

Mapping the active fault triggered the 2003 Mw 6.6 Bam earthquake with ASTER DEM and 3D images

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The Mw 6.6 Bam earthquake occurred at 01:56:52 (UTC) on December 26, 2003 around the Bam area, southeastern Iran. This earthquake is one of the most disastrous earthquakes in Iran's recorded history. It caused great life loss (at least 40,000 people killed, and 30,000 people were injured) and widespread damage (70 percent of buildings were damaged or destroyed) in the Bam area as declared by Iranian local government. However, geomorphic and geometric characteristics of the active fault triggered this earthquake is still unclear because there was not large surface ruptures except small surface fissures.

The Digital Elevation Model (DEM) and three dimensional (3D) images generated from Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Visible and Near Infrared (VNIR) Level 3A01 data provide the excellent three-dimensional perspective of tectono-geomorphic and geometric features of active faults associated with the Bam earthquake. Results indicate that a 60 km-long right-lateral strike-slip fault striking N25°W triggered this earthquake. This right-lateral strike-slip fault is composed of three segments appearing left-stepping en echelon pattern. The Bam area is located near the step-over (pushing-up) between the northern two segments, where is predominated by the compressional stresses. This interpretation is consistent with evidence from the focal mechanism solution of the Bam earthquake and field investigations after this earthquake. The analysis of geometric and geomorphic features of the Bam fault related to the 2003 Mw 6.6 Bam earthquake provide us useful experience to evaluate possible engineering damage associated with future great earthquakes on strike-slip faults in highly populated and industrialized regions.