

Supplemental Material for “*Systematic Estimation of Earthquake Source Parameters for Continental Australia: Attenuation and Stress Drop*”

Trevor Allen

This electronic supplement provides the data and model coefficients used in the production of the manuscript “*Systematic Estimation of Earthquake Source Parameters for Continental Australia: Attenuation and Stress Drop*”, published in the *Bulletin of the Seismological Society of America*. Files include:

- [brune_source_parameters.csv](#): Summary file of earthquake source parameters calculated in this study. Table S1 provides a description of table attributes.
- [atten_coeffs.csv](#): Coefficients for the Fourier spectral attenuation model used in the evaluation of earthquake source parameters, as applied in Equations 8-11 of the manuscript. The coefficients include the aleatory variability model (e.g., Al Atik *et al.*, 2010), such that:

$$\sigma_T = \sqrt{\sigma_{be}^2 + \sigma_{we}^2},$$

where,

- σ_T is the total variability
- σ_{be} is the between-event variability
- σ_{we} is the within-event variability

Figure S1 shows an example of the between- and within-event residuals relative to the Fourier attenuation model for frequencies of 0.75 and 2.0 Hz, respectively. The residual values are strongly dependent on the stress drop of the earthquake, particularly at higher frequencies (Figure S1b). The residual values are less sensitive to the earthquake’s stress drop at lower frequencies, which is to be expected (Figure S1b). The within-event residuals are largely independent of distance (Figures S1c-d)

Table S1. A description of table attributes in the summary file, [brune_source_parameters.csv](#), as calculated in this study.

ATTRIBUTE	DESCRIPTION
EVENT	Origin time of earthquake
GAID	Geoscience Australia earthquake ID
LON	Earthquake longitude (degrees)
LAT	Earthquake latitude (degrees)
DEP	Earthquake hypocentral depth (km)
OMAG	Original magnitude as per the Geoscience Australia catalogue (https://earthquakes.ga.gov.au/)
OMAG_TYPE	Original magnitude type
MB	Body-wave magnitude
BRUNE_MAG	Moment magnitude from Brune spectral fitting
BRUNE_MAG_STD	Standard deviation of the moment magnitude from Brune spectral fitting
STRESS_DROP	Stress drop from Brune spectral fitting (MPa)
LOG_STRESS_DROP_STD	\log_{10} standard deviation of the stress drop from Brune spectral fitting
CORN_FREQ	Corner frequency from Brune spectral fitting (Hz)
CORN_FREQ_STD	Standard deviation of the corner frequency from Brune spectral fitting (Hz)
NRECS	Number of recordings used for Brune spectral fitting
FMIN	Minimum frequency used to fit Brune spectral model (Hz)
FMAX	Maximum frequency used to fit Brune spectral model (Hz)

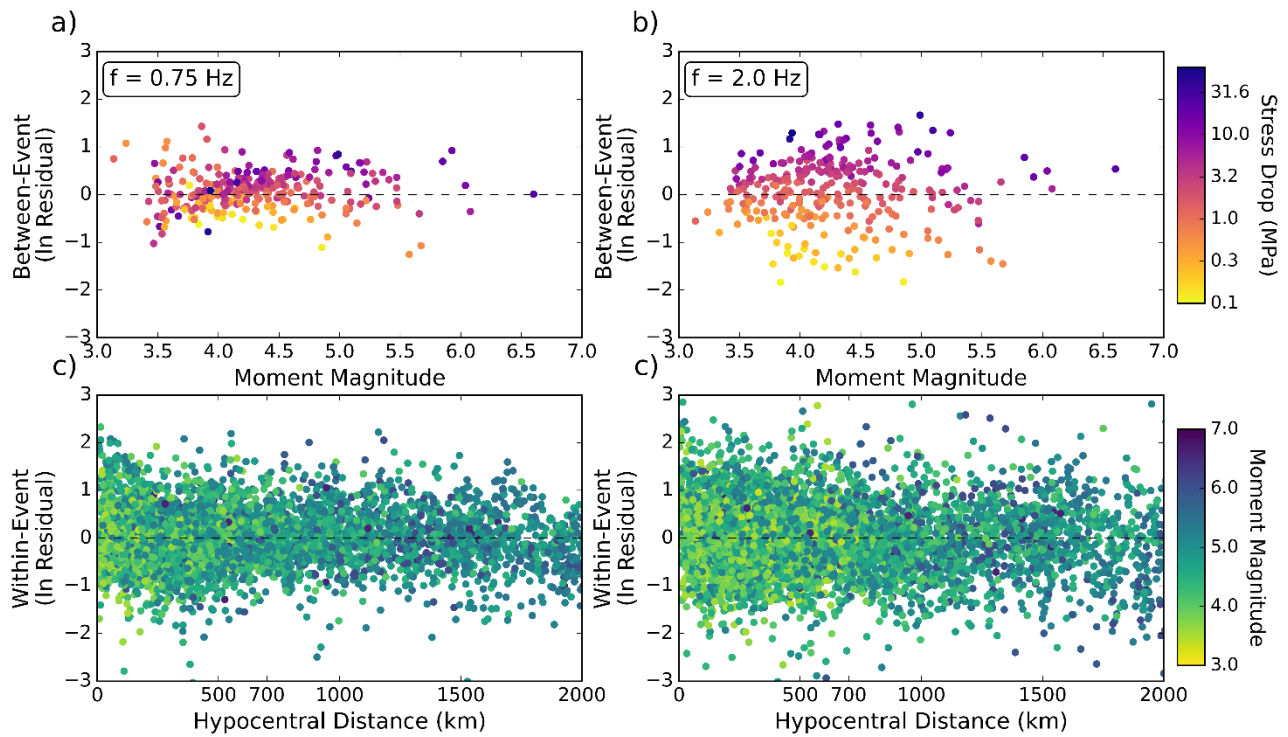


Figure S1. Between- and within-event residuals (in natural log units) using observed data relative to the Fourier attenuation model. The between-event terms are shown for frequencies of (a) 0.75 Hz and (b) 2.0 Hz and are color-coded by stress drop (in MPa). The within-event terms are also shown for (c) 0.75 Hz and (d) 2.0 Hz and are color-coded by magnitude.

Reference

Al Atik, L., N. Abrahamson, J. J. Bommer, F. Scherbaum, F. Cotton, and N. Kuehn (2010). The variability of ground-motion prediction models and its components, *Seismol. Res. Lett.* **81**, 794-801, doi: 10.1785/gssrl.81.5.794.