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Source rock evaluation and sequence stratigraphic model based on the palynofacies and geochemical analysis of the subsurface Devonian rocks in the Western Desert, Egypt.

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Abstract

The Paleozoic rocks are the least explored among the subsurface successions in the Western Desert of Egypt. This contribution submits a significant record for the palynofacies and geochemical analysis for an important division of the subsurface Paleozoic rocks from Faghur-1 and NW-D302-1 boreholes. The palynofacies of the Devonian sediments of Zeitoun Formation extensively verified and classified. The palynofacies classification depended on the statistical techniques of cluster and correspondence analysis. The cluster analysis discriminated four classes of palynofacies in *R*-mode, which are brown wood palynofacies class R_1 , spore palynofacies class R_2 , AOM-opaque phytoclasts palynofacies class R_3 and marine phytoplankton palynofacies class R_4 . In the *Q*-mode, the cluster analysis revealed three palynofacies types, which are palynofacies type C, palynofacies type B, palynofacies type A. The combination of cluster and correspondence analysis is employed to interpret the evolution of basin dynamics and the mechanisms that controlled the deposition of Devonian rocks. Three basic environmental settings were recognized and they include 1.) Oxidic highly proximal shelf setting, 2.) Oxidic proximal shelf setting and 3.) Oxidic distal shelf. The high oxygenation levels are confirmed by the inorganic geochemical analysis of Fe%, TS/Fe and TS/TOC in the samples from Faghur-1 borehole. The paleoenvironmental reconstruction is used to identify four 2nd order stratigraphic sequences in the studied sections, which are DevSeq1, DevSeq2, DevSeq3 and DevSeq4. These sequences are systematically described and correlated with their equivalent global Devonian Sequences. The palynofacies investigation is integrated with the inorganic and organic geochemical analysis to evaluate the potentiality of hydrocarbon generation from the probable source rocks in the studied

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