Quaternary slip rate of the Dasht-e Bayaz Fault, source of the destructive 1968, Mw 7.1, earthquake (ENE Iran)

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Résumé

The Dasht-e Bayaz Fault is located in the northern part of the Lut Block in eastern Iran. After the destructive 7.1 Mw earthquake of 1968, the Dasht-e Bayaz region became one of the most seismically active areas in Iran. The occurrence of this earthquake was followed by several destructive earthquakes, making this area a suitable benchmark for world-class seismic clustering. Despite the remarkable seismic activity of the fault, the lack of detailed information on the slip rate of the fault has prevented the description of the geodynamic contribution of the Dasht-e Bayaz fault to the accommodation of active deformation governed by the Arabia-Eurasia convergence. We study the long-term slip rate through the analysis of cumulative Quaternary offsets along the Dasht-e Bayaz fault. We recognized five successive generations of Quaternary alluvial fans (Qt1 to Qt5, from oldest to youngest) some of which were cut and offset laterally along the fault. Fifty-seven samples were collected from four sites to define abandonment ages using the 10Be cosmic ray exposure (CRE) dating method. We obtained CRE ages of 159.0 ± 5.0, 88.6 ± 3.7, and 19.5 ± 0.7 ka for the abandonment of alluvial fan surfaces Qt2, Qt3, and Qt4, respectively. Attribution of these ages to geomorphic displacements recorded by offset alluvial fans gives an average slip rate of 0.9 ± 0.14 mm/year for the Dasht-e Bayaz fault. This slip rate has probably remained constant since at least the Late Pleistocene and is lower than previously suggested (2.5 to 2.6 mm/year). Despite the recently demonstrated seismic activity, our results indicate a minor geodynamic contribution of the Dasht-e Bayaz fault to the accommodation of internal deformation within the Iranian plateau. This study highlights that slow-slip active faults within continents produce high seismic risk despite their insignificant structural and geodynamic roles.

Mots-Clés: Dasht, e Bayaz Fault, CRE dating, Lut block, Iran, fault slip rate, slow, slipping fault

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