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Digitization and Re-Analysis of Turkey's Legacy Seismic Records: Four Major Historical Earthquakes

Kandilli Observatory and Earthquake Research Institute (KOERI) was established in the 1800s during the Ottoman Empire as the Imperial Observatory and has conducted observations in meteorology, astronomy and seismology for over a century. KOERI expanded its seismic network and ability to determine earthquake parameters, evolving with advancements in seismology. Over time, it built a rich database in seismology, astronomy, and meteorology, making it a prominent institution with a rich legacy of scientific observations. We have been digitizing historical earthquake seismograms to construct a historical earthquake database at KOERI since 2009, gaining expertise in vectorization and overcoming related challenges. We have analyzed the 1912 Ganos, the two 1935 Erdek-Marmara Island, and 1963 Çınarcık Earthquakes in the Marmara Region by digitizing analog seismograms and applying modern seismological methods to these digitized records to determine seismic parameters, including seismic moment, moment magnitude, radius of the circular source zone, and stress drop. We also determined epicentral locations using historical seismic data, such as original records and station bulletins, and identified fault mechanisms applying moment tensor inversion to digitized seismograms.

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