



## **Fault-Zone Maturity Defines Maximum Earthquake Magnitude: The case of the North Anatolian Fault Zone**

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Estimating the maximum likely magnitude of future earthquakes on transform faults near large metropolitan areas has fundamental consequences for the expected hazard. Here we show that the maximum earthquakes on different sections of the North Anatolian Fault Zone (NAFZ) scale with the duration of fault zone activity, cumulative offset and length of individual fault segments. The findings are based on a compiled catalogue of historical earthquakes in the region, using the extensive literary sources that exist due to the long civilization record. We find that the largest earthquakes ( $M \sim 8$ ) are exclusively observed along the well-developed part of the fault zone in the east. In contrast, the western part is still in a juvenile or transitional stage with historical earthquakes not exceeding  $M=7.4$ . This limits the current seismic hazard to NW Turkey and its largest regional population and economical center Istanbul. Our findings for the NAFZ are consistent with data from the two other major transform faults, the San Andreas fault in California and the Dead Sea Transform in the Middle East. The results indicate that maximum earthquake magnitudes generally scale with fault-zone evolution.