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Dynamic fracture modeling of 2003 Bam earthquake, Iran

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On the December 25 2003, an earthquake, 6.6Mw occurred in Bam city located in southern Iran. The earthquake destroyed the city and killed about 26000 people, one of the highest death tolls in recent years. But how such relatively moderate size earthquake behaved such destructive? We look for the answer in characteristics of its source. One of the most important quantities in understanding physics of faulting and its hazards is the rupture velocity, the speed with which rupture front propagates. We try to determine how rupture velocity varies during faulting in Bam earthquake. The source has reported to have had right lateral strike slip mechanism. Theoretical studies predict that in strike slip ruptures, know as opening mode II, rupture front can travel in two velocity regimes: below Rayleigh wave speed called, subRayleigh, and between S and P wave speeds, supershear or intersonic regime. To find the velocity regime, we present a 2D dynamic model, covering a rectangular area of about 25 km by 12 km in fault parallel and fault normal directions. The model governs by linear slip-weakening model and heterogeneity in prestress and stress drop on the fault. Simulating seismic ground motion recorded on the fault, shows that dominant regime is subRayleigh during Bam earthquake as its slip pulses appear in fault normal component strongly other than in fault parallel one. A second fracture front initiated and traveled in intersonic regime.