Using EarthScope and MAGNET GPS to determine the slip rate on the Honey Lake Fault, northern Walker Lane, California

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The Walker Lane is a complex zone of active intracontinental transtensional faulting in the western United States. This ~100 km wide zone accommodates 10 mm/yr of right lateral deformation between the northwest translating Sierra Nevada/Great Valley (SNGV) microplate and the west-northwestward extending Basin and Range province. In the northern Walker Lane, to the north of Lake Tahoe, at least 5 mm/yr of right lateral shear occurs across a zone spanning the Honey Lake/Warm Springs and Mohawk Valley faults. These parallel, northwest striking, dextral faults work together as a cooperative pair to accommodate the deformation, however it is unclear which fault is dominant.

Geologic studies suggest that the Honey Lake fault slips at a rate of ≥ 1 mm/yr with a minimum of 0.3 mm/yr slip on the Mohawk Valley fault. In contrast, a regional geodetic study estimates a dextral slip rate of 1.2 ± 0.3 mm/yr on the Honey Lake fault and 2.9 ± 0.2 mm/yr for the Mohawk Valley fault. The distribution of slip between the two faults plays an important role in determining the regional distribution of seismic hazard for the nearby communities of Susanville and Truckee, CA, and Reno, NV.

To improve the estimate of slip rate on the Honey Lake fault, we have increased the density of GPS stations along a transect spanning the Mohawk Valley fault and Honey Lake faults. These stations are a part of the semi-continuous Mobile Array of GPS for Nevada Transtension network (MAGNET, http://geodesy.unr.edu) that forms a dense complement to the EarthScope Plate Boundary Observatory. We use preliminary results to solve for slip rates, fault dip and locking depth on both faults using a block model specifically designed for the Honey Lake/Mohawk Valley fault system. This analysis will allow us to address questions regarding the trade-off between slip rates on neighboring faults, uncertainties in fault geometries and linkages, and the potential role of normal faulting in regional deformation.