Seismotectonics of Turkey and Iran from calibrated earthquake locations

Uncertainties in earthquake hypocenter locations, which are counted in tens-of-kilometers in most regions of the world, are a serious limitation to seismotectonic studies. For example, they preclude individual events from being confidently attributed with mapped surface faults, complicate the study of mainshock-aftershock sequences and triggering behavior, and errors in depth are problematic for establishing the mechanical and rheological properties of the crust. These errors mostly arise from unknown Earth velocity structure. Well-established relative multiple-earthquake relocation techniques help eliminate these errors, but it remains challenging to achieve minimally biased absolute (`calibrated') locations.

In this talk, using an advanced multiple-earthquake relocation technique, we demonstrate how calibrated earthquake locations can be employed to transform our understanding of the kinematics of faulting in Iran and Turkey, and also to improve interpretations of the associated seismic hazard. We give examples from the recent Mw 6.6 2017 Bodrum-Kos earthquake sequence in the southwestern Turkey where we reveal the dip direction of the ruptured fault plane using seismology (earthquake relocations and waveform modeling) and geodesy (InSAR), and from the Zagros fold-and-thrust belt of southern Iran where we build a high-resolution earthquake catalog that consists of ~2500 earthquakes, with epicentral uncertainty less than 5 km, covering ~70 years of instrumental seismicity of the range.

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