

Empirical Infrasound Predictions for the DAG Series

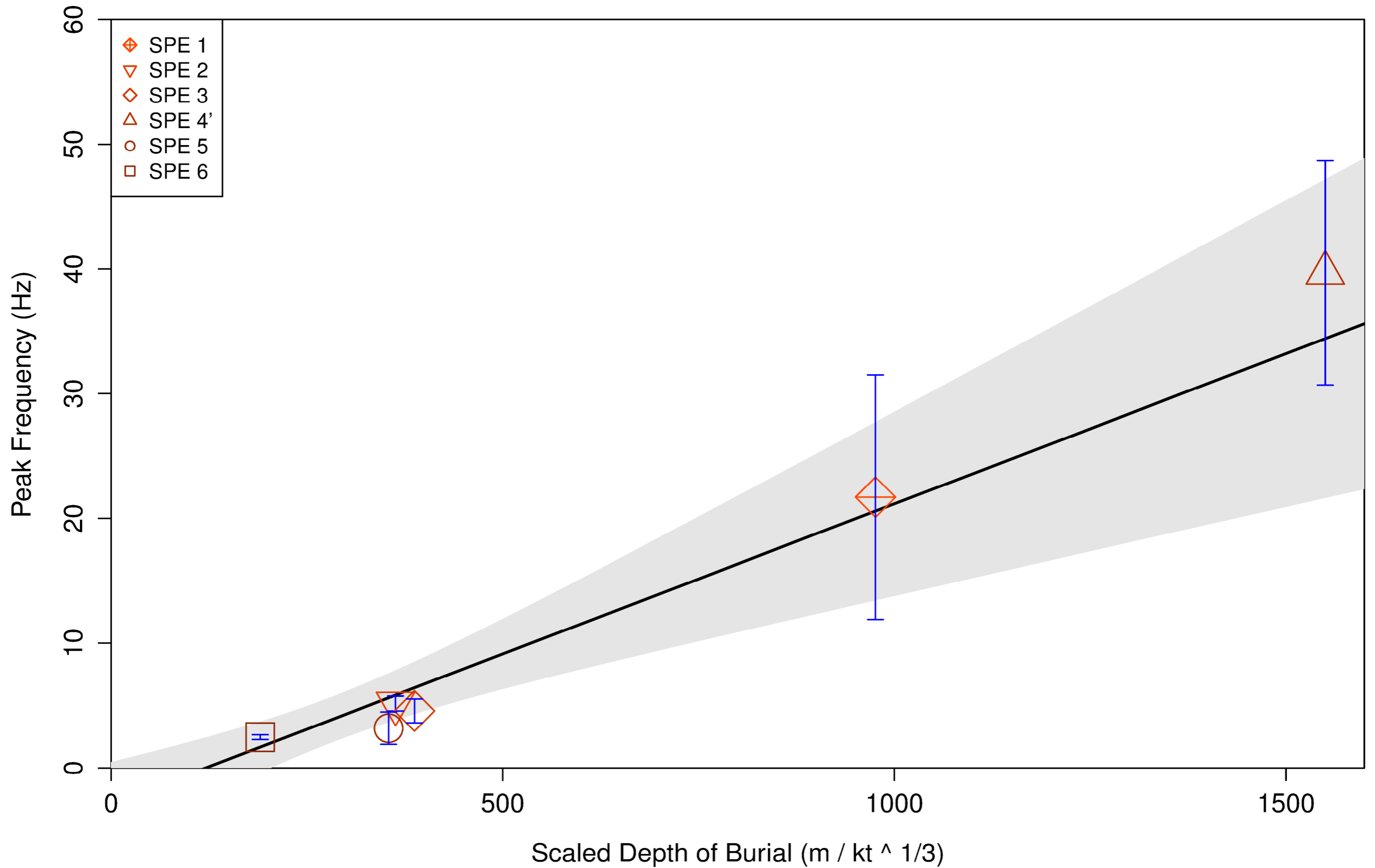
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Introduction

- A preliminary study of SPE Phase 1 infrasound waveforms suggests a relationship with SDOB
- Linear least squares regression is a logical first step to characterizing this relationship.
- Linear and logarithmic models appear to be appropriate
- Models probably valid only for buried explosions in hard rock; applicability to the DAG is unclear

Evaluate the explanatory power of simple linear regression models vs. more sophisticated methods.

