

**GEOTECHNICAL EXTREME EVENTS
RECONNAISSANCE (GEER) ASSOCIATION**



Turning Disaster into Knowledge

**EXECUTIVE SUMMARY OF **GEOLOGICAL
RECONNAISSANCE** OF THE FEBRUARY 06, 2023,
KAHRAMANMARAŞ EARTHQUAKES, TÜRKİYE**



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EXECUTIVE SUMMARY

On Feb. 6, 2023, a devastating earthquake sequence occurred within the East Anatolian fault system. A Mw 7.8 earthquake struck at 4:17 a.m. local time approximately 35 km northwest of the city of Gaziantep in south-central Türkiye. This earthquake was followed by a second large magnitude earthquake of Mw 7.5 at 1:24 p.m. with the epicenter near the city of Elbistan, approximately 85 km north of the earlier earthquake epicenter. Both events occurred at 10 and 15 km depths, respectively, and resulted in significant left lateral, strike slip surface rupture along two distinct traces of the East Anatolian fault system.

Following the February 06, 2023, events, a geotechnical engineering reconnaissance effort was organized by the Geotechnical Extreme Events Reconnaissance Association (GEER), to perform a field reconnaissance of the seismic, geological, and geotechnical issues caused by the earthquake sequence. The first geologic reconnaissance team consisting of Özgür Kozacı and Erhan Altunel was deployed February 12 to February 22. The second geologic reconnaissance team consisting of Kevin Clahan, Richard Koehler, and Cengiz Yıldırım was deployed February 28 to March 10. The reconnaissance included hundreds of geo-located observations along the two main rupture traces and affected areas. A draft map of observation localities is shown in Figure 1. Both teams investigated earthquake effects including fault surface rupture and deformation, as well as, ground failures from landsliding, liquefaction, and lateral spreading (Figures 2a, b, c, d). In total, the geologic reconnaissance teams observed over 300 km of fault surface rupture and mapped nearly 80 km of the ruptures in detail. Left-lateral surface displacements along the Mw 7.8 East Anatolian fault rupture were remarkably consistent, 3 to 4 m, but diminished to the south near Antakya to around 0.5 m. The lesser Mw 7.5 event produced the largest recorded surface displacements of consistent 7 to 8 m of left lateral offset with the largest recorded displacement measuring 8.6 m. The teams are currently processing field data and preparing a summary report of observations and interpretations to be released as part of a more comprehensive geologic, seismic, and geotechnical engineering reconnaissance publication released through GEER.

