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Robert M G Bond[1], Lucy Eastwood[1] (1) Paradigm Geophysical (UK) Ltd, Woking, United Kingdom

3D Visualisation and Interpretation of Geological Structures using Volume-Based Seismic Interpretation

3D visualisation and interpretation of seismic data reveals complexities of structure in the subsurface which previously could only be seen in outcrop. As in the field, the interaction of structure and stratigraphy is also commonly apparent within seismic volumes, often providing the additional component of being able to track the evolution of these architectures through geological time.

Through the use of static and animated figures we present the results of structural interpretation of a number of seismic volumes, including examples from Southern England, Northern Europe, Indonesia and West Africa.

We examine many complementary techniques of seismic volume visualisation, showing how these are utilised to define geological structure in different tectonic and geographic domains. We show how techniques such as optical stacking, multiple attribute rendering (especially of geometrically calculated seismic attributes) and horizon propagation can be used to accurately extract both stratal and fault architectures. Waveform-based propagation technology allows the extraction of geologically meaningful surfaces through zones of strong amplitude variation - for instance in areas with bright channelised deposits and across both subtle and significant fault throw. Stratigraphic features identified on such surfaces can be used to verify, quantify and provide the geological timing of fault-throw in strike-slip and dip-slip components.

Fault interpretation benefits greatly from 3D Visualisation, showing the interlinkage of laterally restricted faults, and allowing accurate decisions to be made regarding which splays constitute the significant components of fault geometry at depth.