Developed over the past decade, high precision GPS data were acquired by eight University of Utah continuous stations and seven campaign surveys between 1992 and 2003 to evaluate horizontal velocity field of the Wasatch Front area [Chang et al., 2006]. Observations across a 65-km wide area centered on the Wasatch fault indicates a horizontal extension rate of $1.6 \pm 0.4$ mm/yr nearly perpendicular to the fault, which accommodates ~50% of the crustal deformation across the ~200 km-wide eastern Basin-Range (Figure 1). Analysis of the spatial variation of the strain-rate field reveals that the strain accumulation is concentrated near the Wasatch fault, which suggests an abrupt transition in the horizontal deformation at the fault between the eastern Basin-Range and the Rocky Mountains.

Using the horizontal deformation results from the continuous and campaign GPS survey, we have calculated nonlinear inversions on fault geometry, locking depth, and loading rates. Results suggest that a dislocation dipping $27^\circ$ and creeping at 7 mm/yr from depths of 9-20 km, which corresponds to the interseismic loading part of the Wasatch fault, is our favorite model based on the current GPS data (Figure 2). Note that this loading rate is notably higher than the ~1 to 2 mm/yr rate derived from the paleoseismic data.

To consider along-strike variations of the fault behavior, moreover, a dual-dislocation model that reflects the changes in strikes of the surface trace of the Wasatch fault better explains the variations of the velocity field near the fault (Figure 3). The improved results of using two fault segments to model the Wasatch Front horizontal velocity field suggest that multi-dislocation models with geometry similar to the fault surface traces may be plausible to describe the interseismic behavior of the Wasatch fault.

To examine the physics of normal faults in a broad area of regional intraplate deformation, the EarthScope PBO has established three profiles of GPS stations (Figure 1) across the eastern Basin Range including parts the northern (I-84 corridor), central (I-80 corridor) and southernmost (central to southern Utah) Wasatch fault. Data from these 27 (21 currently operating) stations greatly benefit studies of the interseismic loading of the Wasatch normal fault.

References

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