

## Introduction

Previous paleoseismic investigations along the Garlock fault, a major sinistral strike-slip fault extending approximately E-W across the Mojave Desert in southeastern California, reveal earthquake occurrence may be clustered through time and space (Dawson et al., 2003; Madden and Dawson, 2006; and Madden Madugo et al., 2012). In order to fully understand whether the pronounced temporal clustering of earthquakes observed at El Paso Peaks (Dawson et al., 2003) has been a repeated feature of displacement along the fault, we revisited a paleoseismic trench site on the central Garlock fault at Koehn Lake that was previously studied by Burke (1979) and Madden and Dawson (2006). Our trench was located ~30 m east of the 2006 Madden and Dawson trench, and we observed very similar structural and stratigraphic relationships to the earlier trench. Planned correlation of the event stratigraphy in the trenches will result in a comprehensive record of paleoearthquakes at the Koehn Lake site. In order to constrain event ages, we collected 71 luminescence samples and 194 radiocarbon samples from throughout the trench. In addition to providing constraints on event ages, these samples will provide the opportunity for numerous 1:1 comparisons between radiocarbon and post-IR infrared stimulated luminescence (p-IR IRSL) dates. These results will yield the longest record of paleoearthquakes on the Garlock fault, providing insight into the fault's long-term behavior back to latest Pleistocene time. In turn, our results will facilitate comparisons with other paleoearthquake records from the central and western Garlock fault that will help reveal patterns of displacement through time and space.

