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Complex Rupture Process of the 2018 Mw 7.5 Swan Island Earthquake Along the Geometrical Complexity of the Oceanic Transform Fault

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Abstract

Teleseismic P-waveforms are inverted to construct a rupture model of the 2018 Swan Island earthquake by using a relative weight smoothness constraint technique into the potency density tensor inversion method which can resolve both rupture extension and fault geometry involving earthquake source mechanism change. Rupture evolution shows almost unilateral rupture propagation toward west from the epicenter along the Swan Island transform fault. The 2018 Swan Island earthquake rupture process exhibits a total rupture duration of around 50 s and shows at least three rupture episodes when a main rupture episode is within the first 10 s. In addition, the rupture evolution exhibits a complexity corresponding to fault geometric complexity including bend along the Swan Island transform fault. Rupture speed decreases relating to the bend around the oceanic mountain at around 30 km westward from the epicenter along the Swan Island transform fault. Moreover, the rupture propagation is terminated at 15 km westward from the epicenter, coinciding with the bathymetric step or oceanic cliff of the Cayman trough. Our study shows a new finding that the rupture evolution along the oceanic transform fault, which has been thought to have simple rupture evolution, can be complexly related to the fault geometry and the bathymetric feature.

Keywords: rupture process, complex rupture propagation, Swan Island earthquake, potency-density tensor inversion method