

Explosion source data analysis from a Jordanian Quarry

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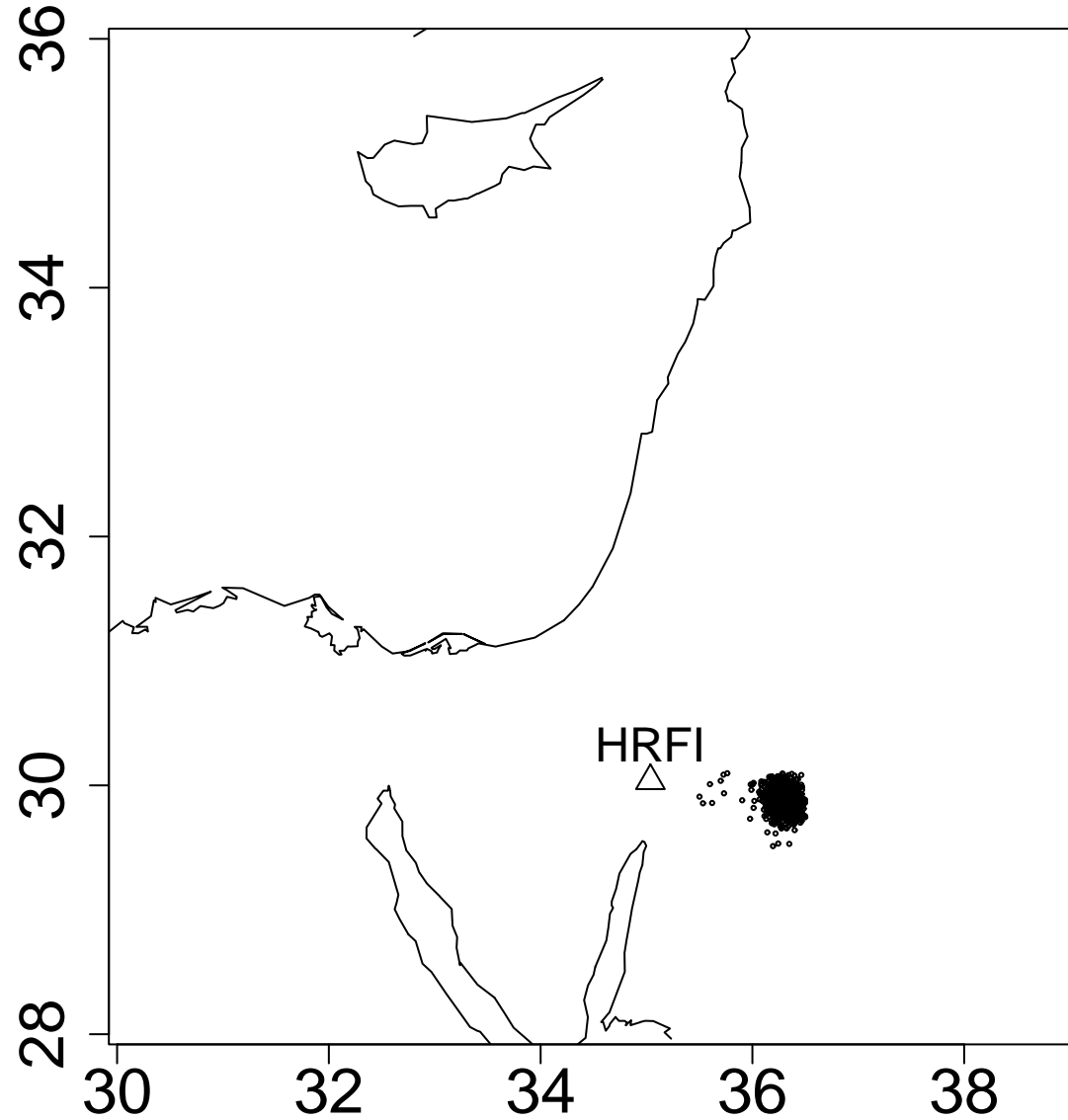
Goal: Use Singular Value Decomposition (SVD) to investigate source similarity

1. Identify events
2. Winnowing and preprocessing
3. Z component data and singular value spectrum
4. Data reconstruction
5. Conclusions

