

The Glacial and Post-Glacial Character of the Lower Unayzah Formation in the Subsurface of East-Central Saudi Arabia

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Deposition of the lower Unayzah reservoir (C and B members) in Saudi Arabia commenced in late Carboniferous times during the earliest stages of the late Paleozoic Gondwanan glaciation. The Unayzah C comprises quartzose sandstones, laid down upon the so-called Hercynian unconformity in a widespread glacio-fluvial outwash braidplain, during (probably several) early glacial retreat stages. These sediments were overridden and deformed during intervening glacial readvances, when advancing ice sheets thrust the sediments over each other with the construction of push moraines. The top Unayzah C surface is a significant unconformity representing the final sub-glacial contact of the Gondwanan ice-sheet. The overlying Unayzah B (early Permian) represents the final glacial retreat phase. It is sharply divided into a lower Unit B1 and an upper Unit B2. Unit B1 is dominated by glacial sediments, including highly deformed material attributed to localized push moraines (and hence representing minor glacial readvances); ice-proximal, subaqueous outwash fans (lacustrine turbidites and massive diamictites); and ice-distal, glaciolacustrine deposits including laminites and stratified diamictites. Unit B2 is characterized by fine-grained red-beds, representing low-lying alluvial floodbasin deposits. Embedded within these occur eolian and fluvial sandstones. A significant drainage event is thus implied between Units B1 and B2. The end of Unayzah B time is represented in places by paleosol development, indicating a disconformable contact with the overlying Unayzah A. This study extends the record of the advance and retreat of the Gondwanan ice sheets in southern Saudi Arabia, and also permits a degree of correlation with coeval rock units in Oman.