CORRELATION BETWEEN B-VALUE AND DIFFERENT STYLES OF FAULTING IN THE CASPIAN SEA REGION

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The frequency-magnitude equation is a statistical relationship which describes the number of earthquakes as a function of their magnitude (Gutenberg and Richter, 1944). The parameter *b* of this equation, known as b-value, describes the relative number of large earthquakes to smaller earthquakes, a lower b-value shows a larger percentage of large events. Moreover, the regional variations of b-value are found to have a correlation with stress level variations and there is an inverse correlation between this parameter and the stress level (Enescu and Ito, 2003). It has been found that the b-value decreases with an increase in shear stress or effective stress (Urbancic et al., 1992). This parameter varies spatially over a region (Wiemer and Wyss, 2002). Schorlemmer et al. in 2005 suggested that the b-value can act as a stress meter. They explored the b-value for different types of faulting by analyzing several high quality catalogues. While the highest b-values belong to the normal events, thrust events have the lowest b-values and intermediate values mark strike-slip faulting. This research examines the Caspian Sea region to correlate b-value with different faulting styles. The South Caspian Basin is a part of the Alpine-Himalayan seismic belt. This basin, apparently a rigid block, is limited from all sides by active earthquake belts (Figure 1).

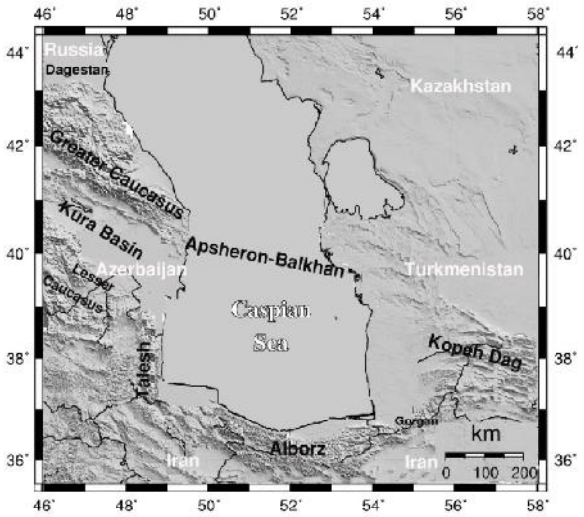

Figure 1: Caspian Sea, active seismic belts

Focal mechanism and depth of earthquakes on the margins of the South Caspian Basin is highly variable, and include strike slip faulting, large and small angle thrusting, and normal faulting (Figure 2). The Earthquakes occurring in the southern border are mostly shallow. In contrast, they get deeper in the northern border of the Basin where the Apsheron-

Balkhan earthquake belt has been stretched.

The catalogue of the International Seismological Centre (ISC: www.isc.ac.uk/) was used to map spatial changes of b-value using the maximum likelihood method (Wiemer and Wyss, 2002). All investigations were computed with ZMAP (Wiemer, 2001). In the Caspian Sea basin, focal mechanism can be approximately classified regarding the faulting styles. Earthquakes in the Apsheron-Balkhan seismic belt are deep with normal focal mechanism and b-value map shows an overall b-value for this region of about 1.2, whereas in the Talesh, western Alborz and eastern Kopeh Dag, where the dominant faulting mechanism is thrusting, low b-values can be extracted, of approximately 0.5. In the central Alborz and eastern Apsheron-Balkhan, strike-slip faults result in intermediate b-values. Overall, the correlation between faulting mechanism styles and the b-values in the Caspian Sea region can be clearly seen (Figure 2).

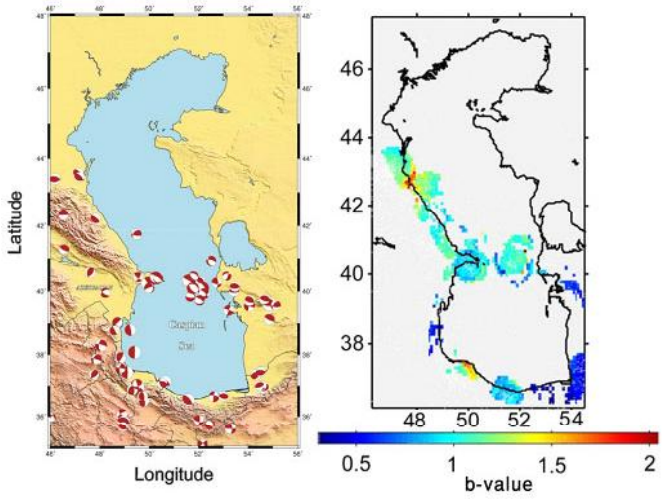

Figure 2. Faulting mechanism and the b-value. The left hand figure shows the faulting mechanisms (Obtained from International Institute of Earthquake Engineering and Seismology) and the right hand figure shows the b-value map (data from the ISC catalogue) of the Caspian Sea region

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