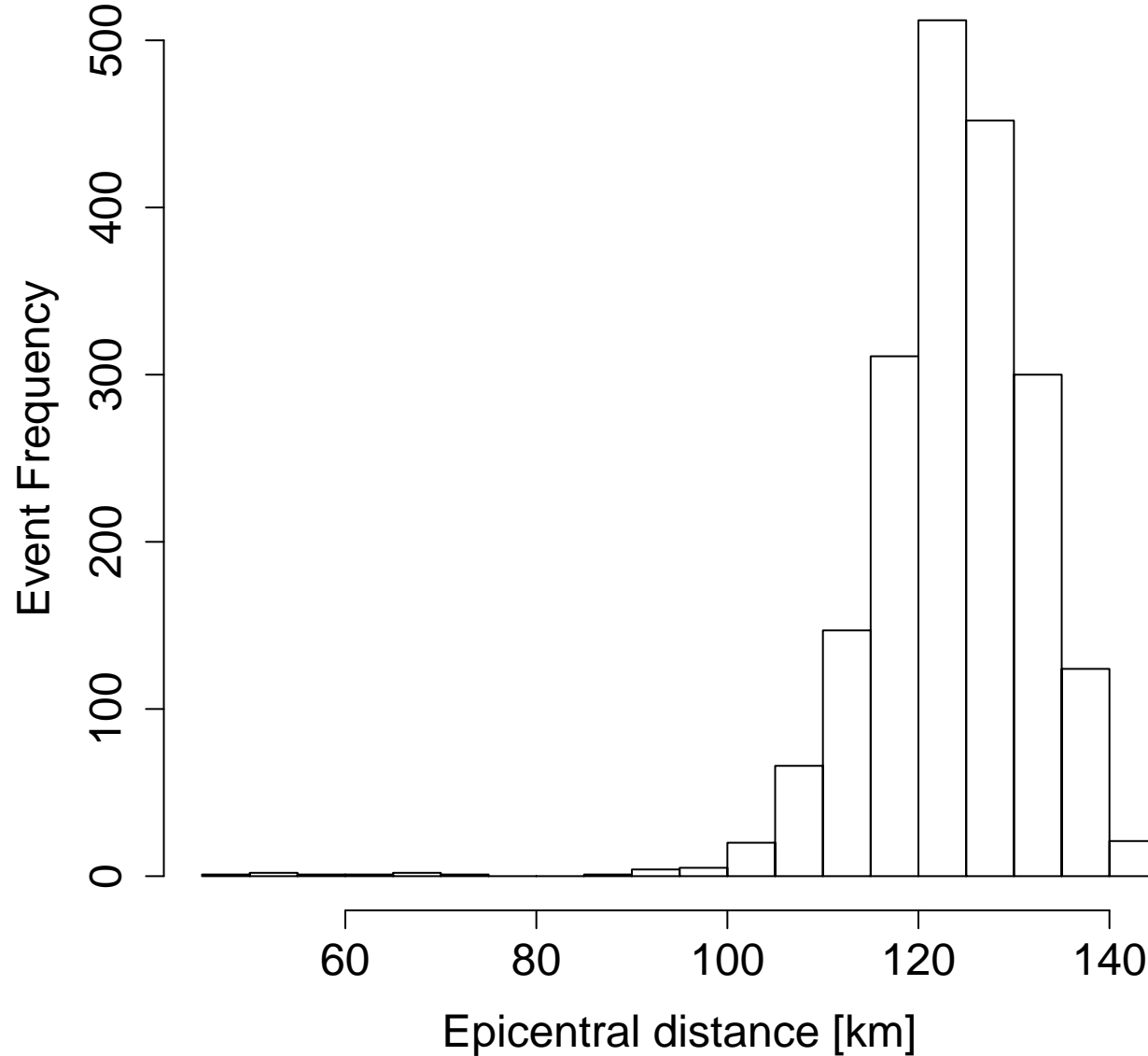


Location of HRFI and Jordan Phosphae Mines Co. quarry events

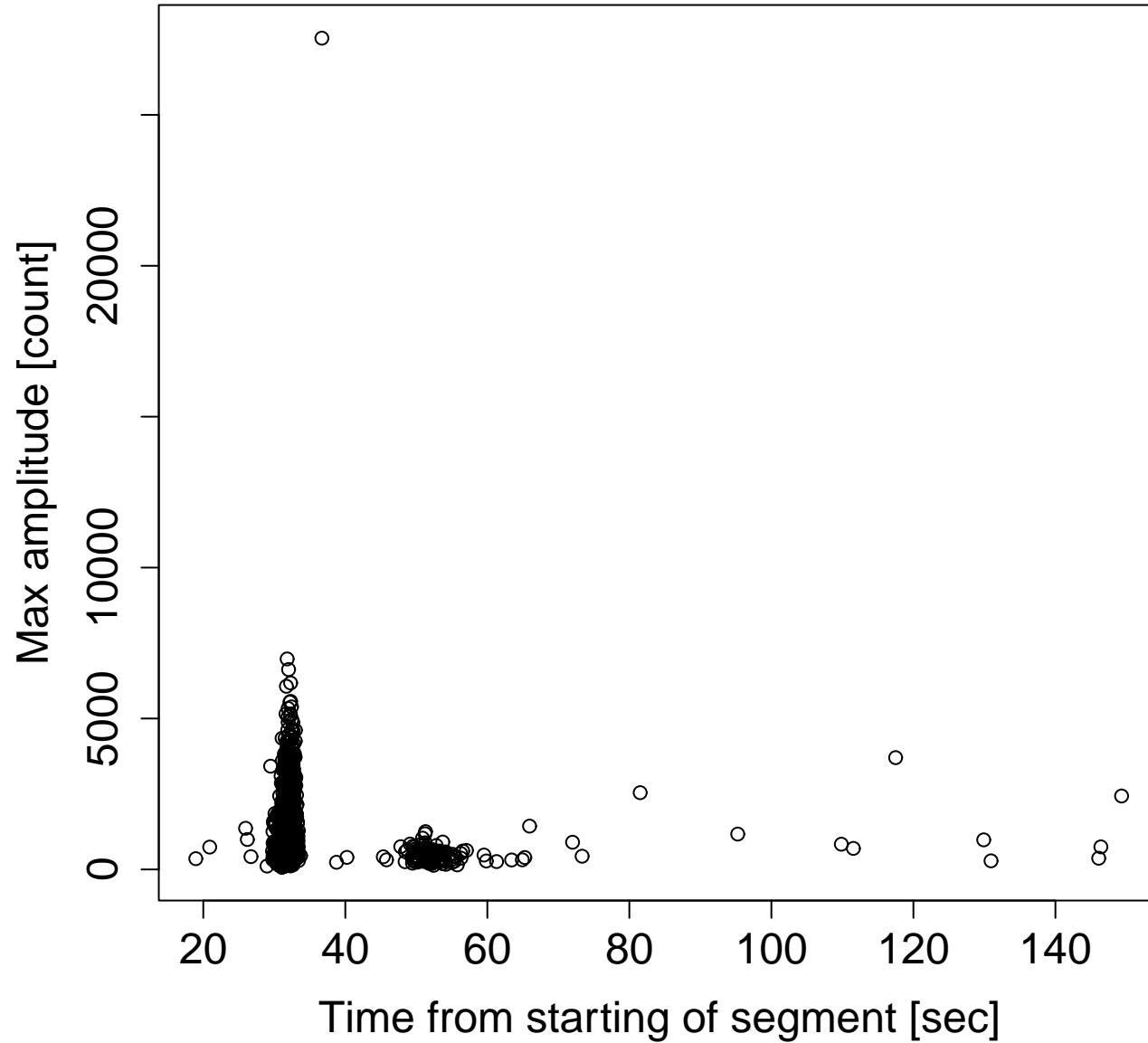
HRFI: 3 component
broadband STS-2 seismometer.
 $\Delta t = .025 \text{ sec}$
Quanterra digitizer



