Mini-Proposals of PBO: The "Big Bend" of the San Andreas near Gorman

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One of the most fundamental questions about earthquake faults is how they interact. At a triple junction, block motion cannot occur without creating or destroying area; this geometric incompatibility will cause stress concentration and possibly involvement of additional faults (e.g. Geoff King papers, Gabrielov et al. 1996). One manifestation of this motion is an areal contraction or expansion at the triple junction. This might occur very locally if the interacting block are fairly rigid, or it might be spread over tens of km by additional faults which chip away at the corners of the blocks. Geodetic measurements could thus help to determine the strength of the interacting blocks near triple junctions, which could in term improve models of stress interaction at faults and help to determine the effective rheology of fault zones. This objective can be achieved without waiting for large earthquakes.

An important contributor to earthquake triggering may be the interaction stress on one fault caused by slip, either seismic or aseismic, on another. According to some important ideas about friction, the slip rate on faults should be modulated by the stress changes from other faults. Nowhere is this interaction stronger than where two faults come together. By monitoring the slip rates on faults entering a triple junction, and the deformation around the triple junction, we have the potential to observe this interaction directly. This objective would be best achieved if a significant earthquake occurred on one of the faults, but other types of episodic strain acceleration may also be observable.

The intersection of the Garlock and San Andreas faults at the Big Bend provides a unique opportunity to study the way the fault interact. Stations should fill circle of 30 km radius about big bend. Because of the geometry of the faults, there should be locally dilation caused by right lateral motion on the SAF and left later motion on the Garlock. However, regional tectonics is dominated by compression across the SAF. Thus the dilation implied by the fault model should very distinctive. Neglecting this effect might complicate interpretations of the slip rates away from the Big Bend, so high resolution studies in this area essential to the regional interpretation.

The major goals of this project require GPS observations only, at a density of about 5km between sites and with a precision of a mm/yr. However, if there were an earthquake or episodic slip on either fault near the intersection, strain meter observations could help to determine the time signature.