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Abstract

In November 2011, a *M*5.0 earthquake occurred less than a day before a *M*5.7 earthquake near Prague, Oklahoma, which may have promoted failure of the mainshock and thousands of aftershocks along the Wilzetta fault, including a *M*5.0 aftershock. The *M*5.0 foreshock occurred in close proximity to active fluid injection wells; fluid injection can cause a buildup of pore fluid pressure, decrease the fault strength, and may induce earthquakes. *Keranen et al*. [] links the *M*5.0 foreshock with fluid injection, but the relationship between the foreshock and successive events has not been investigated. Here we examine the role of coseismic Coulomb stress transfer on earthquakes that follow the *M*5.0 foreshock, including the *M*5.7 mainshock. We resolve the static Coulomb stress change onto the focal mechanism nodal plane that is most consistent with the rupture geometry of the three $M \geq 5.0$ earthquakes, as well as specified receiver fault planes that reflect the regional stress orientation. We find that Coulomb stress is increased, e.g., fault failure is promoted, on the nodal planes of ~60% of the events that have focal mechanism solutions, and more specifically, that the *M*5.0 foreshock promoted failure on the rupture plane of the *M*5.7 mainshock. We test our results over a range of effective coefficient of friction values. Hence, we argue that the *M*5.0 foreshock, induced by fluid injection, potentially triggered a cascading failure of earthquakes along the complex Wilzetta fault system.