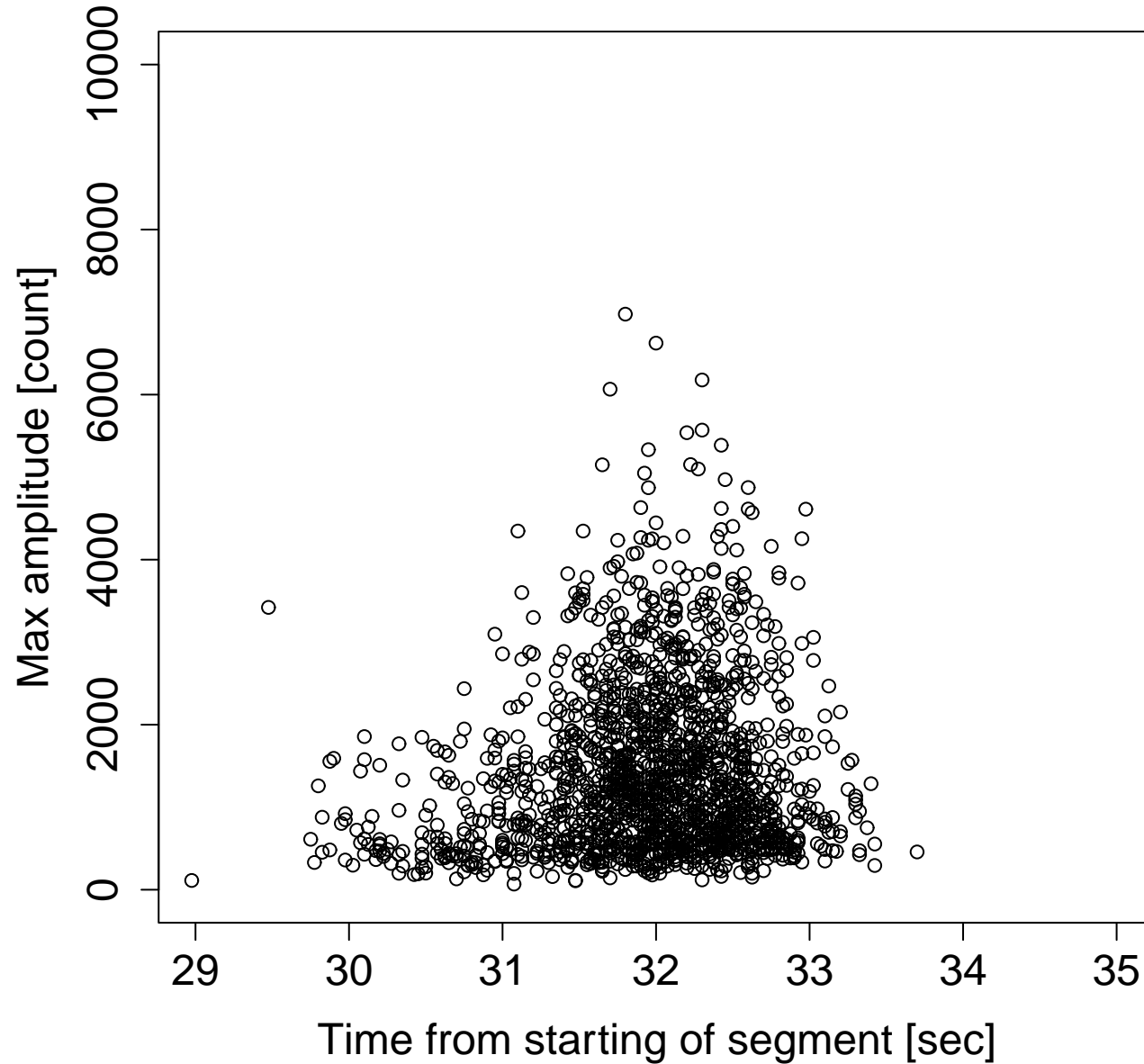
Histogram of epicentral distance distribution



