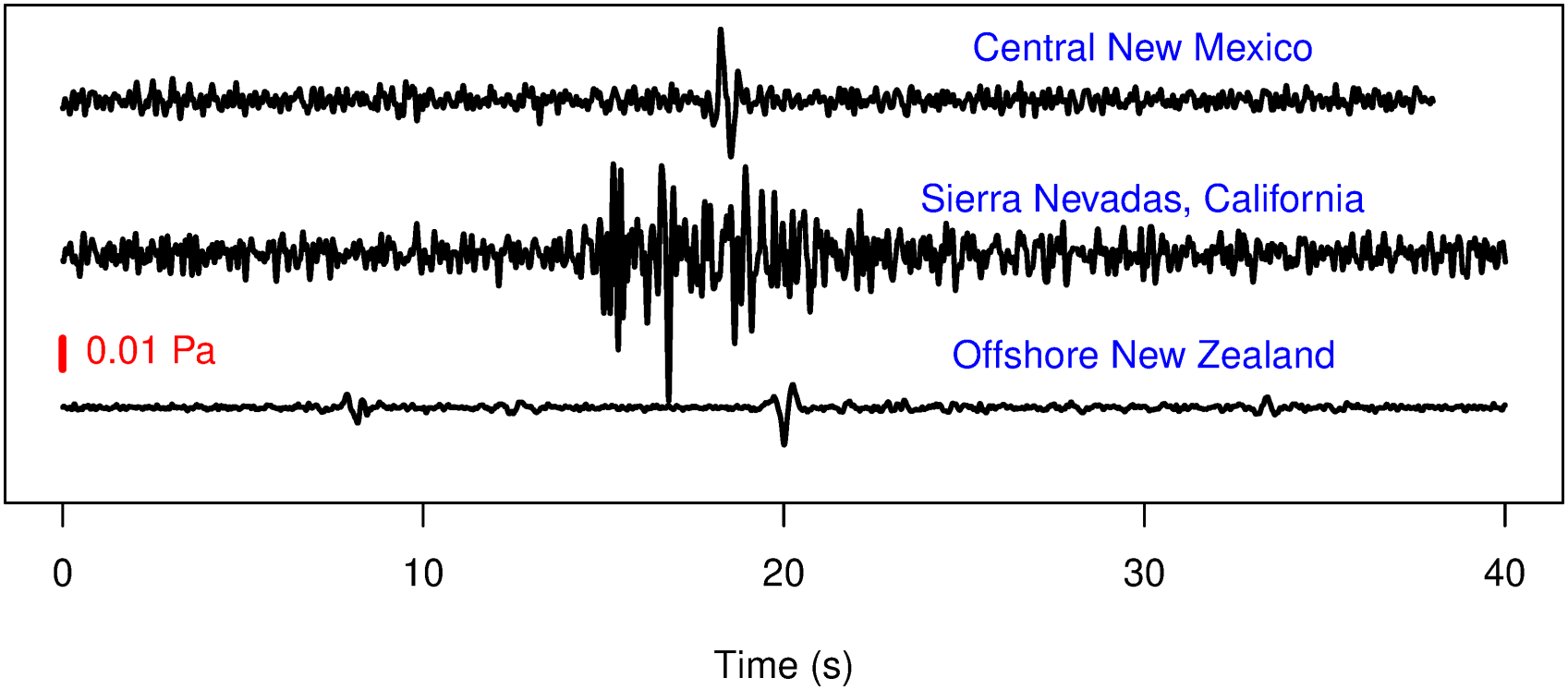
Introduction

What is this platform's detection range?

What size events can it capture?

