Unayzah-C Reservoir: A Late Carboniferous to Early Permian Periglacial Sandstone Filling Hercynian Palaeotopography

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Penetrations of the Unayzah-C Reservoir in eastern Saudi Arabia as part of Saudi Aramco's non-associated gas program provide new insights on the depositional nature of this poorly understood unit with regard to controls on basin formation and fill. This data strongly suggests that a deeply incised, subarial Hercynian related paleotopography was subsequently filled by sands associated with periglacial fluvial systems draining Gondwana ice sheets.

No age diagnostic fauna have been identified in the Unayzah-C, but its age has been roughly constrained as Late Carboniferous to Early Permian, on the recognition of rare reworked Middle Carboniferous palynomorphs in the Unayzah-C and recognition of Early Permian palynomorphs in overlying strata. Confusion as to basin formation and subsequent fill history has persisted in part due to a lack of data, but primarily due to the existence of two major global geologic events which severely impacted Saudi Arabian geology at about this time: The Early to Middle Carboniferous Hercynian Orogeny and the Late Carboniferous to Early Permian Gondwana glaciation.

Structural mapping of pre Hercynian strata demonstrates the fold belt geometry of these Lower Paleozoic rocks. Isopach mapping of the Unayzah-C, conversely, reveals a deeply incised fluvial system which in places transects Hercynian structures suggesting an antecedent origin. When compared with the Hercynian subcrop map, these valleys appear strongly controlled by the underlying lithologies. Sandstones of the Unayzah-C are lithologically dissimilar to the underlying rocks, and rarely yield reworked palynomorphs only near the basin margin or in close proximity to major Hercynian structures, suggesting a generally more distant provenance.