Maximum amplitude times – z component



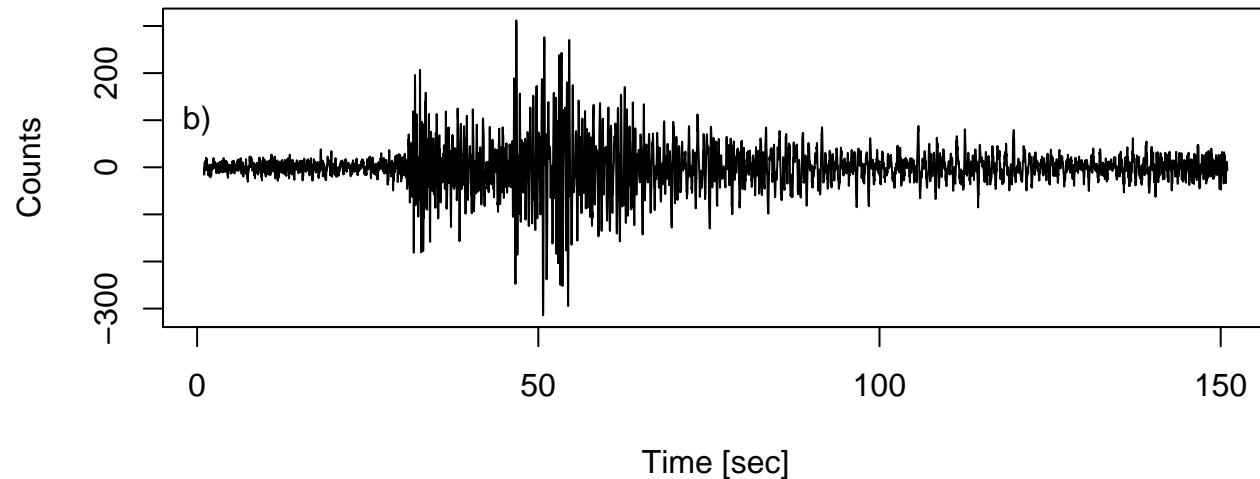
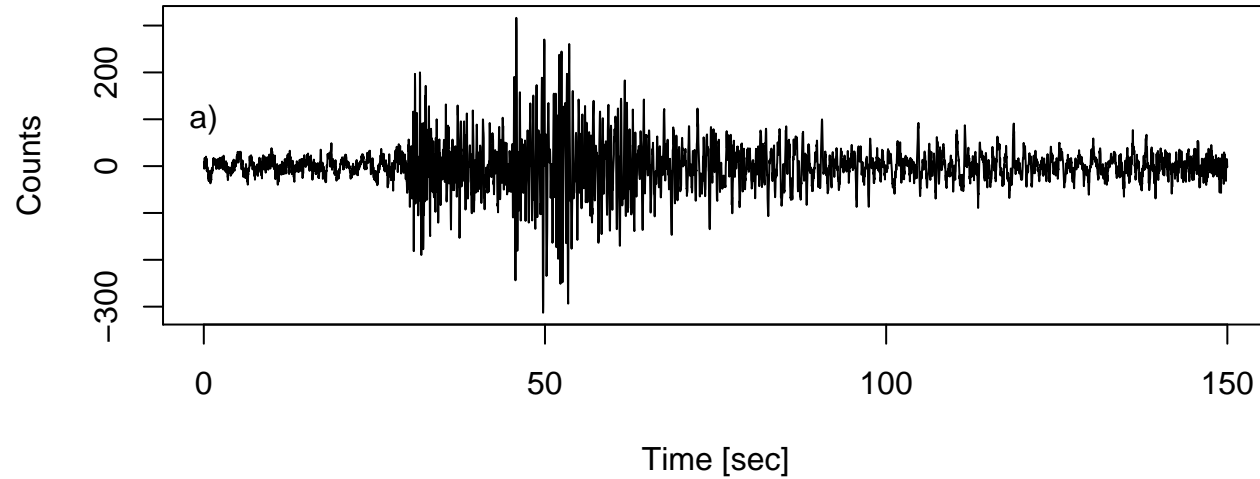
P-wave winnowed events



