Forward Modeling of Outcrop Data – a Tool for Improving Hydrocarbon Reservoir Prediction in Deepwater Architectural Elements

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The behaviour of hydrocarbon reservoirs is often profoundly affected by architectural elements that are, or appear to be, below the resolution of conventional seismic data. The ability to predict or recognise sub-surface architecture in mass transport deposits, or the coarse clastic fills of submarine channels, both of which may be economically important for hydrocarbon exploration, is far from satisfactory.

We are planning to improve these skills by simulating the seismic response of architectures mapped from outcrops, and understanding the complicated relationships between the physical properties of the small scale geometries and the form of the seismic wavelet, and finally its influence on low frequency seismic models. Truly seismic-scale outcrops of deep water elements are rare, but in our opinion, study of the rock record is crucial for understanding of lithofacies distribution and reservoir potential.

We present some models of architecture and lithologic distribution based on the large-scale outcrops, which have been used for generating seismic forward models. They are based on two types of deposit; a Jurassic-Cretaceous slide complex in Antarctica and Cretaceous turbidite canyon/channel complex in a late Cretaceous continental slope sequence, Baja California, Mexico. Forward seismic models were constructed by combining detailed structural and stratigraphic detail from outcrop sections with physical properties derived form representative subsurface datasets from a variety of settings and burial depths. We believe this approach will yield the most useful results for comparison between outcrop sections and subsurface datasets.