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Inshore gas limit and shallow stratigraphy of the Orange River mud belt

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The seismic stratigraphy of the Orange River mud belt on the shelf of southern Namibia was reconstructed on the basis of high-resolution seismic profiles. In particular, the inshore limit of gas-charged sediment is outlined, together with the shallow stratigraphy of several transgressive sediment packages that overlie the acoustic basement. The seismic data reveal an onlapping relationship between the low-gradient Cretaceous strata and the higher-gradient surface of the Precambrian Gariep Complex. Together these form the regional acoustic basement. The overlying Orange River mud belt is characterised on the mid-shelf by a 25 m thick unconsolidated sedimentary package that onlaps the Precambrian basement which crops out from a depth of 45 m to the shoreline.

The unconsolidated sediment can be subdivided into three packages. A lower package comprising undulating high- and low-amplitude reflectors which infills palaeo-topographic depressions in the upper surface of the Cretaceous and Precambrian strata. This is overlain by a package comprising distinct sub-parallel reflections which onlap the underlying surface as it shallows. A third, lens-like unit is present within a topographic depression between the upper and lower packages. This unit onlaps the lower package seawards and the acoustic basement landwards.

Gas-charged sediments obscure the stratigraphic record from the mid-shelf seawards. The inshore gas limit migrates landward from the north toward the Orange River mouth. Acoustic windows and gas-free sediments are common, as is free gas dissemination into the water column.

The strong partitioning of the shelf into a gas-free and gas-saturated zone suggests a differential sedimentary response of the shelf to transgression in the course of unconsolidated sediment deposition. This could be due to a change in the antecedent shelf gradient in places where the Precambrian basement crops out, together with separation and redistribution of finer material in hyperpycnal flows to seaward, creating a muddy layer with a high organic matter content.