Did a slow earthquake follow the Jan 12-13, 2011 earthquake series on the San Andreas fault at San Juan Bautista?

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The San Juan Bautista section of the San Andreas fault is the transition zone between the creeping section in the south and the locked fault section in the north that last ruptured in the 1906 San Francisco earthquake. It is an area of heterogeneous creep, with locked patches, possibly capable of producing ~M6 earthquakes, embedded in the otherwise creeping fault (Johanson and Bürgmann, 2005). It has a history of producing slow earthquakes of about the same size as its largest recorded seismic events. The largest of these is a slow earthquake that followed a Mw5.1 seismic event in 1998 and itself has a moment of Mw5.0 (Gwyther et al., 2000; Uhrhammer et al., 1999). This slow earthquake was detected by strain- and creep-meters, but was also detectable in data from a nearby BARD continuous GPS station (SAOB). At the time, this was the only continuous GPS station in the region, but since completion of PBO installation, there are several more GPS stations and strainmeters that would be capable of detecting a 1998-like slow earthquake (Figure 1).

A recent series of earthquakes (Jan. 12-13, 2011) on the San Juan Bautista segment were followed several days later by a moderate creep event. We have brought together data from continuous GPS stations from the BARD and PBO networks, creepmeters, strainmeters and seismic data, including repeating earthquakes, to investigate whether the increased surface creep was indicative of a more widespread slip transient and to determine its extent and temporal evolution. The expression of both the earthquake and possible slow earthquake in the GPS data is subtle, but by leveraging multiple data sources we expect to have much better constraints than we could from any one source alone.

Figure 1: Forward model of 1998 slow earthquake given the current BARD and PBO GPS networks and for InSAR range change. Forward-modeled GPS motions are white arrows and are relative to station P232 (white triangle). Colored points show the projected range change magnitude and extent from the 1998 event. Yellow triangles are PBO borehole strainmeter locations and green triangles are USGS creepmeters.

References