EXPLORING THE INFLUENCE OF FAULT-SURFACE TOPOGRAPHY ON EARTHQUAKE RUPTURE DYNAMICS: A STUDY OF RUPTURE PARAMETER CORRELATIONS

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Geological observations reveal that fault-surface topography exhibits variations at both large (segmentation) and small (roughness) scales. These complexities influence earthquake rupture dynamics, impacting properties such as slip, rupture speed, rise time, and peak slip rate. Understanding the correlations among these rupture parameters is crucial for advancing our understanding of earthquake rupture physics and building synthetic rupture models, which emulate dynamic rupture characteristics within kinematic frameworks. While previous studies have explored these correlations, the influence of fault roughness on them remains unclear. Therefore, our study aims to analyze how small-scale roughness affects rupture parameter correlations. Leveraging a dataset generated by Mai et al. (2017), which includes twenty-one dynamic rupture models with varying roughness realizations, heights of roughness, and hypocenter locations, our analysis seeks to develop a fundamental understanding of how small-scale variations in fault-surface topography impact rupture parameter correlations. This research has the potential to inform the development of realistic synthetic rupture models capable of generating high-frequency seismic waves (approximately up to 6 Hz) consistent with dynamic rupture models.