

Inter-seismic locking on the Hikurangi subduction zone: Uncertainties from slow-slip events

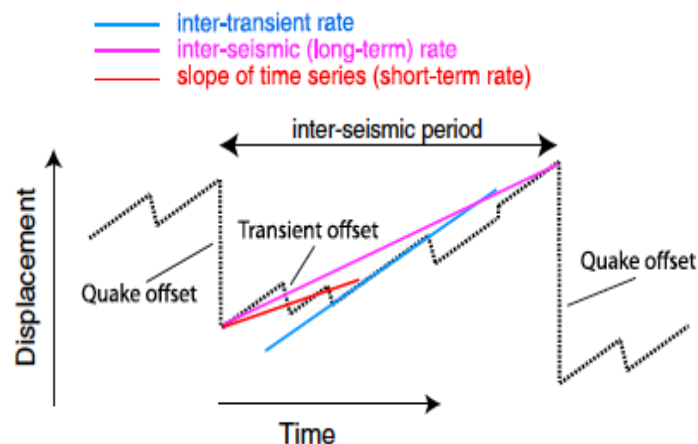
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Abstract: Inter-seismic locking on the Hikurangi subduction zone in New Zealand is examined in light of alternative assumed locking distributions and the impact of transients (slow-slip and volcanic sources) on temporal and spatial resolution. The modern pattern of locking in the north is poorly resolved and, based on simulations of possible transient behavior, may be an ephemeral feature of the subduction cycle. While there appears to be some contemporary locking in the northern half of the HSZ, its location is model-dependent and hence its relationship to structure, slow-slip or any transition zone there is unclear. Simulations of site velocities using the 14-year history of transient events reveal that in the timescale of the inter-seismic period the northern half of the HSZ could be either locked or unlocked and this may not be resolvable for decades. In the southern half, there is strong contemporary locking in the 15 to 40 km depth range but again the slow-slip history leads to large uncertainty in the long-term pattern. Slow-slip events not only reduce the long-term locking by aseismic slip but also greatly hinder our ability to see it. It is within the range of possible models that the slip deficit rate at the HSZ is more uniform along strike and the modern appearance is controlled by the particular pattern of transients over the past 10 to 20 years when the GPS data were collected. Similarly, uncertainties in surface velocities will be large at any subduction zone with large transients.



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