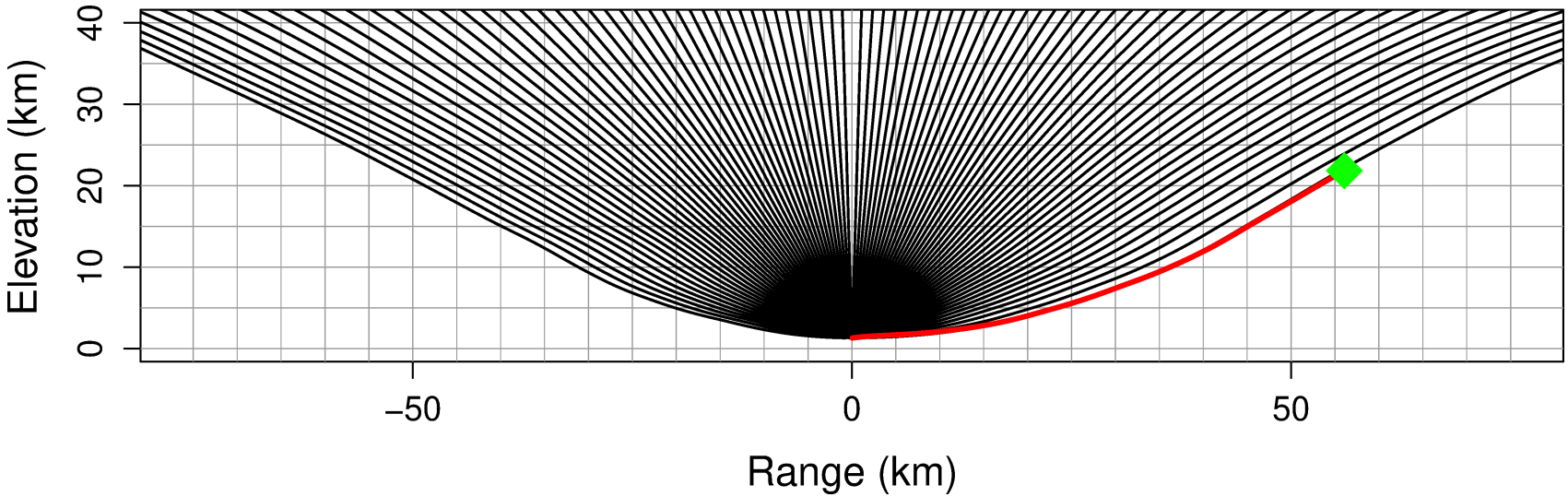
When do the waveforms become distorted?

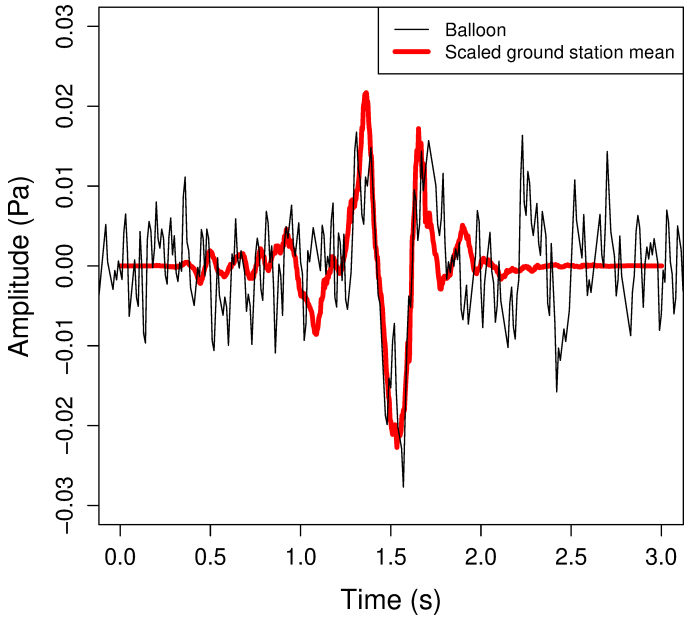
Unknown Signals



What can we tell about the nature and location of these events?

