MODELING THE 3D DYNAMIC RUPTURE OF MICROEARTHQUAKES INDUCED BY FLUID INJECTION

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Understanding the dynamics of microearthquakes is a timely challenge to solve current paradoxes in earthquake mechanics and to investigate earthquake ruptures induced by fluid injection. We perform fully 3D dynamic rupture simulations caused by fluid injection on a fault and we generate Mw$\leq$1 seismic events assuming spatially variable stress drops caused by pore pressure changes. Spontaneous arrest of a propagating rupture is possible when we consider a high fault strength parameter S, that is, high ratio between strength excess and dynamic stress drop. With high S values even minor variations in Dc have a substantial effect on the rupture propagation and on the ultimate size of the earthquakes. Modest variations of dynamic stress drop determine the rupture mode, distinguishing self-arresting from run-away ruptures. Several features inferred for accelerating dynamic ruptures differ from those observed during rupture deceleration in a self-arresting earthquake due to the spatial gradient of the effective normal stress. These results integrate those obtained with spatial variations of the initial stress, highlighting the role of the heterogeneities of stress drop and Gc.