Peak Frequency



Peak Frequency Predictions

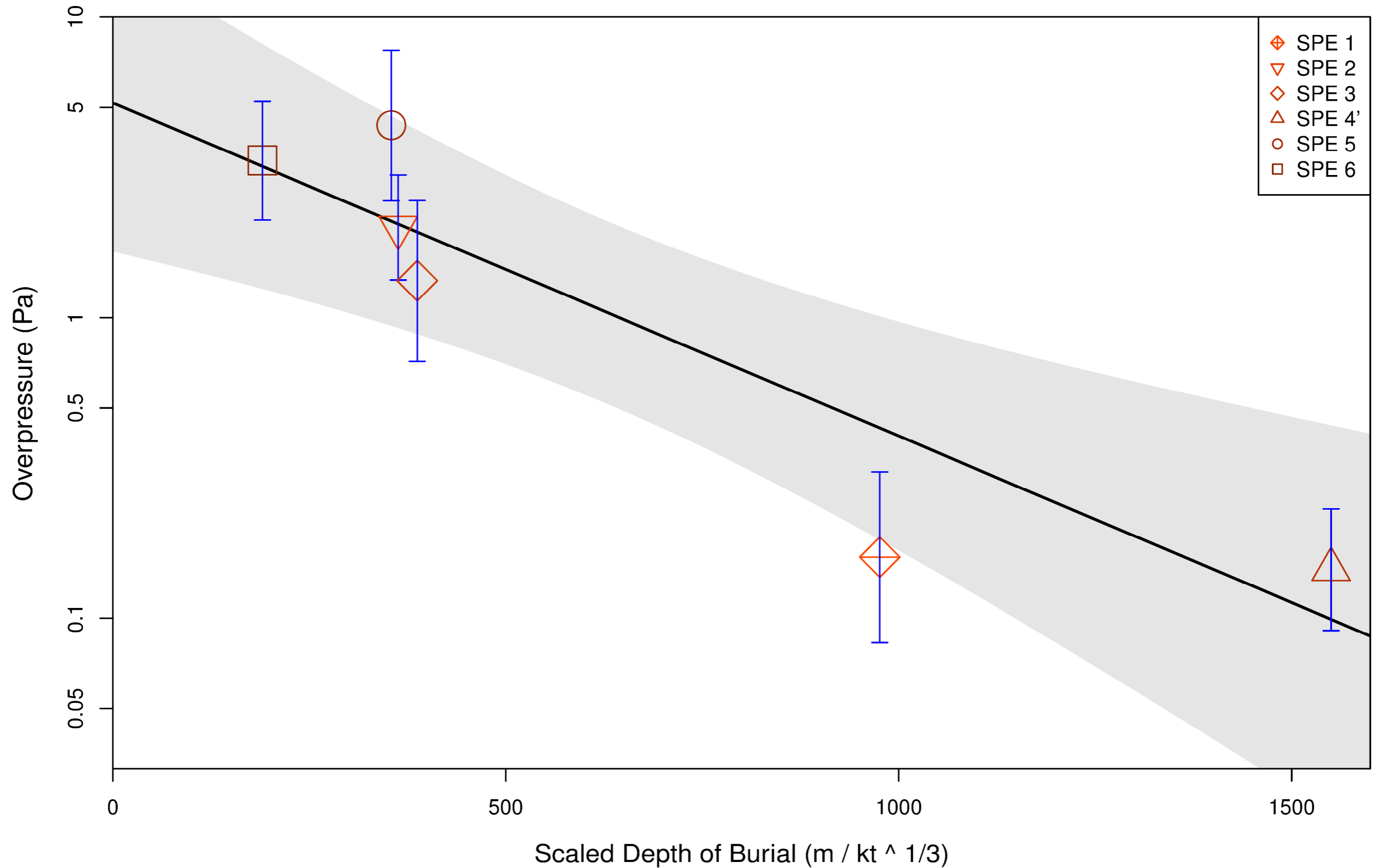
Shot	SDOB (m/kt ^{^(1/3)})	Peak Frequency (Hz)
DAG-1	3100	70 +/- 28*
DAG-2	650	13 +/- 4.0
DAG-3	550	10 +/- 3.0
DAG-4	190	1.7 +/- 2.0**

*Extrapolation from SPE-1 domain

**Nonphysical

Generally expect **lower** peak frequencies at the DAG site. SDOB for DAG-1 is outside of Phase 1 domain, so probably unreliable. Confidence interval for DAG-4 illustrates limitation of linear regression.

