

The 1997 May Zirkuh (Qa'enat) earthquake (M_w 7.2) of eastern Iran

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The destructive Zirkuh-e-Qa'enat earthquake of 1997 May 10 (M_w 7.2, M_s 7.3, M_b 6.3) produced 125 km of NNW-SSE right-lateral strike-slip surface faulting on the Abiz fault in the Sistan suture zone of eastern Iran. The longest known surface rupture associated with an Iranian earthquake. Seismological investigation shows that rupture occurred in four main subevents, propagating in a sequence from north to south. Although predominantly strike-slip, the orientation of the faulting in each subevent varied, with appreciable reverse components in the north-central part and at the southern end Abiz fault. This change in fault style along the Abiz fault can be seen in the coseismic surface ruptures. Average coseismic surface displacements were approximately 2 meters. The 1997 surface ruptures followed clear traces of late Quaternary slip on the Abiz fault, and for its northern 50 km re-ruptured fault segments that had slipped in a previous earthquake of M_s 6.0-6.6 in 1936 and 1979. The 1997 earthquake ruptured the northern end of the N-S right-lateral strike-slip system on the Sistan suture zone, ending where it abuts an E-W system of left-lateral strike-slip faults which have also slipped in large earthquakes during the last 30 years. The earthquakes on this conjugate system of strike-slip faults form a sequence that may have been triggered by the enhancement of stress on one fault as a result of deforming Iran against stable western Afghanistan by N-S slip on the right-lateral faults and clockwise rotation of the E-W left-lateral faults.