Title: Combined analysis of seismotectonics of the southern Dead Sea Fault (Eastern Mediterranean) using GPS measurements and seismicity

Authors: Cochran, W. J. ; Gomez, F. G. ; Abu Rajab, J. ; Al Tarazi, E.

Affiliation: AA(Geological Sciences, University of Missouri, Columbia, MO, USA wjcwf9@mail.mizzou.edu), AB(Geological Sciences, University of Missouri, Columbia, MO, USA fgomez@missouri.edu), AC(Faculty of Natural Resources & Environment, Hashemite University, Zarqa, Jordan jgahfar@yahoo.com), AD(Faculty of Natural Resources & Environment, Hashemite University, Zarqa, Jordan ealtarazi@yahoo.com)

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Abstract

Owing to its relative structural simplicity, the Dead Sea Fault (DSF) is an ideal subject to study active kinematics associated with slow continental transforms. The DSF constitutes the boundary between the Arabian and Sinai plates in the eastern Mediterranean region. The southern DSF's seismic activity has relatively quiescent over the last 4 centuries, despite historical documentation of large (Mw ≥ 7) earthquakes. This study incorporates high precision Global Positioning System (GPS) measurements and seismicity along the southern DSF to assess kinematics of the transform and the Dead Sea pull-apart basin. In addition to other regional continuous GPS data, this study presents new results from a network of 38 survey-mode GPS sites and 4 continuous GPS stations in Jordan. Survey-mode GPS data were acquired through multiple campaigns between 2005 and 2010. Raw GPS data were processed using Gamit/Globk, and transformed into an Arabia-fixed reference frame. Application of elastic dislocation models suggests a left-lateral slip rate of 4.0-4.7 mm/yr, and a locking depth of 10-18 km, respectively. This range of slip-rates is consistent with previous geologic interpretations along the southern DSF, and the lower end of the locking depth range is generally consistent with the seismogenic crustal depth. Slip rates for the Wadi Araba and Jordan Valley fault segments provide boundary constraints for assessing kinematics of the large step-over basin at the Dead Sea. Comparison of geodetic moment accumulation rates with seismic moment release permits quantifying a possible deficit in the rates of seismicity that can contribute to the understanding of the regional earthquake hazard.

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