Gross Depositional Environment Mapping of the Cambro-Ordovician Sequence in Saudi Arabia

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Abstract

This study presents the lithology, facies types and facies distribution of Cambro-Ordovician sequences in Saudi Arabia. Gross depositional environment maps were produced by integrating key facies indicators, which were the result of analyzing palynological, petrophysical, and seismic data, and the surface and subsurface sedimentological interpretations. The comprehensive methodology of Gross Depositional Environment (GDE) mapping consists of four stages: first, understand the stratigraphic framework of the Cambro-Ordovician sequences; second, interpret the main facies indicators; third, map facies indicators; and finally generate the integrated GDE maps. The analysis revealed that the Cambro-Ordovician sediments in Saudi Arabia are primarily subdivided into four main facies associations: fluvial and distributary channel deposits, deltaic to upper shoreface deposits, lower shoreface deposits, and offshore siltstone to mudstone deposits. The Cambro-Ordovician strata were significantly influenced by the Hercynian Orogeny, resulting in the separation of facies into two major regions that are separated by a massive arch. The smaller region consists of terrestrial deposits dominated by alluvial to fluvial sediments. Shifting away from the arch, a gradual change into distal marine facies is observed. On the other hand, in the larger region of the basin marginal marine deposits to open marine deposits were more developed. This is supported by extensive marine ichnofacies observed when examining the cores.