

SEISMOTECTONICS OF BADRA-AMARAH FAULT, IRAN-IRAQ BORDER

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Keywords: Seismotectonics of Iraq, Focal Mechanism Solutions, Stress Analyses, Arabian Plate, Badra-Amara Fault

The Badra-Amarah fault is located in the northeastern borders of the Mesopotamian zone at the Iraq-Iran border. The length of the fault is about 500 km. This fault is seismically active and cause earthquakes with magnitudes reach 5.5 and focal depths reach 33km. The seismic history of this fault shows a lot of seismic swarms that accrued at this fault. In this study the European-Mediterranean Seismological Centre (EMSC) catalogue has been used to study the seismic history of the Badra-Amarah fault. Besides the seismic history, the focal mechanism solutions of this fault were collected from deferent sources and then they have been used to derive the recent stress pattern in the study area.

One of the global institutions that make an effort to determine seismic moment tensor for the medium to large magnitude earthquakes ($m_b \approx 4.0$) is the Harvard University (USA) group that estimates the Centroid Moment Tensor (CMT) solutions. About 30 focal mechanism solutions in the study area were calculated by the Harvard CMT for the time period from 1980 to 2012 (Figure 1). The focal mechanism solutions show that the Badra-Amarah fault is a reverse fault with strike direction equal to 310° , dip direction equal to 220° , and dip angle equal to 53° .

In this study, the principal stress axes and the horizontal stress axes were derived from a number of focal mechanisms by using formal stress inversion methods of moment stress axes (P, N, and T). This inversion gives the four parameters of the reduced stress tensor; these are the three principal stress axes (the maximum stress axis σ_1 , the intermediate stress axis σ_2 , and the minimum stress axis σ_3) and the stress ratio $R = (\sigma_2 - \sigma_3) / (\sigma_1 - \sigma_3)$. In this study, two methods of stress inversion are presented; these are the Improved Right Dihedron and the Rotational Optimization methods. These two methods are implemented in a free source program named TENSOR that was developed originally in DOS by Delvaux (1993). Then it was developed in Windows by Delvaux and Sperner (2003). In this study, the Windows Win-Tensor version 4.0.4 was used to invert the moment stress axes to principal stress axes and stress ratio. The final results of formal stress inversion of the 30 focal mechanism solutions indicate that the principal stress axes on the Badra-Amarah fault are: $\sigma_1 = 10^\circ/217^\circ$, $\sigma_2 = 06^\circ/308^\circ$, and $\sigma_3 = 78^\circ/069^\circ$ (Figure 2). The results of this study are compatible with the tectonic setting of the collision zone between the Arabian and Iranian plates.

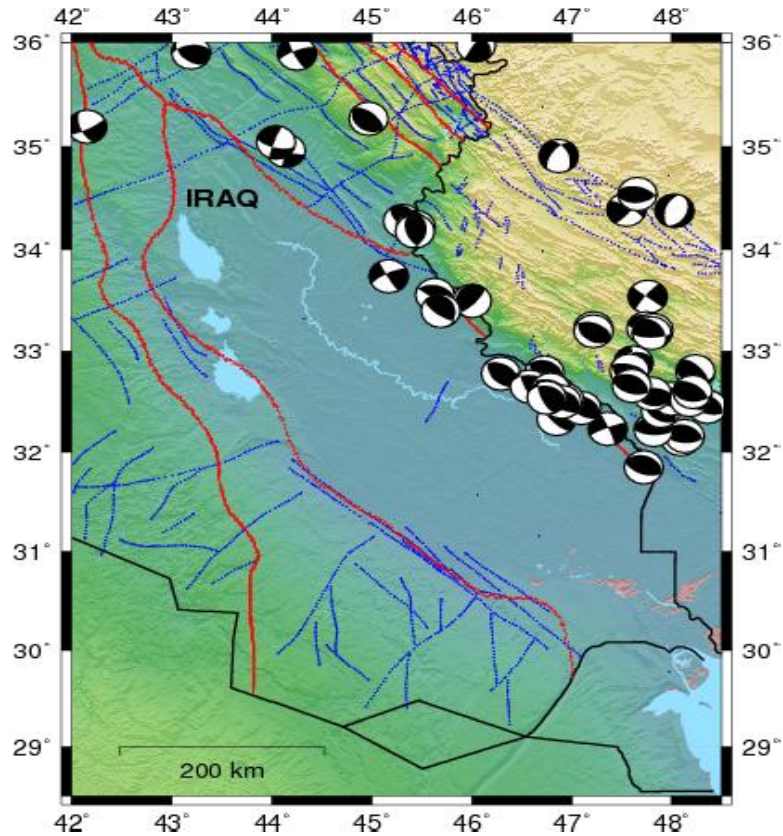


Figure 1. Moment tensor solutions for number of earthquakes in the Babra-Amarah fault

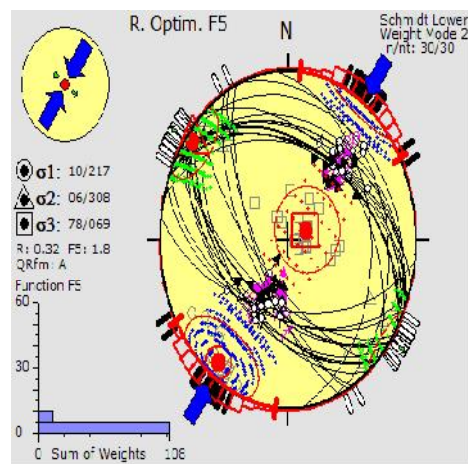


Figure 2. Results of formal stress inversion of the focal mechanism solutions

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