Overpressure at 1 km range



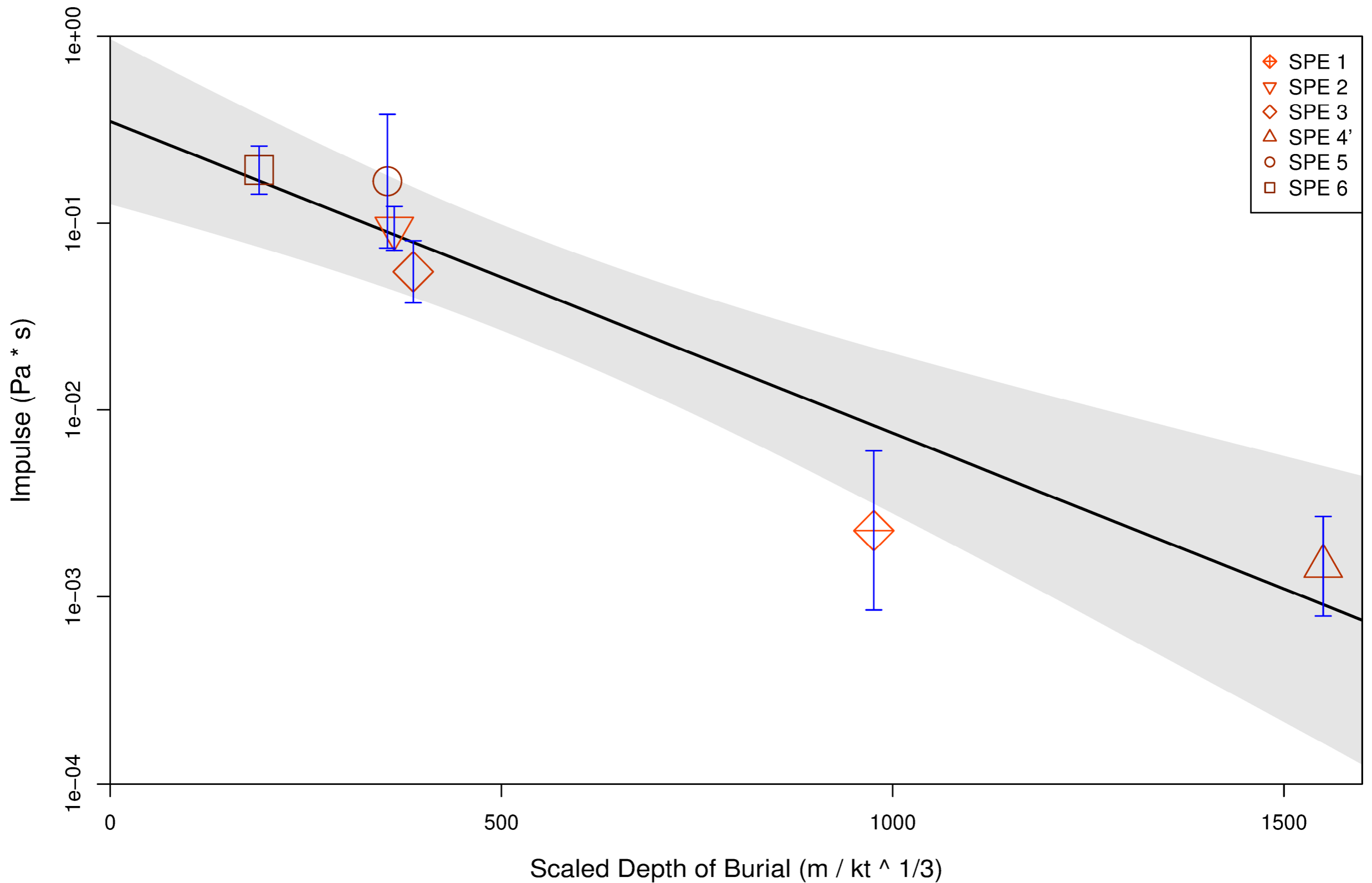
Overpressure Predictions

Shot	SDOB (m/kt ^{^(1/3)})	Overpressure (Pa)
DAG-1	3100	0.002 (0.000063 to 0.072)*
DAG-2	650	1.0 (0.50 to 2.0)
DAG-3	550	1.3 (0.63 to 2.6)
DAG-4	190	3.2 (1.2 to 8.2)

*Extrapolation from SPE-1 domain

SDOB for DAG-1 is outside of Phase 1 domain, so the overpressure predictions are probably less reliable. However, results suggest that most of the array will not detect an acoustic signal from DAG-1.

Impulse at 1 km range



Impulse Predictions

Shot	SDOB ($m/kt^{1/3}$)	Log Impulse ($Pa \cdot s$)
DAG-1	3100	-5.6 (-7.3 to -3.8)*
DAG-2	650	-1.5 (-1.8 to -1.2)
DAG-3	550	-1.4 (-1.7 to -1.1)
DAG-4	190	-0.77 (-1.1 to -0.42)

*Extrapolation from SPE-1 domain

SDOB for DAG-1 is outside of Phase 1 domain, so probably less reliable. Results from previous explosion tests suggest that impulse is insensitive to repeated underground blasts at the same site.

Conclusions

- Regression models appear reasonable for peak frequency, overpressure, and impulse at SPE Phase 1.
- More work needs to be done in defining the limits of the model and handling heteroscedasticity, among others
- Results from the DAG series will evaluate the predictive power of this method.