WHAT HAPPENS WHEN TWO RUPTURES COLLIDE?

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Here, we present a first and unique experimental observations of the interaction between two rupture fronts that spontaneously nucleate along an experimental fault and ultimately collide during their propagation. While this scenario might initially seem like an experimental anomaly, it may, in fact, be highly relevant for studying the rupture process of complex earthquakes. Indeed, the Mode II geometry presented here can be associated with the rupture of long strike-slip faults, which are known to exhibit intricate behavior. We demonstrate that the dynamic interplay between multiple rupture fronts and the associated radiated waves, as elucidated in our findings, may offer insights into the complex source time function of such earthquakes. Notably, we show, supported by numerical modelling of this phenomenon, that the collision of the rupture fronts generates interface waves that propagate along the sliding interface. Additionally, the rupture fronts interact with the onset and cessation of S-waves radiated by the opposing rupture fronts, which can alter their velocity and also generate interface waves.