Geophysical Research Abstracts
Vol. 18, EGU2016-5858, 2016
EGU General Assembly 2016

Facies distribution, depositional environment, and petrophysical features of the Sharawra Formation, Old Qusaiba Village, Central Saudi Arabia

Muhammad Asif Abbas (1), Michael Kaminski (1), and A. Umran Dogan (2)

(1) King Fahd University of Petroleum & Minerals (KFUPM), Geosciences, Dhahran, Saudi Arabia (kaminski@kfupm.edu.sa), (2) Center for Global and Regional Environmental Research (CGRER), University of Iowa, Iowa City, Iowa, USA

The Silurian Sharawra Formation has great importance as it rests over the richest source rock of the Qusaiba Formation in central Saudi Arabia. The Sharawra Formation has four members including Jarish, Khanafriyah, Nayyal, and Zubliyat. The formation mainly consists of sandstone and siltstone with subordinate shale sequences. The lack of published research on this formation requires fundamental studies that can lay the foundation for future research. Three outcrops were selected from the Old Qusaiba Village in Central Saudi Arabia for field observations, petrographical and petrophysical study. Thin section study has been aided by quantitative mineralogical characterization using scanning electron microscopy – energy dispersive spectroscopy and powder x-ray diffraction (XRD) for both minerals, cements, and clay minerals (detrital and authigenic). The outcrops were logged in detail and nine different lithofacies have been identified. The thin section study has revealed the Sharawra Formation to be mainly subarkosic, while the mica content increases near to its contact with the Qusaiba Formation. The XRD data has also revealed a prominent change in mineralogy with inclusion of minerals like phlogopite and microcline with depths. Field observations delineated a prominent thinning of strata as lithofacies correlation clearly shows the thinning of strata in the southwestern direction. The absence of outcrop exposures further supports the idea of southwestern thinning of strata. This is mainly attributed to local erosion and the presence of thicker shale interbeds in the southeastern section, which was probably subjected to more intense erosion than the northwestern one. The Sharawra Formation rests conformably over the thick transgressive shale sequence, deposited during the post glacial depositional cycle. The lowermost massive sandstone bed of the Sharawra Formation represents the beginning of the regressive period. The shale interbeds in the lower part are evidence of moderate-scale transgressive episodes, while the thin shale interbeds in the middle and upper part of the Sharawra Formation represent small-scale transgressions. Overall, the Sharawra Formation contains a series of repetitive transgressive and regressive events and has been interpreted as a pro-deltaic deposit in previous studies. In the present study, the lowermost sandstone thickly bedded facies lie within the transition zone environment. The siltstone facies and the horizontally stratified facies show a middle shore face environment. The middle shore face environment is present locally. The bioturbation in the uppermost facies is indicative of the upper shore face environment.

The porosity values do not vary much, as the average porosity for the sandstone facies is about 15%, for the siltstones it ranges about 7%. The permeability is variable throughout the formation, the values range from 50 to 300 md. Although sandstone has a good porosity and permeability, the siltstone facies exhibit poor petrophysical characteristics. In terms of reservoir characterization, the mineralogical mature, moderately well sorted top most sandstone facies, with appreciable porosity and permeability can be considered as a potential reservoir rock. This study has provided a base for future quantitative studies in this important formation in the area.