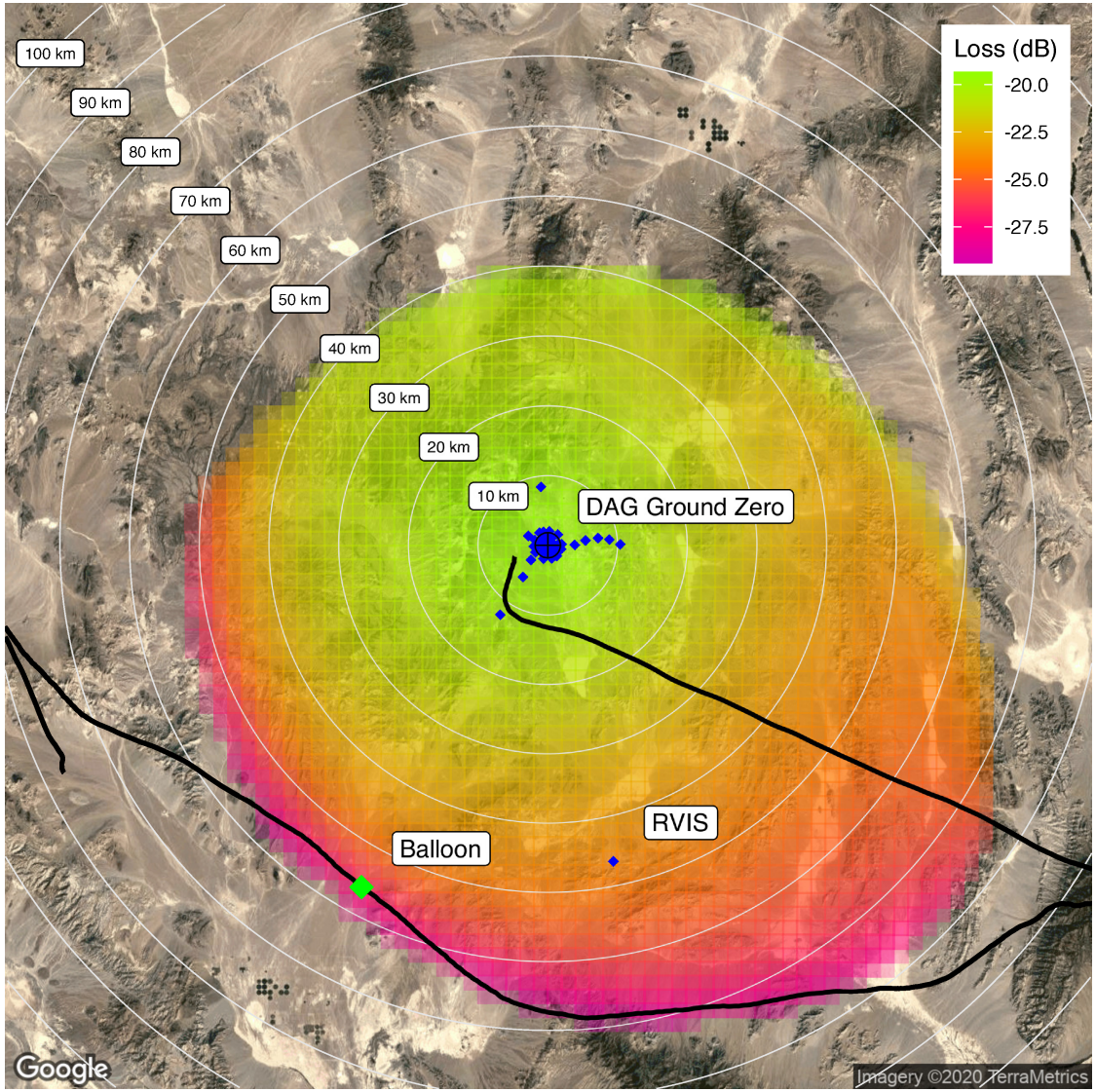
Detection Range and Waveform Distortion





A signal from an underground explosion traveled 56 km laterally and 21 km vertically without visible distortion.