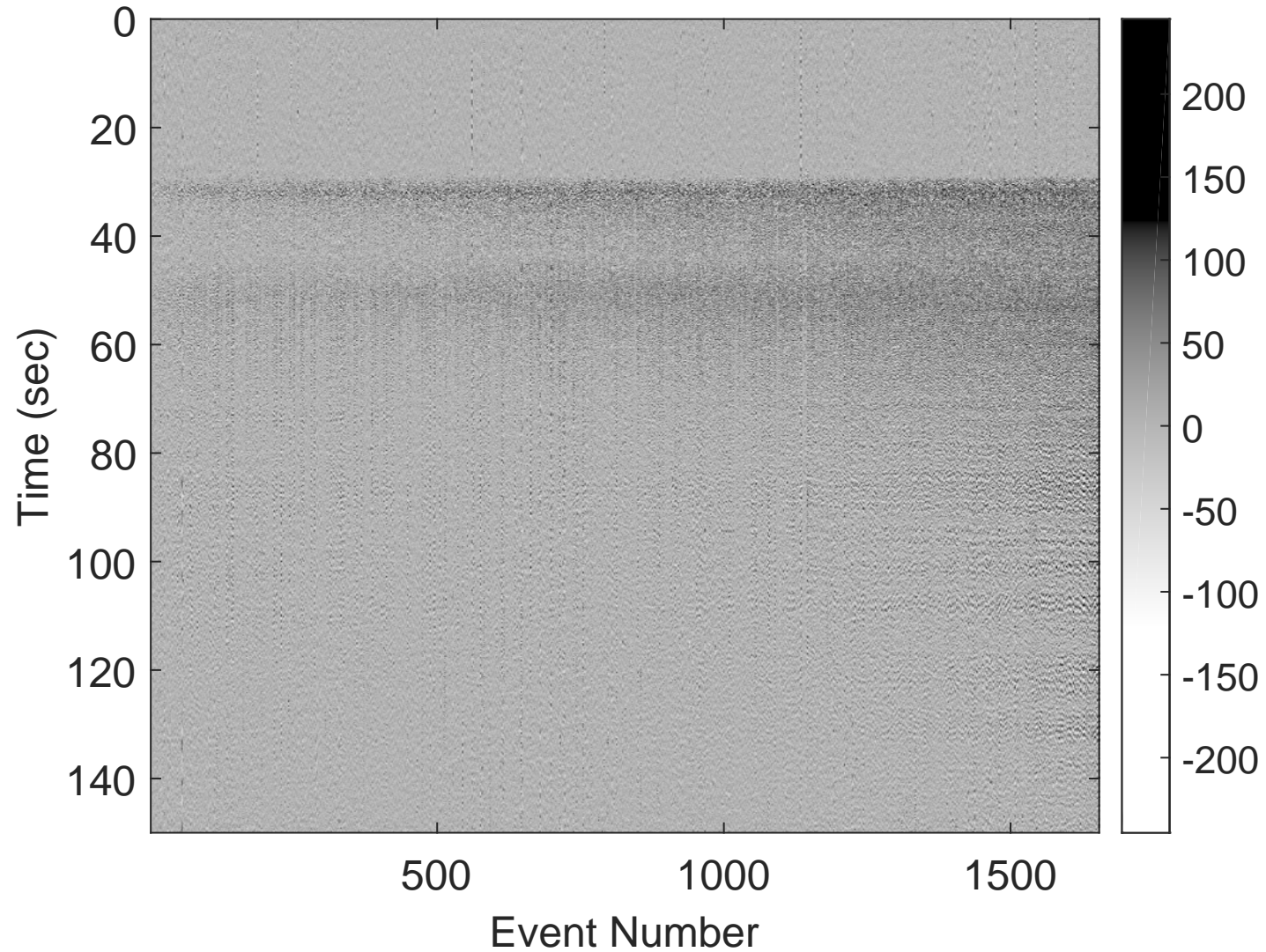
Preprocessing: Sorting, Bandpass(.1 -12Hz), Detrend

Detrend Algorithm:
STL: A seasonal-trend
decomposition procedure
based on loess

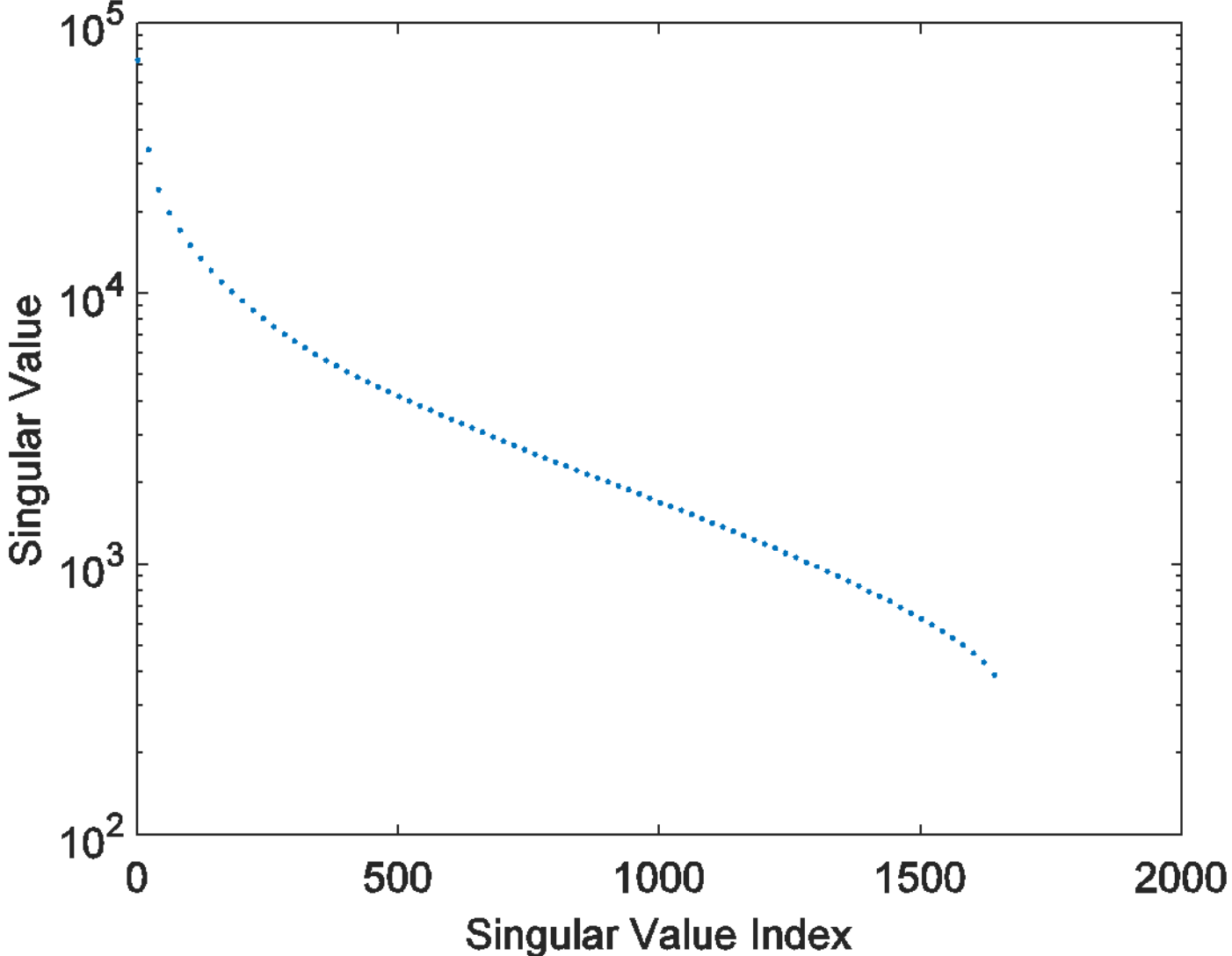
Cleveland et al 1990
Journal of Official Statistics



