SEAPEX Exploration Conference 2005
Orchard Hotel, Singapore
5th – 7th April 2005

ABSTRACT

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Sequence Boundary Mapping and Palaeogeographic Reconstruction: The Keys to Understanding Deepwater Fan Deposition Across the NW Borneo Active Margin

One of the cornerstones of de-risking a basin for reservoir development at play level is to carry out regional sequence boundary mapping and from there establish palaeogeographic reconstructions through time that enable depositional domains to be identified and mapped. This paper will show examples of how sequence mapping and palaeogeographic reconstruction have been carried out across NW Borneo using an extensive 2D and 3D seismic dataset and well data. Now that a comprehensive framework has been established it becomes clear why this Neogene regressive active margin has become the hottest new deepwater oil play in SE Asia.

One of the unique features of NW Borneo intra-plate margin is that active tectonics inboard has resulted in there being a relatively short distance between the coast line of Borneo and toe-of-slope within the NW Borneo trough. During the Late Miocene in particular, uplift and erosion across the inboard shelf and mountainous hinterland regions of Sabah shed large volumes of sediment into shallow marine domain of the NW Borneo basin. Because of limited accommodation space along a narrow shelf sands and shales entering the margin, from river systems such as the Padas in Sabah or from shelf-edge collapse, cascaded down the slope and across the basin floor forming a series of fan lobes that amalgamate laterally and vertically into major fan complexes. Because of a relatively steep slope profile much of the sand component was dumped close to the toe-of-slope break where turbidity flows decelerate on encountering a rapid change in slope gradient that, across the NW Borneo margin, is speculated to be in the order of 4 – 10^{o}. Today these deep marine fans have been folded and thrust within the NW Borneo active margin fold belt. Deformation within this fold belt commenced around 9.5 Ma.

This case study highlights the role sequence mapping and palaeogeographic reconstruction can play in helping to predict reservoir development in untested deepwater plays. Through the integration of regional geological studies with palaeogeographic indicators from spec 2D seismic or wildcat well data it is possible to reconstruct the slope profile across a margin through time. It is proposed that a key to success in many deepwater ventures is to use knowledge of the slope profile to predict where the sweet spots for sand deposition are and so provide a rational focus for new venture acquisition.