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POSTER PRESENTATION

Quantitative Analysis of Geobody Geometries and Architectural Elements within Paralic Depositional Systems: A Case Study from the Mungaroo Fm, Carnarvon Basin, Western Australia

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A key criterion to model subsurface fluvial reservoirs is the definition of dimensions and architecture of component geobodies. Schemes for classifying fluvial architectural elements are however complex, with a multitude of different terminologies in use and the published range of dimensions for the different elements is often large. There is also a lack of robust statistical databases and thus key input parameters for reservoir models, such as W:T range, is often poorly constrained.

This study presents a classification of geobodies from a paralic system that has been used to generate a robust set of statistical parameters (spatial and temporal width:thickness and sinuosity trends). The dense geobody dimension database offers a lower margin of uncertainty and improved confidence levels for W:T ranges of the encountered fluvial architectural elements in these types of depositional system. This can be applied to similar paralic depositional systems globally to help constrain geobody dimensions and reduce uncertainties associated with reservoir modelling.

The large database comprises 6,236 statistical data points for width, sinuosity and wavelength, extracted from the 3D seismic data, integrated with 36 channel thickness measurements constrained by well data. This very large dataset has been sampled over an area of approximately 10,000 km^2 from the Triassic fluvio-deltaic Mungaroo Formation, in the Northern Carnarvon Basin, NW Shelf Australia. Five architectural elements can be identified from seismic attribute analysis, comprising fluvial channel belts, crevasse splays and inter-channel areas. Morphometric measurements such as width, thickness, wavelength, amplitude, orientation and sinuosity data have been extracted and collated into a geobody database comprising 27,370 measurements that define three series of geobody classes. Width and thickness data are compared to published literature. This dense dataset is a contribution to refine the classifications of fluvial architectural elements within this type of depositional system, which previously have been difficult to differentiate.

Spatial and temporal analyses of the geostatistics reveal several trends in the rate of change of a range of metrics, which can be related to process changes and stratigraphic evolution of the depositional system. Downstream decreases in geobody widths and thicknesses are attributed to increased channel bifurcation and the distributive nature of the lower delta plain, whilst decreases in geobody width & thickness through time suggest an overall transgression of the depositional system. Higher order stratigraphic progradational and transgressive cycles are also revealed by this statistical analysis, providing further evidence for the interpretation of sequence boundaries and amalgamated multistorey channel belts.

The results presented are the first published statistical dataset for this region and the largest dataset published for paralic reservoirs from an integrated well and seismic study. Statistics extracted from this subsurface study, integrated with our current understanding of geobody dimensions (and their relative distributions) from ancient and modern-day analogues, can be incorporated into future stochastic models. This approach enables reservoir modellers to predict the distribution of a range of geobodies / reservoir elements, even those below seismic resolution, and model their interaction and connectivity within this type of depositional system.