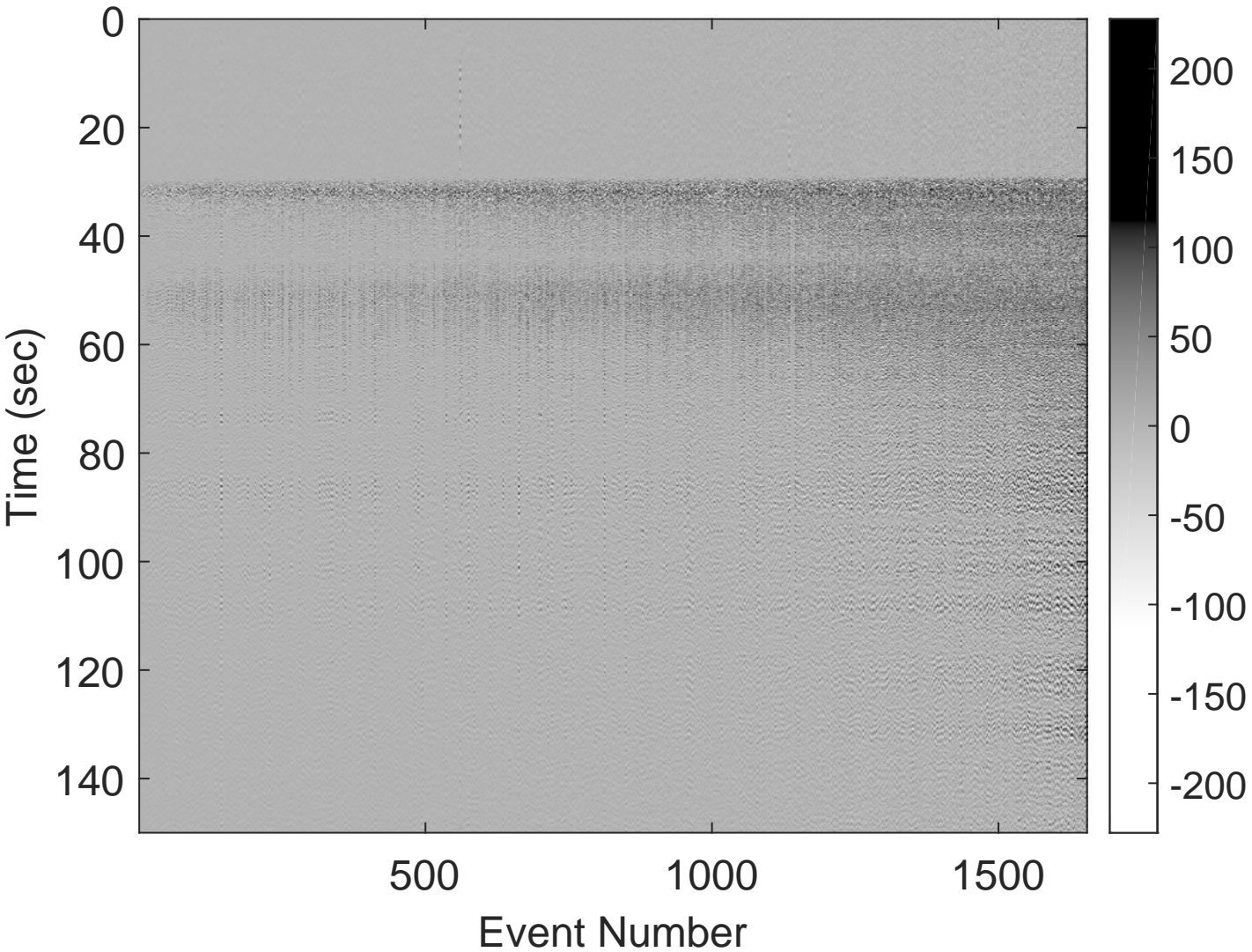
Pre-processed z component data



Singular value spectrum



SVD reconstruction (10%)



