

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

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ABSTRACT

The South Caspian Basin is a part of the Alpine-Himalayan seismic belt. This basin is limited from all sides by active earthquake belts. The diversity of the focal mechanism of earthquakes on the margins of this basin shows the complex tectonic activity of the region including strike slip faulting, large and small angle thrusting, and normal faulting. Data analysis shows that the b-value of the Gutenberg Richter Relation is variable in the region and is correlated to faulting style. While the highest b-values belong to the normal events, thrust events have the lowest b-values and Intermediate values mark strike-slip faulting. In the Caspian Sea basin, earthquakes occurring 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. This also introduces the b-value as a stress-metre.

INTRODUCTION

The Caspian Sea is the largest closed body of water on Earth with a surface area of around 380,000 km². This sea measures around 1,180 km North-South (between latitudes 36° and 47°) and as much as 480 km East-West (between longitudes 49° and 54°). It is a remnant of the Tethys Ocean that became landlocked about 5.5 M years ago due to plate tectonics (Kroonenberg et al., 2007). Five different countries border this sea, namely Iran, Turkmenistan, Kazakhstan, Azerbaijan and Russia (Fig. 1).

It is conventional to consider the basin of the Caspian Sea as having three parts (Froehlich et al., 1999; Kaplin and Selivanov, 1995):

A northern part, with a mean water depth of only 10 m,

A central part, where the water depth increases up to 788 m,

A southern part, wherein the water depth increases up to 1025 m.

Globally, the Caspian Sea region is a part of the Alpine-Himalayan seismic belt which is one of the two major seismic belts on Earth, and it is also surrounded by seismic active belts of earthquakes. Moreover, intense past seismic activities are apparent in the geological and tectonic setting of the region.

lowland plains, in the south eastern margin of the Caspian depression, have low slope and smooth surfaces starting in the mountainside toward the plains, and gradually reach areas with lower elevation. In this section, due to suitable climate conditions, for agriculture, lands have become modelled into gentler and more rounded shapes. In the southern margin, there is still evident morphology of the foothills and plain-like