Supporting Information for "Simulation of Large Earthquake Synchronization and Implications On North Anatolian Fault Zone"

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S1. Full Inertial Effects on Synchronization We checked the effect of the wave mediated stress transfer on the synchronization by applying the dynamic kernel in equation 7 of the manuscript (Lapusta et al., 2000). The effective normal stress σ_n and the constitutive parameters $a - b_{asp}$ are set to 70 MPa and -0.005 rather than the parameters given in table 1. First, we checked a two asperity setup with the same homogeneous initial conditions for the sake of comparison. Figure S1 shows dynamic term leads to a faster wave propagation than the quasi-dynamic approximation in the main manuscript. However, the final values do not differ significantly.

The three asperity model as in figure 2 (main manuscript) but again simplifying $\sigma_n = 70MPa$ and $a - b_{asp} = -0.005$ in figure S2 shows that results do not differ after a few

cycle but than it starts deviating. The deviation can both account for the dynamic differences between QD and FD and accumulation of small errors. We did not investigate the influence of error accumulation due to the both grid resolution and time stepping, left for a further study. Nonetheless, the additional dynamic term did not lead to a better synchronization, but it leads to even more deviations in failure times as in figure S2

References

Lapusta, N., Rice, J. R., Ben-Zion, Y., & Zheng, G. (2000). Elastodynamic analysis for slow tectonic loading with spontaneous rupture episodes on faults with rate- and state-dependent friction. *Journal of Geophysical Research: Solid Earth*, *105*, 23765-23789. doi: 10.1029/2000jb900250

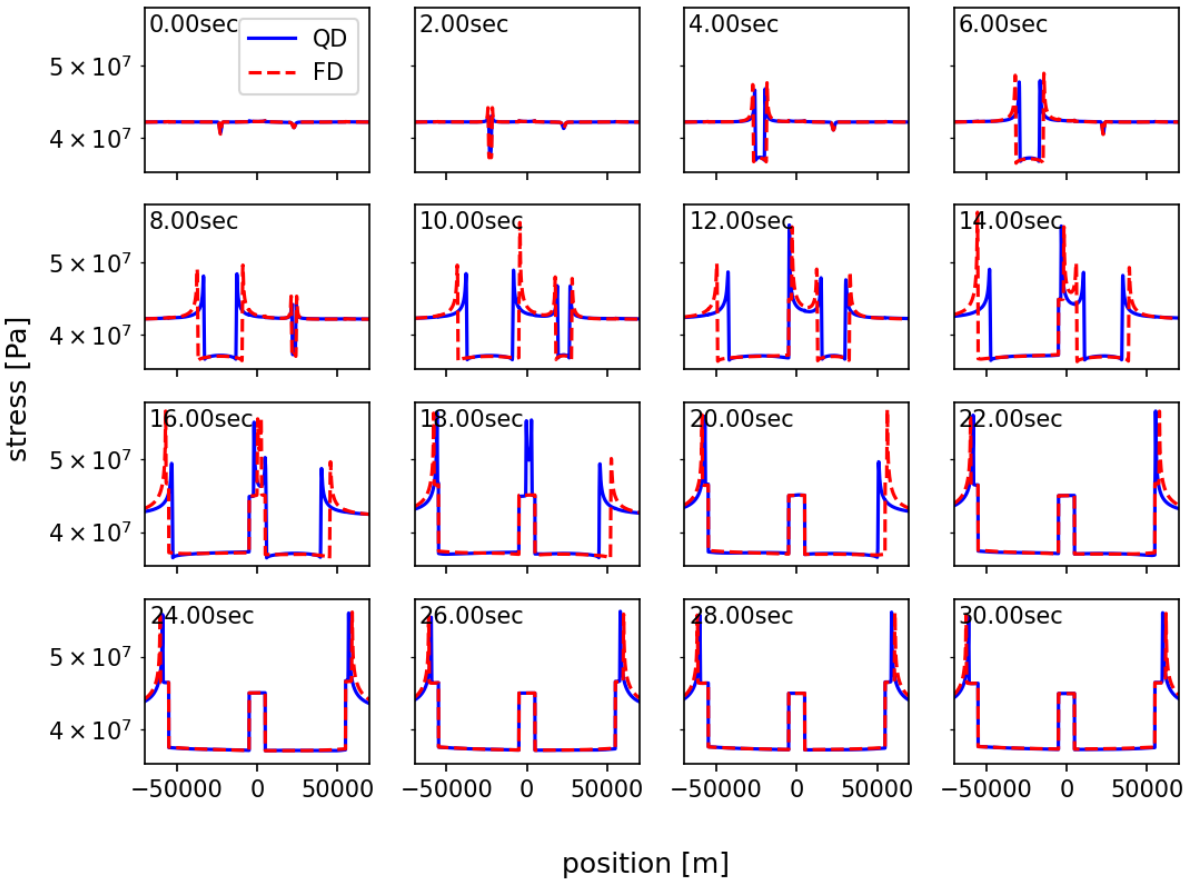

Figure S1. The wave propagation difference between full-dynamic, and quasi-dynamic simulations. The frames are plotted every 2 seconds for a two-asperity model. The color code for plots are given in the legend

