Revising the depositional cycles of the Cambrian-Ordovician interval in the Tabuk Basin, Saudi Arabia.

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Abstract

As a result of mapping and sedimentological analysis of the Lower Paleozoic succession, the detailed cyclicity of the Cambrian-Ordovician interval has been defined. This interval is considered a part of the mega-depositional cycles of the Paleozoic and was deposited over paleohighs of the Arabian Shield with an unconformity contact. The interval is subdivided into five formations, namely the Shig, Shigri, Al Ula, Risha, and Sajir, which are easily correlated across the Tabuk Basin in northwest Saudi Arabia. These formations provide important insights into the depositional environments and stratigraphic framework of the Paleozoic succession in the Arabian platform, which improve understanding of the geometry of transgressive-regressive (T-R) sequences at Tabuk Basin.
The Cambrian-Ordovician interval is overlain by the transgressive deposits of the Qasim Formation in the Ordovician.

A detailed study of the depositional environment and sequence stratigraphy of this cycle reveals a three-part cycle of marine transgression with marine pulses that formed flooding surfaces. Within the Cambrian-Ordovician sub-cycle, three sedimentary facies associations (fluvial, tidal, and coastal to open marine) have been identified, extending from the Saudi-Jordan border to the southeastern corner of the Jibal Al Misma quadrangle, west of Hail.
The cycle starts with a fluvial deposit and ends with a marine deposit. The Cambrian-Ordovician interval commences with an alluvial conglomeratic sandstone of the Shig Formation, which is overlain by a transgressive coastal to tidal flat environment exhibiting wavy bedding and sigmoidal cross-stratification of siltstone with vertical Skolithos burrows, with fine-grained sandstone at the top of the Shigri Formation reflecting the maximum flooding of this cycle. The second cycle begins with a conformable contact of fluviatile sandstone sequences of the Al Ula Formation, which exhibit a transgressive tidal environment with vertical Skolithos burrows and fine-grained sandstone in the upper part. The third sub-cycle commences with a thick fluvial sandstone sequence of the Risha and Sajir Formations of the Saq Group, showing tidal influences at the top. This study provides insights into the three-part cycle, fluvial-shallow marine sedimentation, and identification criteria for the Cambrian-Ordovician interval. A synthetic sequence stratigraphy is proposed from sequences analysis along the outcrop belt.

Keywords: Tabuk Basin, Cambrian, Ordovician interval, cycles

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