Geophysical Research Abstracts, Vol. 9, 04705, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04705

Linking Geodetics and Geodynamics along the northern San Andreas system:Deformational constraints on triple junction tectonics

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It has long been recognized that the San Andreas plate boundary through central and northern California forms and evolves as a response to the migration of the Mendocino triple junction (MTJ). The general concept of faults developing and eventually coalescing into a primary plate boundary structure after MTJ passage serves as the framework for most tectonic and geodetic analyses of the fault system. What has been less well understood or quantified is specifically how the fault systems form, what drives fault localization, and how does the concomitant crustal evolution play a role in the plate boundary development. It has been proposed, in the Mendocino Crustal Conveyor (MCC) model of Furlong and Govers (1998), that crustal deformation, transient crustal thickening and thinning, and the associated topographic, heat flow, and seismic character of the crust are a consequence of viscous coupling within the evolving slab window. The substantial augmentation of the geodetic data for northern California through a combination of campaign and most recently (through the PBO-EarthScope project) continuous GPS observations now allows us to test, calibrate, and refine the MCC model. Specifically the (1) crustal thickening at and north of the MTJ, predicted by MCC processes, is clearly seen in the crustal velocity and GPS derived strain fields, (2) the E-W extent of MCC deformation is delineated by the GPS data to occur primarily through the core of the northern Coast Ranges - consistent with the topographic and fluvial evolution of the region, (3) compatible with previous seismic observations, the GPS data imply that the upper crust is only a minor participant in the MCC crustal thinning that occurs approximately 200 km south of the MTJ (i.e. 4-5 million years after MTJ passage), and (4) development of the precursor faults to the San Andreas plate boundary structure appears to be driven by the combination of MCC crustal deforma-

tion and the development of localized shear within the MTJ-formed slab window. The addition of GPS observations to the existing catalog of geophysical and tectonic characteristics of the northern San Andreas system, now allow us to place the transition from a mature convergent margin to an active translational plate boundary into a physically constrained framework.