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3D Architecture of a Deepwater Turbidite Depositional System from Outcrop and Wells (2): Construction, Visualization and Analysis of Reservoir Models

Extensive outcrop and well datasets from the Tanqua Karoo deepwater complex has allowed deterministic mapping of key surfaces over some 500 km^2 and a stratigraphic interval of 250 m. These mapped surfaces include the bases and tops of the fans and a series of internal high-frequency sequences, marked by regional, intra-fan condensed sections. This detailed surface mapping allows construction of a high-resolution deterministic framework for modelling the 3D architecture of facies associations. Knowledge in terms of quantitative geometrical information and qualitative understanding from the outcrops, and from cores and wireline logs in seven recently drilled wells has enabled population of the 3D model volumes to be conditioned by facies associations. Integration of the statistical distributions of bed thickness from outcrop and core logs with forward modelling techniques that predict lateral velocity changes of turbidity currents across the submarine fans, has enabled conditioning for variable degrees of amalgamation (a proxy for confinement) in different areas of each fan. This use of trends rather than discrete objects better handles the range of architecture observed in the sheet sandstones. Known channels have been deterministically placed in their true x,y,z positions and the distribution of channel type and profile (from erosional and back-filled to largely depositional in a down-dip direction) has been honoured. In complex or less well-exposed areas, both deterministic and conditioned stochastic models have been built and compared. The results allow complete 3D visualization and quantitative interrogation of the reservoir models to better understand the anatomy of deepwater depositional systems.