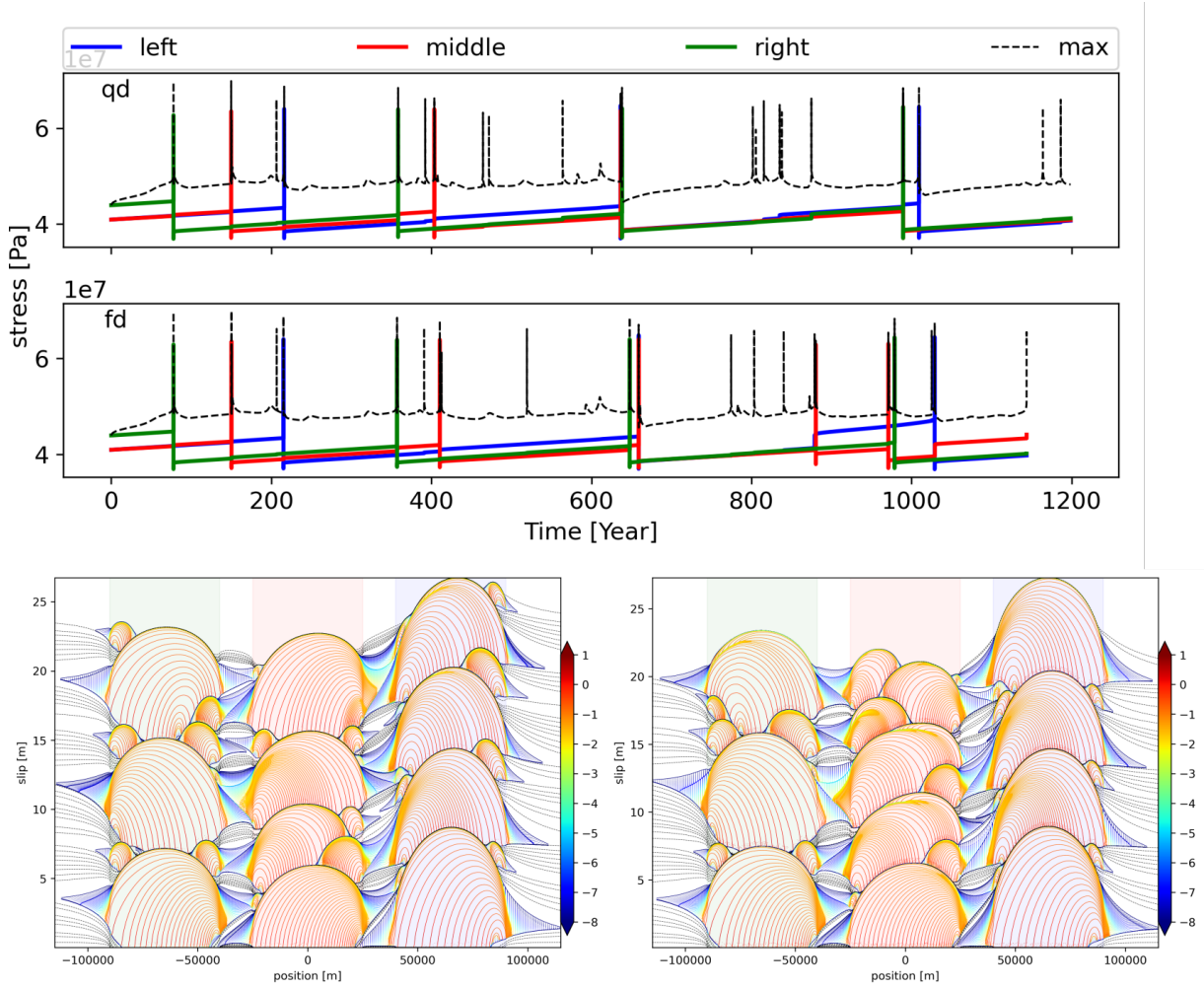

Figure S2. Plots show the difference between FD and QD. The time series of stress are given on upper subplots. The slip profiles for qd (left) and fd (right) are given in below figures.