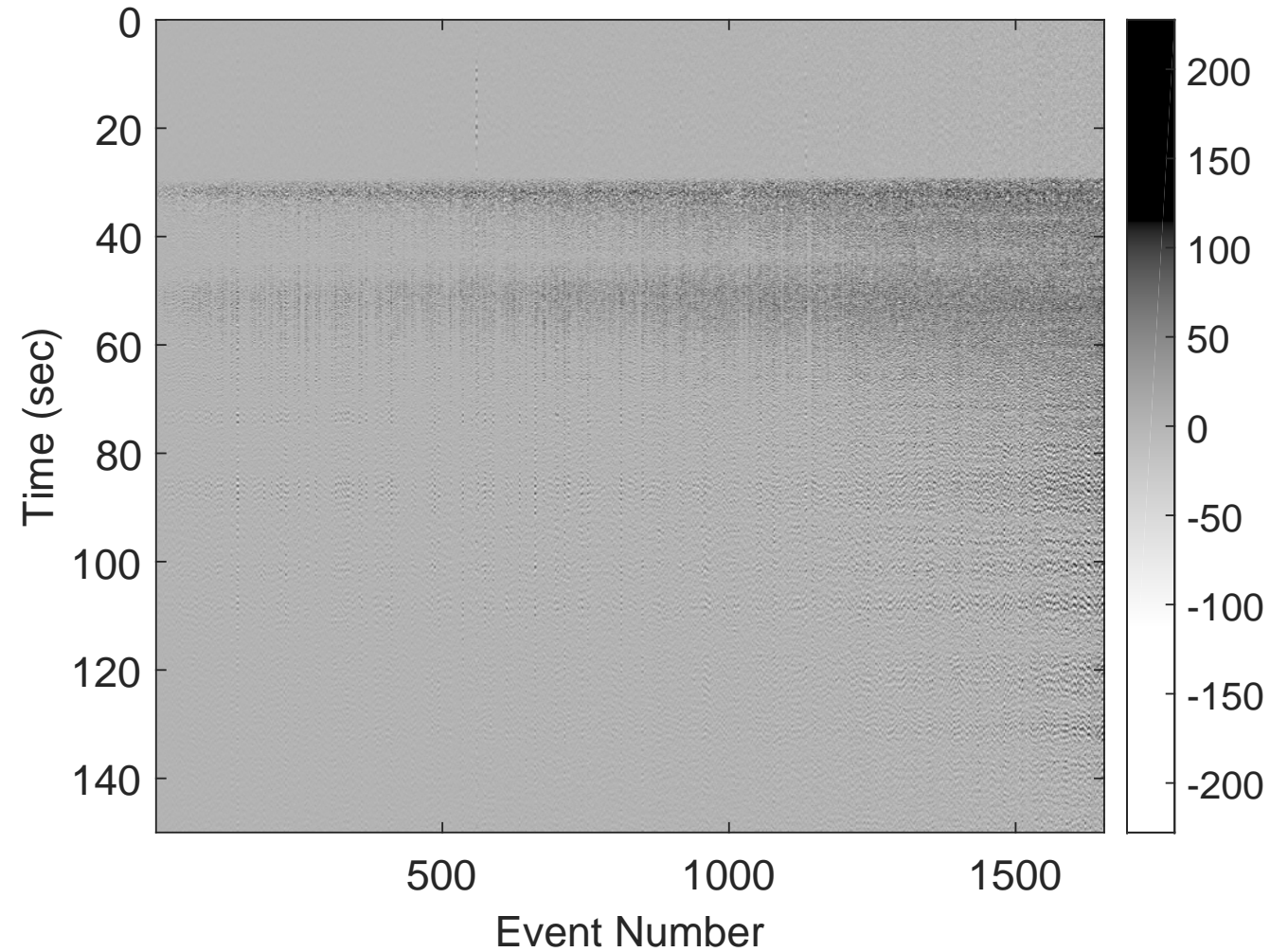
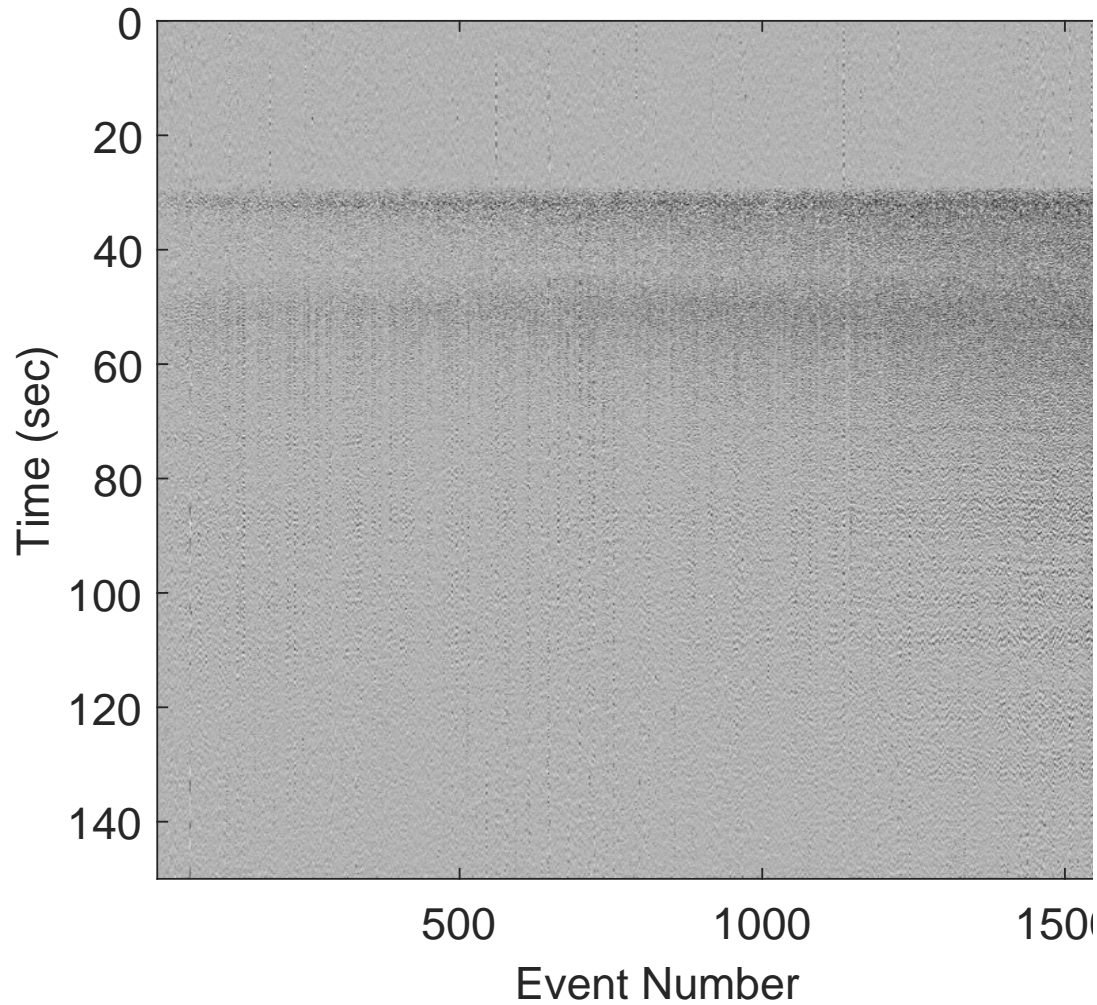
www.crewes.org