## Koehn Lake site

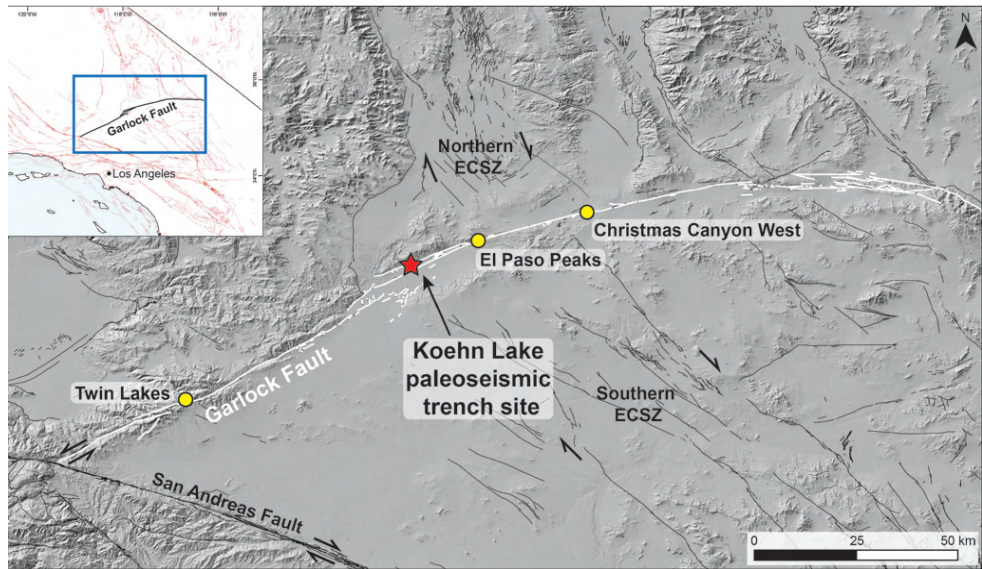


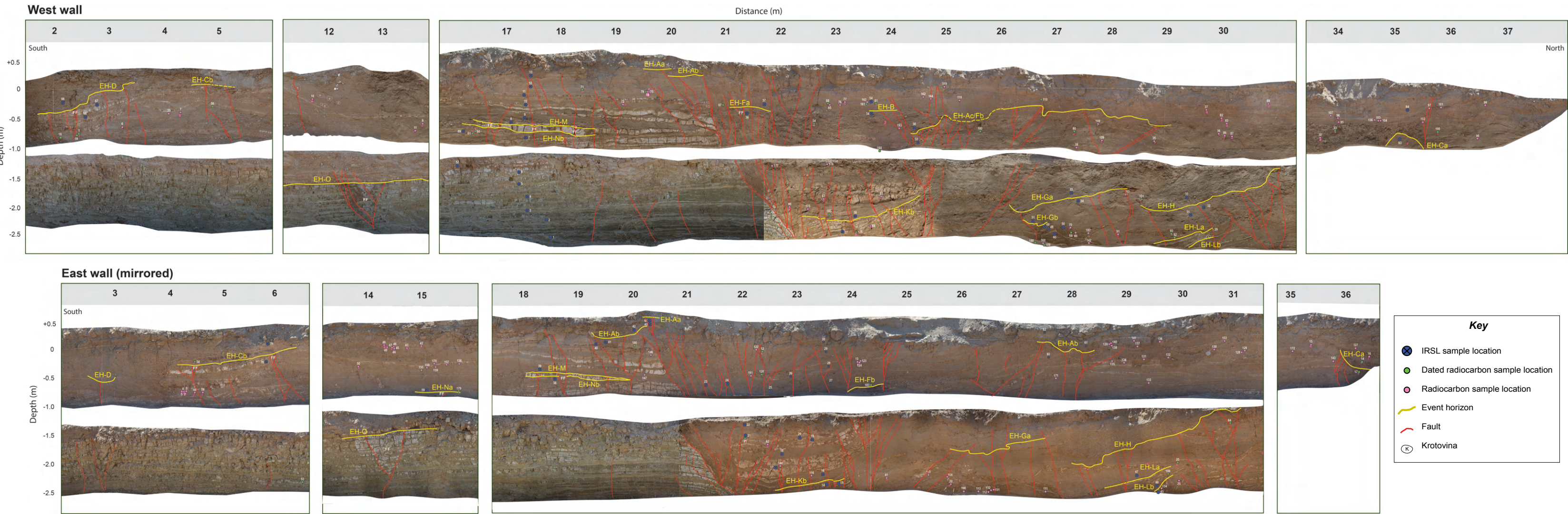
Figure 1. Location map of Garlock fault



Figure 2. Photograph of the Koehn Lake 2021 trench

The Koehn Lake site was recognized in previous trenching studies as having excellent playa-margin and distal alluvial fan stratigraphy, with numerous well-defined structural event markers. *Figure 1* shows the site in relation to other paleoseismic sites along the Garlock fault.

## Trench Logs



## Paleoearthquake record

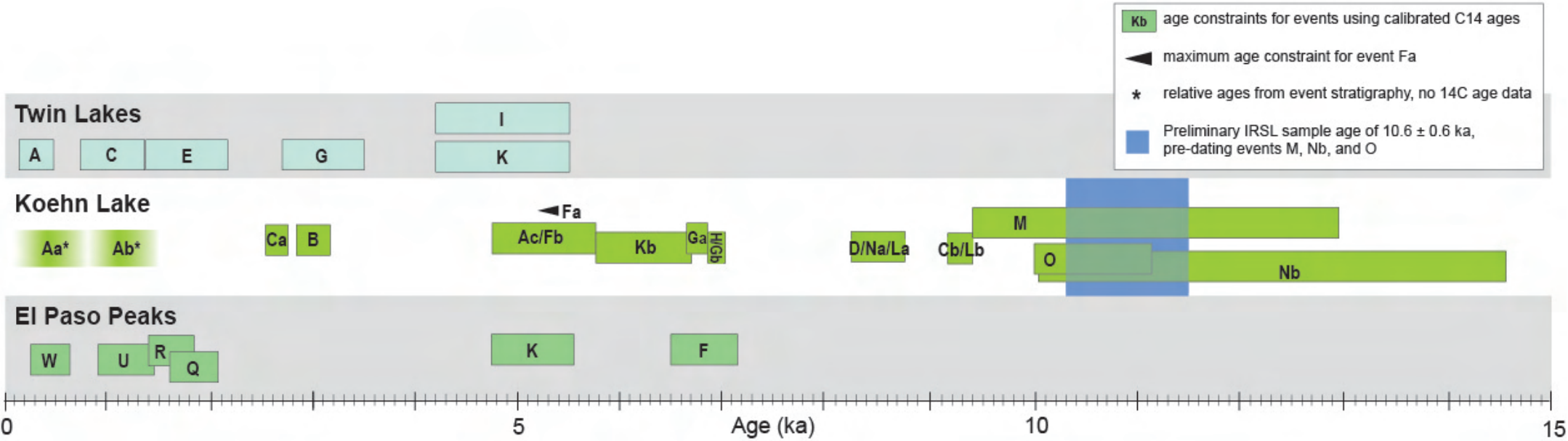


Figure 3. Comparison of preliminary Koehn Lake paleoearthquake ages with published records from the western and central Garlock fault. Twin Lakes (western segment) - Madden Madugo et al. (2012), El Paso Peaks (central segment) - Dawson et al. (2003).

## Conclusions

These preliminary results from our initial round of radiocarbon dates, reveal highly temporally irregular earthquakes at Koehn Lake. Earthquake occurrence appears clustered in time, with at least three clusters occurring circa 0.5-3 ka, 5-7 ka, and 8.5-11 ka. These results are consistent with the suggestion of clustered behavior from Dawson et al. (2003). Differences between the Koehn Lake and El Paso Peaks records, however, suggest that both may be incomplete over certain time periods (KL=0-2 ka; EPP=3-5 ka). Additional dating of IRSL samples is underway at Sheffield University, and we anticipate dating additional radiocarbon samples to further constrain paleoearthquake ages and develop a depositional history at this site. Moreover, we will combine our radiocarbon age constraints with the nearby Madden and Dawson (2006) trench results. This combined record will provide a complete (?) Holocene to latest Pleistocene record at Koehn Lake, and will facilitate comparisons with other nearby sites.

### References

Burke, D. B. (1979). Log of a trench in the Garlock fault zone, Fremont Valley, California (No. 1028). US Geological Survey.  
Dawson, T. E., McGill, S. F., & Rockwell, T. K. (2003). Irregular recurrence of paleoearthquakes along the central Garlock fault near El Paso Peaks, California. *Journal of Geophysical Research: Solid Earth*, 108(167).  
Madden, C., Dawson, T. (2006). High-resolution dating of a complete Holocene earthquake record for the central Garlock fault: Toward an understanding of earthquake recurrence, fault segment interaction and regional earthquake clustering in southern California. SCEC report.  
Madden Madugo, C., Dolan, J. F., & Hartleb, R. D. (2012). New paleoearthquake ages from the western Garlock fault: Implications for regional earthquake occurrence in southern California. *Bulletin of the Seismological Society of America*, 102(6), 2282-2299.