Transmission Loss at Balloon Altitudes

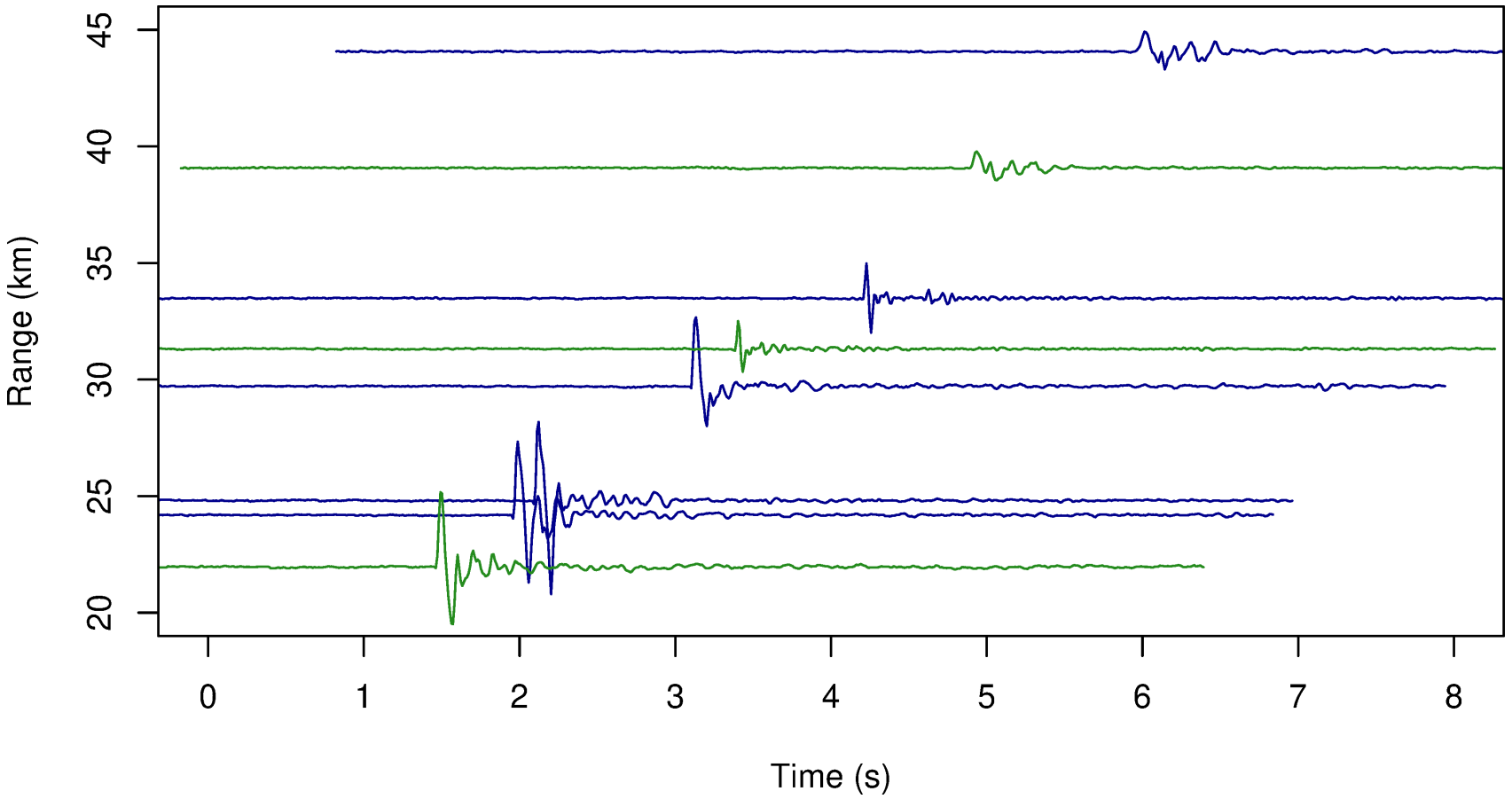


Temperature and wind define ensonified region

- Upwind: stronger sound less range