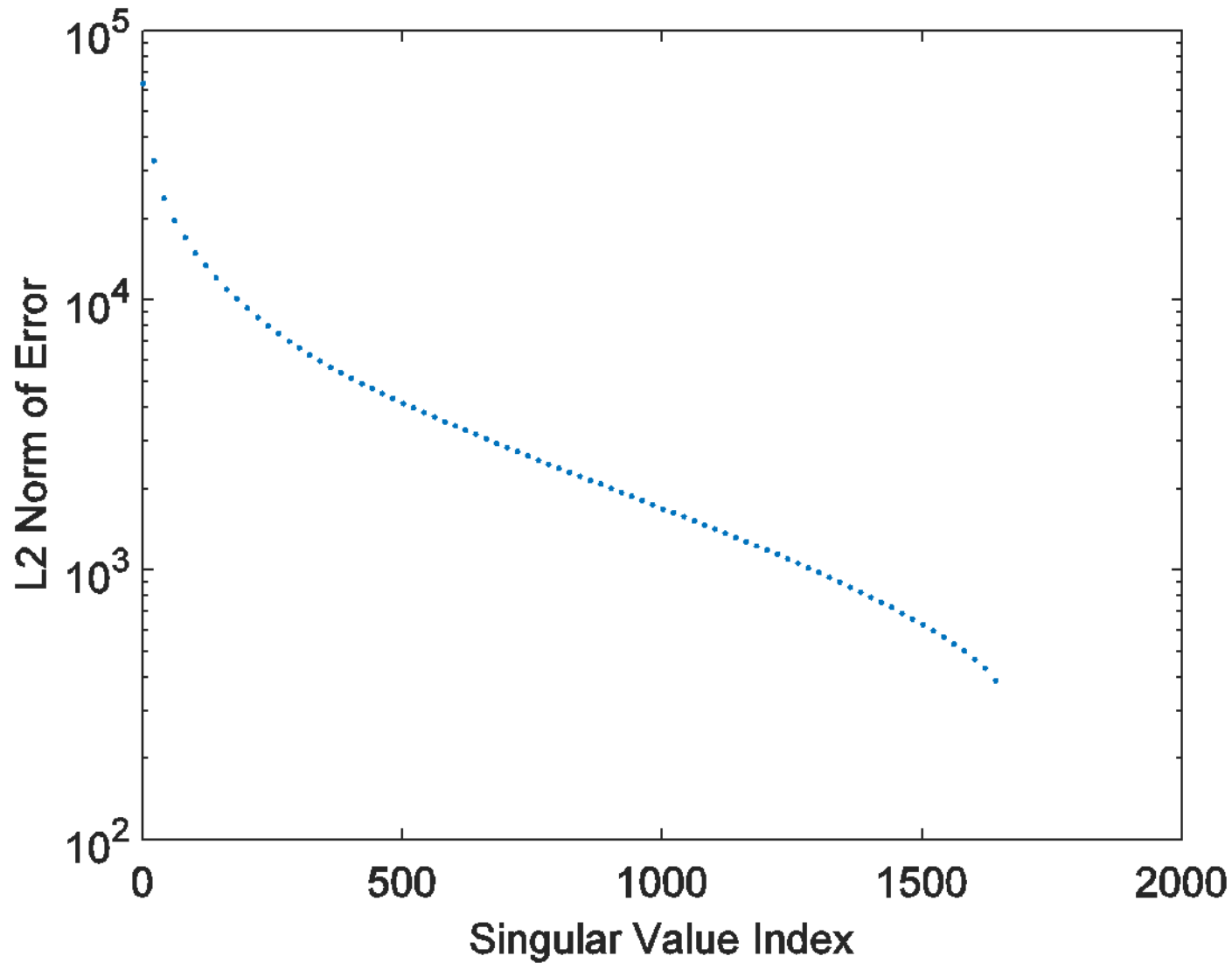
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Comparison of data and svd reconstruction



L2 reconstruction error norm



Conclusions

1. Exploited source similarity to compress data – 10% of singular value spectrum.
2. Essential data features preserved.
3. Highly nonstationary data – good candidate for time-frequency analysis
4. Preliminary results are basis for three country project: Canada, Israel and Jordan

