# 2023 TÜRKIYE EARTHQUAKE SEQUENCE: STRONG MOTION DATA

Tristan E. Buckreis

Department of Civil and Environmental Engineering, University of California, Los Angeles

## Abstract

The 2023 Türkiye earthquake sequence includes the February 6 **M**7.8 mainshock followed approximately nine hours later by a **M**7.7 aftershock, and many smaller aftershocks including **M**6.8 and **M**6.3 events on February 6 and 20, respectively. These events occurred in a region near the plate boundary on the East Anatolian Fault, in the proximity of which numerous strong motion recording stations had been installed north of the Türkiye-Syria border. Within hours of these significant events, strong motion data became available through the Earthquake Data Center System of Türkiye (TDVMS) and the Incorporated Research Institutions for Seismology (IRIS) from over 700 seismic stations operating in the region. Early releases of some data through TDVMS were found to contain baseline-correction and instrument metadata errors, which have been corrected over time. Additionally, records at a few number of stations which had be identified to terminate prematurely (i.e., the record ends while the site is experiencing significant shaking), have been properly windowed in subsequent releases.

Raw time-series have been screened manually to remove noise-dominated and spurious records, and the remaining records were processed using standard procedures developed during Next Generation Attenuation (NGA) projects. A total of 310, 351, 291, and 229 usable three-component recordings were processed from the **M**7.8, **M**7.7, **M**6.8, and **M**6.3 events, respectively, with maximum peak ground accelerations at several stations exceeding 1.0 g. Source, path, and site metadata were compiled according to uniform protocols, which benefited greatly from extensive site characterization performed at seismic stations by the Disaster and Emergency Management Authority (AFAD). The strong motion data and associated metadata are publicly available at https://doi.org/10.17603/ds2-t115-bk16[1], and will be incorporated into the NGA-West3 database.

Comparisons to ground motion models (GMMs) for active tectonic regions demonstrate the existence of complex path effects that result in relatively poor fits between the GMMs and observed data at large distances ($R_{JB} > 200$ km). Residual maps produced from these analyses demonstrate that ground motions generally over-predicted on the Anatolian block and under-predicted on the Arabian block. The repercussions of these events will have a lasting effect on the region, and their scientific and engineering impacts will prove to be influential for future ground motion related studies and efforts.

[1]Buckreis, T., B. Güryuva, A. İçen, O. Okcu, A. Altindal, M. Aydin, R. Pretell, A. Sandikkaya, Ö. Kale, A. Askan, S. Brandenberg, T. Kishida, S. Akkar, Y. Bozorgnia, and J. Stewart (2023) Ground Motion Data from the 2023 Türkiye-Syria Earthquake Sequence. DesignSafe-CI. https://doi.org/10.17603/ds2-t115-bk16