

Low-Latitude Ordovician Glacial Sediments of Gondwana: Reservoir Quality Prediction across the Saharan Platform

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The sediments of the Mamuniyat Formation (Ashgillian, Upper Ordovician) of Libya, Algeria and Tunisia were deposited within a glacially-influenced, typically shallow-marine setting on the continental shelf, beyond or at the margins of a large continental ice-sheet. On a basin scale, broad packages of discrete sedimentary facies are apparent, with visible trends in both sand quality and distribution. However, as is typical of many ice-proximal – distal settings, detailed analysis at outcrop reveals rapid ‘high-order’ lateral facies changes and at least 2 internal unconformities causing uncertainty in reservoir quality prediction.

Detailed analysis of the Mamuniyat Formation from both outcrops and the subsurface of Western Libya, Eastern Algeria and Southern Tunisia has revealed that whilst the main control upon the distribution of reservoir quality is the primary sedimentary fabric, there is a complex diagenetic overprint that hinders conventional reservoir quality prediction, both regionally and locally.

The primary diagenetic control on reservoir quality is the development of quartz overgrowths associated with increased overburden pressures and temperatures encountered during burial. Quartz overgrowths progressively restrict the dimensions of the pore network, reducing both the porosity and permeability of the reservoir. On both a regional and a local scale reservoir quality is further modified by localised fracturing and the development of a late-stage porefilling kaolinite cement that occurs as a result of meteoric water-flushing.

The extent and duration of burial through time has been modelled, paying particular consideration to the effects the Caledonian, Hercynian and Alpine Orogenies have on quartz overgrowth development and subsequently reservoir destruction.