- Downwind: weaker sound greater range

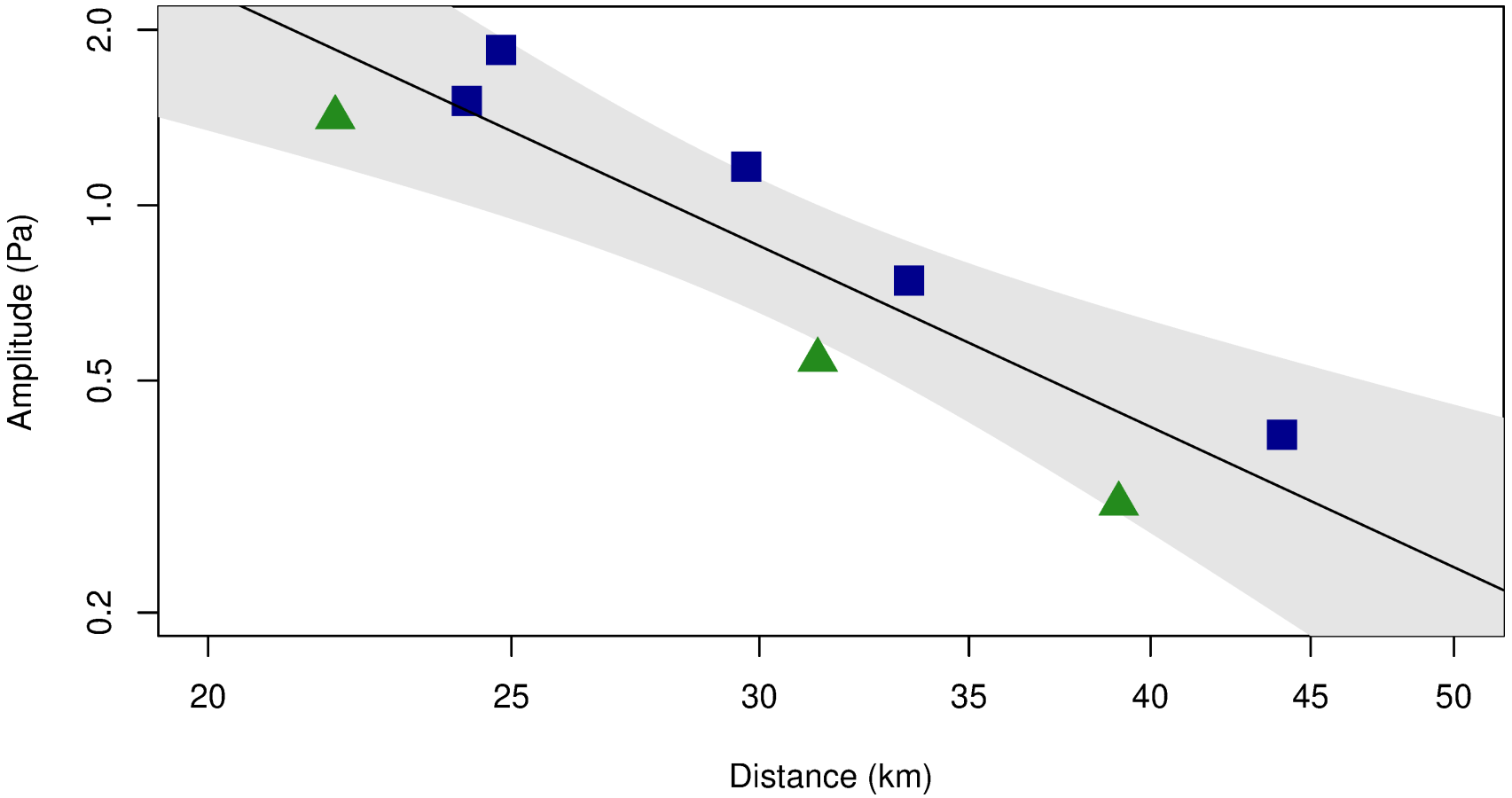
There is a region with **guaranteed sound arrivals**

