

## **Relationship between geodetic and geologic fault slip-rates with more realistic rheologies and rupture histories**

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Geodetic fault slip rates are usually determined by fitting an elastic model of strain accumulation to the observed interseismic deformation. These elastic models assume that the interseismic velocities are steady throughout the seismic cycle. A discrepancy between the inferred geodetic slip-rate and geologic rate may indicate that an elastic model of strain accumulation is inappropriate. If the rheology is inelastic and the fault has ruptured regularly through time, then the geodetic slip-rate is greater than the geologic rate early in the cycle, and less than the geologic rate late in the cycle. This pattern was demonstrated in the model of Savage and Prescott [1978] and Savage [2000]; however, this model does not account for irregular fault rupturing or rheologies more complex than Maxwell viscoelasticity. For periodic fault ruptures, even in models with more realistic rheologies, the geodetic slip-rate still decreases throughout the seismic cycle, where the rate of decrease is determined by the rheologies and the rupture recurrence time. However, when the fault has not ruptured regularly in time, the relationship between the geodetic and geologic slip-rate is more complicated. For instance, when the fault has been recently more (less) active than the long-term, geologic slip-rate, the interseismic velocities are larger (smaller) than if the fault had ruptured periodically, and thus the difference between the geodetic and geologic slip-rate is larger (smaller) early in the cycle, and smaller (larger) later in the cycle, than in a model with periodic ruptures. In this presentation we discuss the relationship between the geodetic and geologic slip-rate in models with viscoelastic rheologies containing more than one relaxation time and non-regular fault rupture histories. To illustrate the relationship, we also present consistent models of interseismic deformation both before and after several recent earthquakes.