

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



Turning Disaster into Knowledge

**EXECUTIVE SUMMARY OF **GEOTECHNICAL
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 geotechnical scout team led by Robb Moss and Onder Cetin deployed February 12 to February 22. The second larger geotechnical reconnaissance team consisting of Emre Duman, Serhat Erinmez, David Frost, Jorge Macedo, Menzer Pehlivan, Onur Pekcan, Arda Sahin and Kristin Ulmer was deployed February 26 to March 5. The reconnaissance resulted in hundreds of geo-located observations within the affected area. A draft map showing the approximate region investigated (gray shaded area) is indicated in Figure 1. Both teams investigated earthquake effects including liquefaction and ground failure on building and other structure performance as well as ground failures from landsliding, highway embankment failures, retaining wall collapses, earth dam instability, and lateral spreading (Figures 2a, b, c, d, e and cover photo). The geotechnical reconnaissance teams observed extensive failures as well as adjacent examples of both poor and good performance in detail. Measurements included structure tilt and settlement, vertical and lateral offsets of ground fissures, and ejecta volumes. In several towns where significant damage was observed, coupled ground failure measurements and building damage assessments were made along transects to facilitate understanding of soil-structure interaction issues. 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.

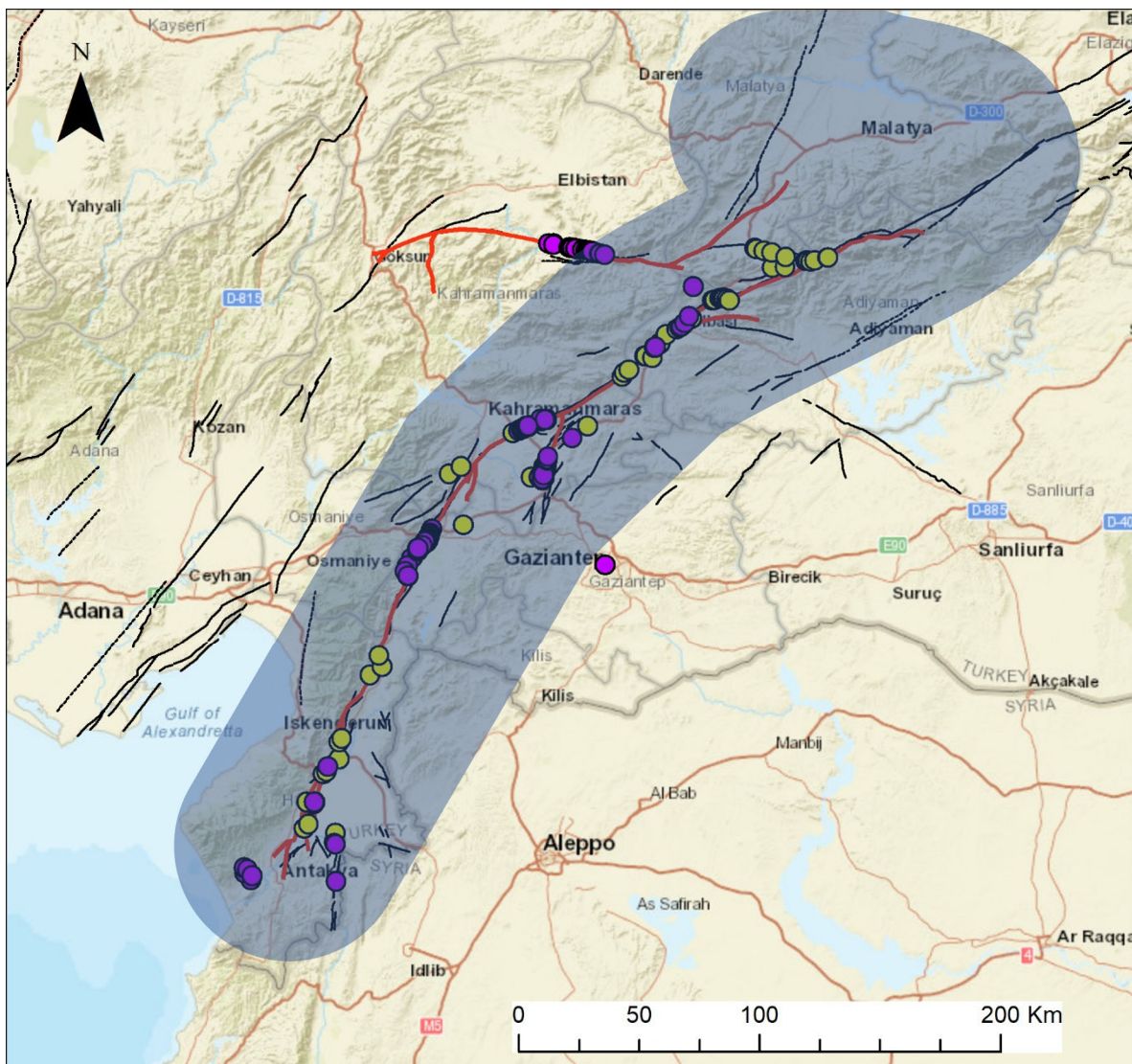
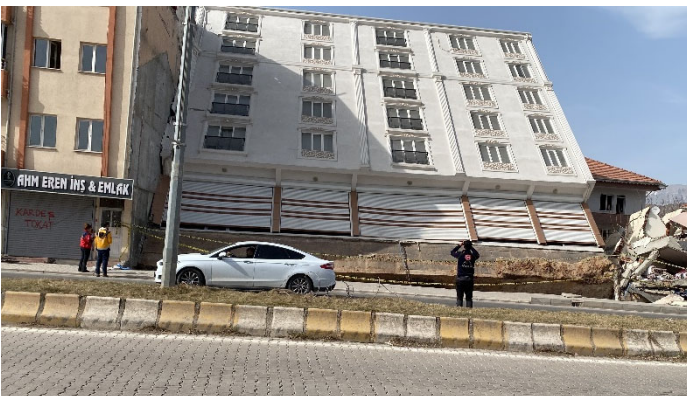
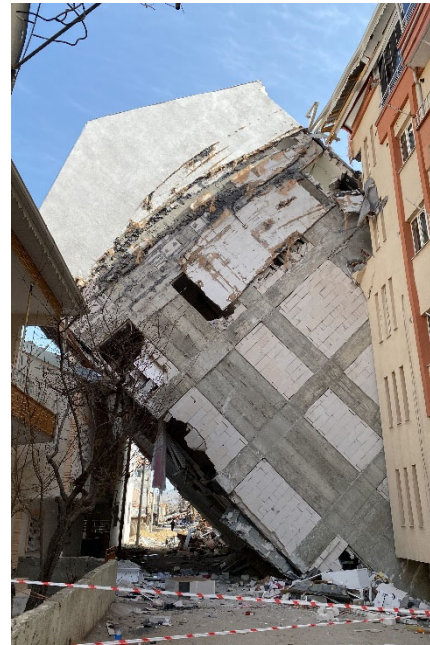


Figure 1: Draft map showing approximate localities visited by GEER geotechnical investigation team including the initial scouting mission and subsequent team deployment. Red lines are the simplified rupture traces from the U.S. Geological Survey (Reitman et al., 2023). Thin black lines are previously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



Figures 2a, b, c, d, e (clockwise from top left): **2a**, failed highway including lateral spreading (lat/long 37.86333/37.76715); **2b**, fissures on crest of Sultansuyu Dam (lat/long 38.31899/38.05171); **2c**, settled/tilted building on mat foundation resting on adjacent building (lat/long 37.78806/37.64898); **2d**, front view of building in photo 2c showing no structural damage (lat/long 37.78806/37.64898); **2e**, lateral spreading along lake shore in Golbasi (lat/long 37.79446/37.65331).