Direct Arrivals at Varying Ranges



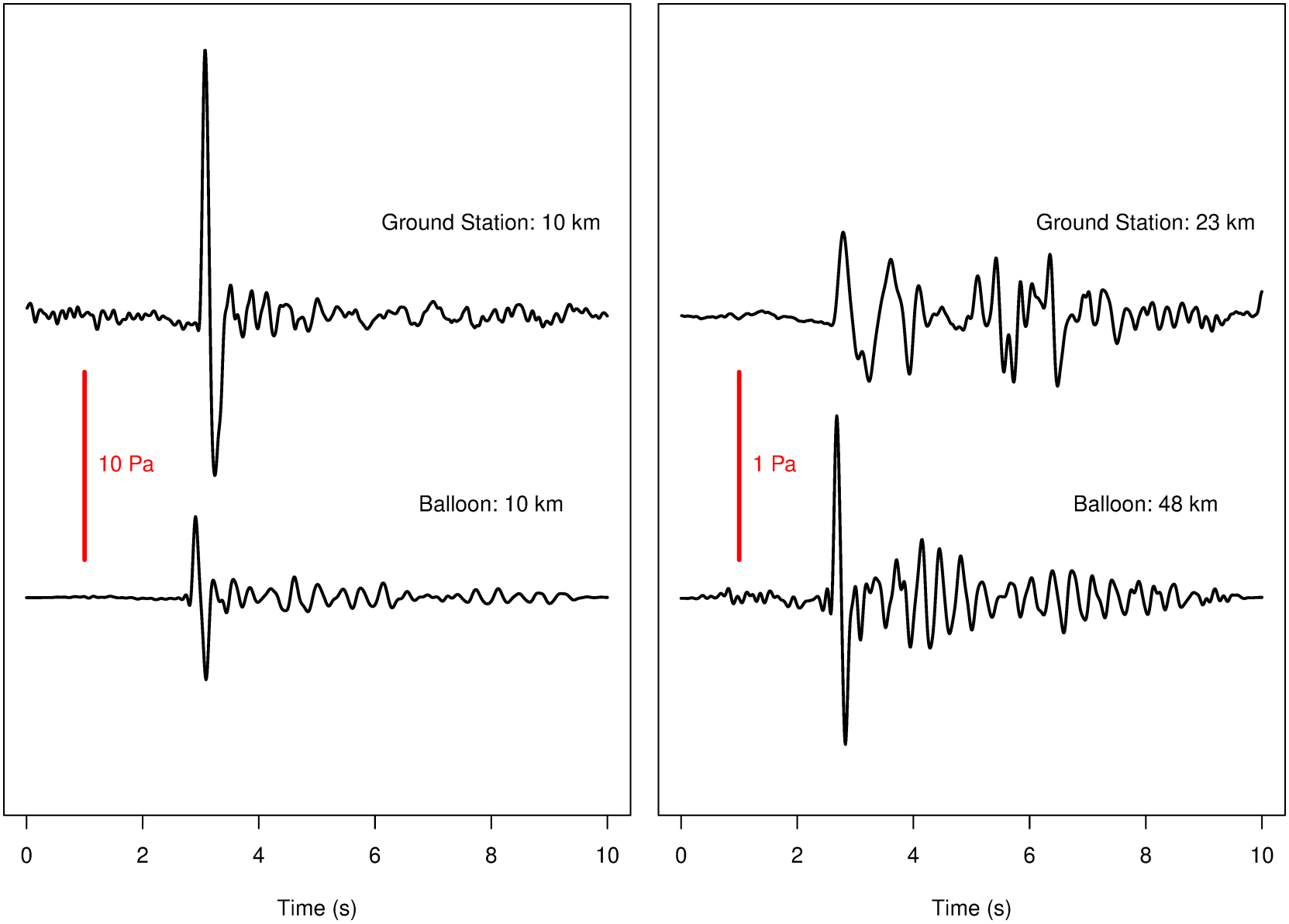
A set of small (50 - 90 kg) explosions recorded on two balloons

