Dynamic Interaction between the Southern San Andreas Fault and Normal Faults under the Salton Sea

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The generation of large earthquakes along the Southern San Andreas Fault (SSAF) is of major interest for the scientific community. Of particular interest is the initiation phase and the triggering of the SSAF by adjacent smaller faults that might participate and affect the evolution of larger multi-fault ruptures. The Brawley Seismic Zone (BSZ) is characterized by continuous micro-seismicity and swarm-type activity, along with the southern portion of the Salton Sea. The BSZ lies right in the middle of the transtensional step-over between the SSAF and the Imperial Fault (IF), concentrating the necessary structural elements to initiate and trigger multi-fault ruptures. Seismicity in the area suggests that the SSAF projects from the accepted southernmost terminus of the SAF at Bombay Beach under the Salton Sea towards the IF. Although most of the seismicity in the BSZ occurs along vertical NE-SW oriented strike-slip cross faults, there is clear evidence of slip along a network of SW dipping normal faults (Brothers et al., 2009, Brothers et al., 2011) under the Salton Sea. For this reason, the normal faults should also be considered as candidate initiation structures for future large earthquakes. Here, we provide updates on our ongoing work regarding the dynamic interactions between the SSAF and the local network of normal faults. To achieve this, we designed a series of dynamic rupture scenarios that help us investigate how SSAF events can transfer slip onto the normal faults, and the mechanisms by which normal fault earthquakes could trigger a major event on the SSAF. Our initial experiments are based on a model implementing the SSAF that is intersected by a normal fault near Bombay Beach. Preliminary results indicate that when earthquakes initiate on the SSAF, the nucleation location plays a catalytic role for slip triggering on the normal fault. More specifically, ruptures approaching from the north promote slip on the normal fault while this effect is reversed for ruptures initiating at the south of (Bombay Beach) the normal fault. Finally, to better capture the extensional features of the southern portion of the Salton Sea we are planning to update our models and run new simulations with a more extended network of normal faults.