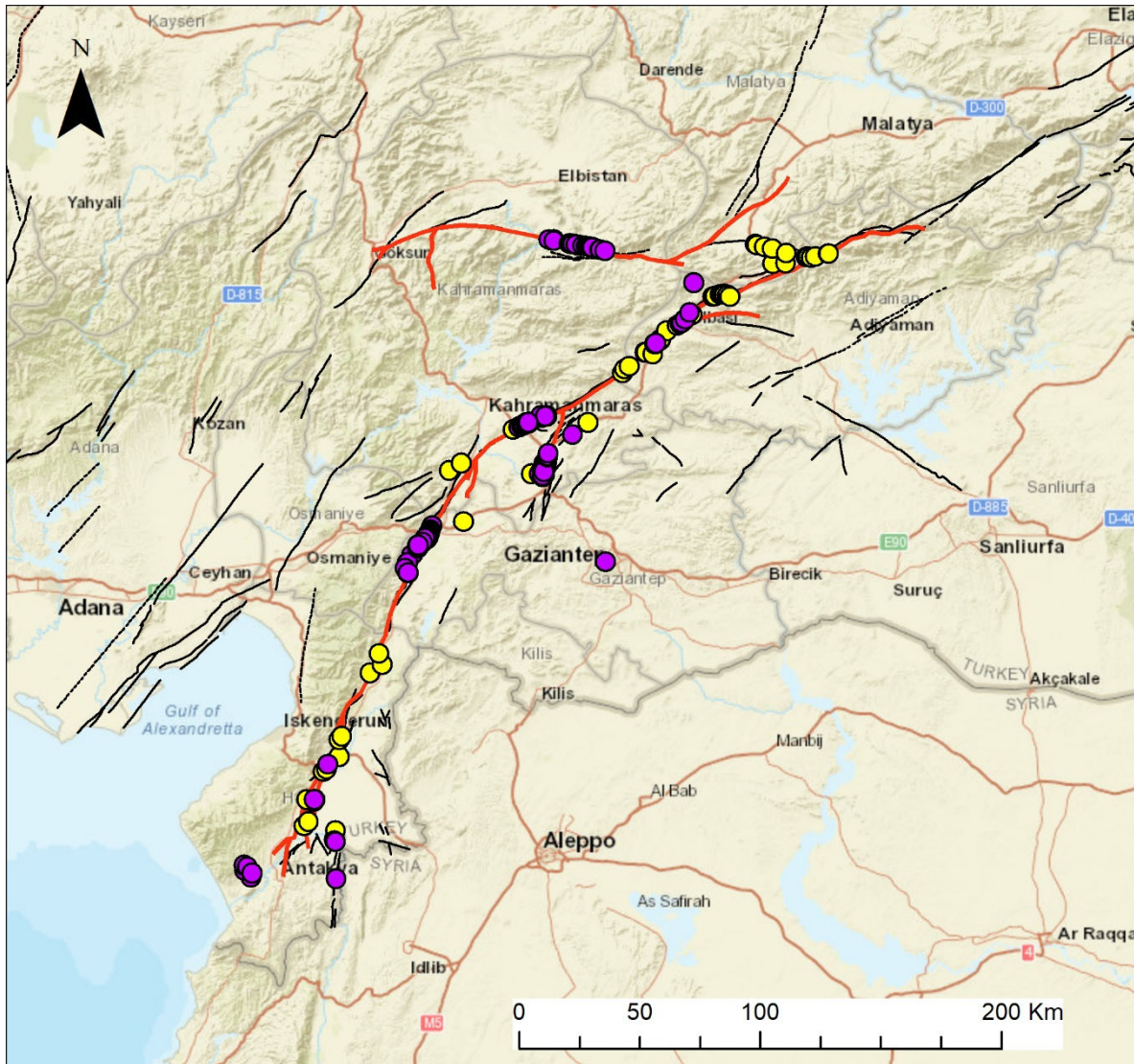
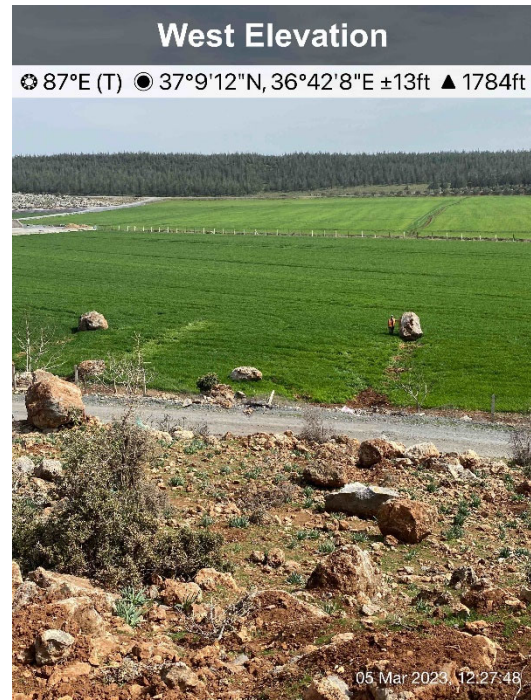


Figure 1: Draft map showing observation localities from the GEER surface rupture investigation team including the initial scouting mission (yellow circles) and subsequent deployment (purple circles). Red lines are the simplified rupture traces from the U.S. Geological Survey (Reitman et al., 2023). Thin black lines are previously mapped faults from the Active Fault Map of Turkey (Emre et al., 2013).



Figures 2a, b, c, d (clockwise from top left): **2a**, fault surface rupture of a portion of the Mw 7.8 earthquake; **2b**, rock falls near Nurdağı; **2c**, liquefaction sand blows near Antakya; **2d**, fault surface rupture of a portion of the Mw 7.5 earthquake near Ekinözü with 8.6 m of recorded left lateral displacement.