Attenuation vs. Range

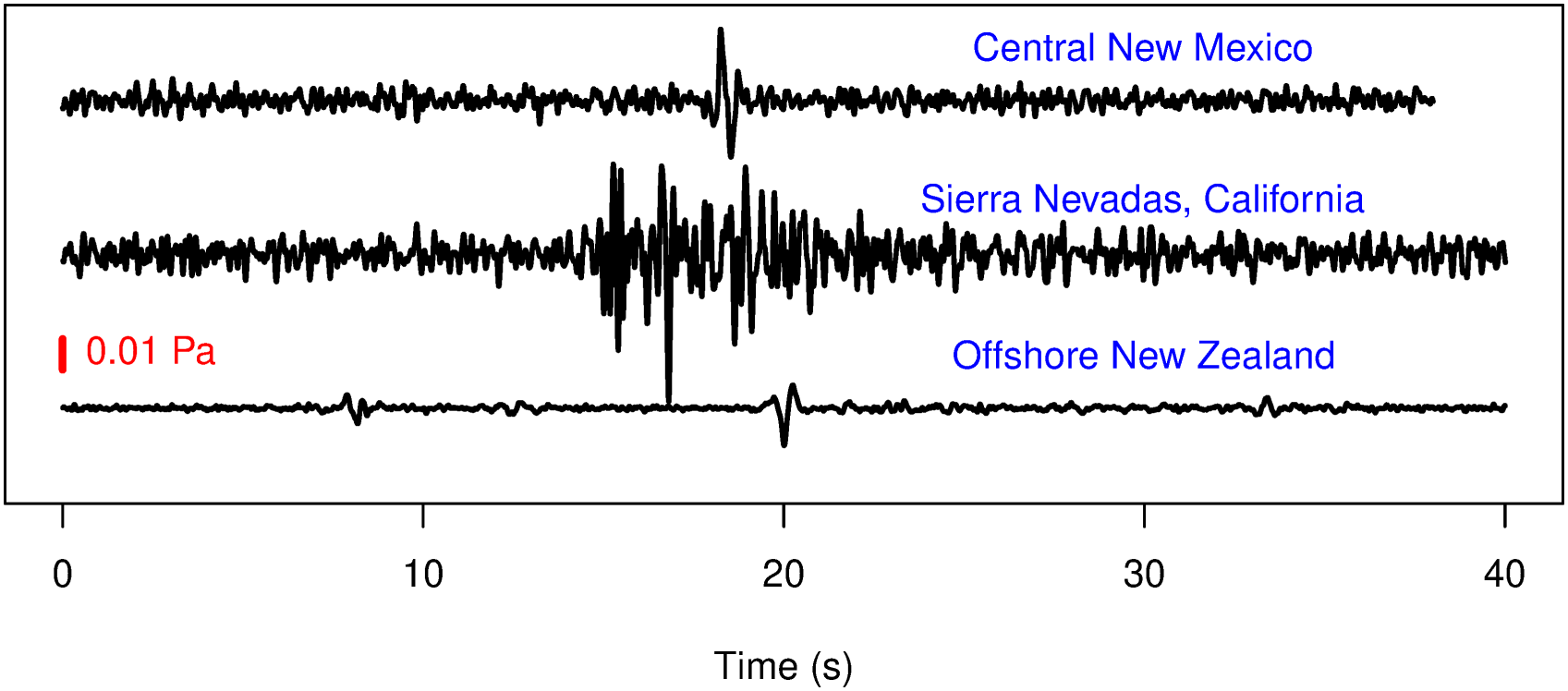


The attenuation coefficient is -2.5 ± 0.50, which seems extreme. **Exact size and emplacement method for the sources is unknown,** adding additional bias.

Comparison with Ground Detections



Unknown Signals Revisited



We can make some guesses about these events...

Conclusions

Balloons can record direct arrivals from 40+ km

- Range is generally superior to ground stations
- Waveforms appear to suffer less distortion
- Ensonified region has sharp boundaries
- Ensonified region geometry depends on wind

More study is needed to test these statements

Acknowledgments

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