Article:

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Supplemental Material for

When do fractured media become seismically anisotropic? Some implications on quantifying fracture properties

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In Figure S1 we show that the linear slip (LS) effective medium model (EMM) of Schoenberg & Sayers (1995) fails to accurately predict the observed shear-wave splitting (SWS) from the finite-difference explicit fracture model for the case of Z_N/Z_T=1.0 (one of the two conditions where mathematically LS should be valid, Chichinina et al., 2015). In Figure S2 we show that even under the long wavelength approximation (LWA), SWS only develops after propagating at least 1 to 2 wavelengths within the fracture volume. To do this, we simulate a seismic source having dominant frequency of 50 Hz within a model having fracture size d=6 m, fracture density of 0.1 and Z_N/Z_T=0.3. For 50 Hz signal, the wavelength is approximately 60 m such that the ratio of wavelength to fracture size is 10 (i.e., within the LWA of λ/d >> 1).

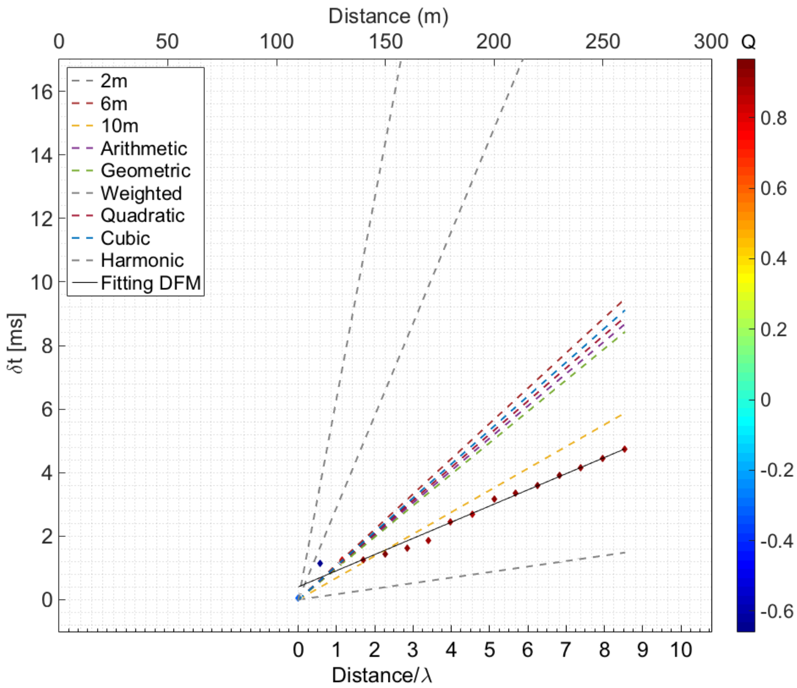

Figure S1: Comparison of LS EMM δt predictions with the observed SWS for the fracture model: d=6 m, ε=0.1 and Z_N=Z_T=1.0. LS EMM predictions of Schoenberg & Sayers (1995) for spacing 2 m, 6 m and 10 m (best fitting LS EMM model) as well as LS EMM predictions from the summed distribution in Figure 9 using 6 different means: arithmetic, geometric, harmonic, quadratic, cubic and weighted. See caption in Figure 4 for details.

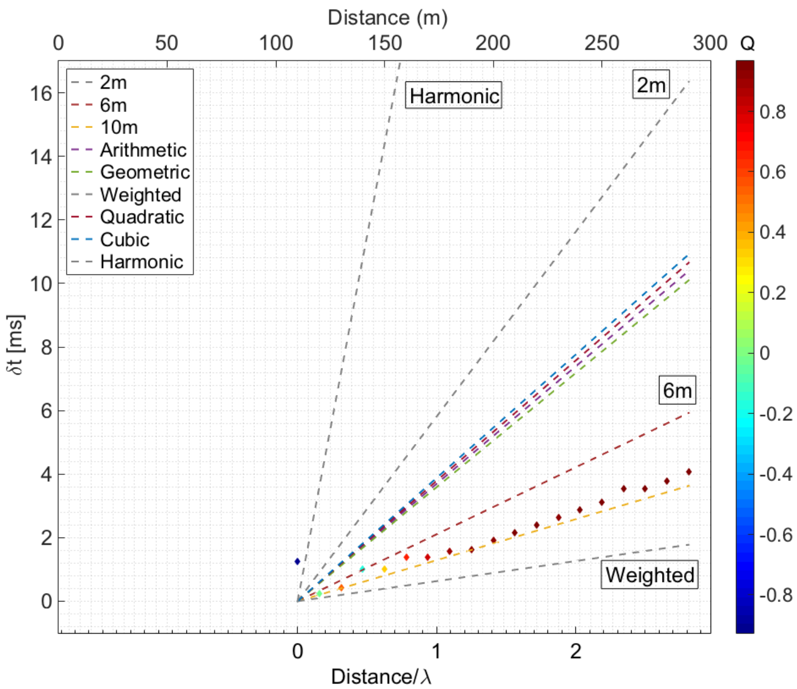

Figure S2: Comparison of LS EMM δt predictions with the observed SWS for dominant source frequency of 50 Hz (approximate wavelength of 60 m) for the fracture model: d=6 m, ε=0.1 and $Z_N=Z_T$=1.0. LS EMM predictions of Schoenberg & Sayers (1995) for spacing 2 m, 6 m and 10 m (best fitting LS EMM model) as well as LS EMM predictions from the summed distribution in Figure 9 using 6 different means: arithmetic, geometric, harmonic, quadratic, cubic and weighted. See caption in Figure 4 for details.

References:

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