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Integrated bio- and lithofacies relationships of the Dhruma Formation (Lower Fadhili Reservoir), Khurais and Qirdi Fields, Saudi Arabia

Biostratigraphic and petrographic analysis of seven cored wells from the Lower Fadhili reservoir section in Khurais Field reveals significant new information about the stratigraphy and paleoenvironments of the Dhruma Formation. Micropaleontological assemblages together with paleoenvironmental marker species and sedimentological variations show that the Lower Fadhili Reservoir (Atash member of the Dhruma Formation) contains a combination of cyclical vertical and lateral paleoenvironmental variations. These stratigraphic variations of the Atash member identify two unconformity-bounded depositional sequences each with a distinctive facies arrangement. Each sequence represents a north or northeast facing ramp deposit in which grain-dominated shoreface deposits exist only in the Qirdi and southern Khurais Field area. The Atash member has been subjected to two major tectonic events, known as the pre-Hysian (newly established) and pre-Aruma. Expressed as major unconformities across the study area, both tectonic episodes are believed to have been caused by fault-controlled differential movement. Missing section at the upper boundary represents most of the Lower Callovian, an approximately two million year hiatus that separates the Atash member from the overlying Hysian member. Well log correlation suggests the magnitude of the pre-Hysian unconformity increases southwards across the Khurais Field area. Available paleontologic data is insufficient for determining the magnitude of the hiatus represented by the basal Atash unconformity.