



A new perspective on the Guerrero gap: Slow slip events and tremors

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The slow slip events (SSE) that have been detected in several subduction zones are characterized by an important variability (in terms of duration, migration, recurrence time). The physical mechanisms responsible for their occurrence and their role in the mechanical evolution leading to large thrust classic earthquakes are still unclear.

Two of the largest events recorded occurred in 2002 and 2006 in the Guerrero segment of the Mexican subduction zone. These events were recorded by 8 and 15 continuous GPS stations respectively, and give us a good opportunity to constrain the characteristics of large SSEs. The total slip during the 2006 SSE has been also measured with InSAR. Combining GPS and InSAR allows a detailed study of the spatial and temporal evolution of slip at depth. We inverted the cumulative GPS displacements to find the distribution of total slip on the fault plane during the 2002 and 2006 SSEs. The two events show significantly different slip distributions, both extending in the deeper part of the seismogenic zone and in the transition zone. For the 2006 SSE, we modeled the spatial and temporal evolution of slip on the subduction interface by inverting the GPS time series. We assumed a functional form for the slip function, and we inverted for the slip amplitude, the initiation time and the duration, using a linearized least-square inversion procedure. The rupture initiated at a depth of 40 km (transition zone), in the western part of the Guerrero gap, and propagated with an average velocity of 1.2 km/day (with regional variations). The rise time (duration of slip in each cell) is about 170 days and the total duration of the event is 11-12 months.

We also analyzed the energy of seismic records to detect non-volcanic tremors (NVT). We found that NVT are not synchronous with SSE slip and are separated spatially with the zones of large slip of the SSE. It is nevertheless observed that the NVT activity increased during the 2006 SSE.

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