28*th* IUGG Conference on Mathematical Geophysics, June 7-11, 2010, Pisa, Italy
Session 5: Geodynamics and geomagnetism

Using gravity and geothermal gradients data to determine the crustal configuration and associated oil and gas accumulations in the Sahel Basin (Eastern Tunisia)

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Keywords: *Bouguer gravity; crustal configuration; crustal thinning*

An analysis of Bouguer gravity anomaly data and geothermal gradient data determined from bottom hole and drill stem tests temperature are used to determine the crustal configuration of the Sahel Basin in eastern Tunisia and its role in the maturation and location of the large number of oil and gas fields in the region. The regional Bouguer gravity anomaly field is dominated by gradual increase in values from the northwest to southeast and is thought to be caused by crustal thinning that is revealed by regional seismic studies. In addition, higher geothermal gradients in the same region as the Bouguer gravity anomaly maximum adds an additional constraint for the existence of crustal thinning in the region. A detailed analysis of the Bouguer gravity anomaly data was performed by both upward continuation and horizontal gradient analysis. These two techniques were combined to show that the region consists of two structure regions: 1) the NOSA-Zeramediner region in the NW part of the study area which is characterized by northwest-dipping, northeast-striking faults, thicker crust (30-31 km) and low geothermal gradients, and 2) the Mahres-Kerkennah region in the SE part of the study area which is characterized by vertical, northwest-striking faults, thinner crust (28-29 km) and a higher geothermal gradients. The correlation of mapped and geophysically-defined faults, volcanic rocks, thinned crust and high geothermal gradients with the location of known oil and gas fields indicates that the faults are a major determining factor in the location of these petroleum accumulations.