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Tectonostratigraphy of the half-graben sub-province in Western Luconia

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The West Luconia Province is located in the western part of offshore Sarawak. It is bounded by the Central Luconia Province to the east and the Natuna Ridge/Platform to the west. Under a Technical Evaluation Agreement (TEA) Shell is evaluating the prospectivity of this little explored region. The result of Shell's Regional Basin Framework Study in 2003 covering the whole of Northwest Borneo and the acquisition of 1,400 line-km of 2D seismic under the TEA in 2002 provides the basis for a detailed study on the Hydrocarbon potential of the Half-Graben sub-province.

The Half-Graben sub-province is characterised by a series of NNW trending, SW dipping extensional faults, creating significant sub-basins that were later filled by Middle to Late Miocene fluviomarine sediments.

Structural extension is interpreted to have taken place during Early to Middle Miocene. The observation of tilted syn-rift Middle Miocene carbonate wedges within the deeper parts of the half-grabens provides substantial evidence for the timing of the half-graben formation. The extension and subsequent rapid subsidence of the half-grabens

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would eventually lead to conditions that stalled the growth of carbonates.

Cessation of carbonate growth was followed by clastic sediment influx into the half-grabens, although the latter process could also have contributed to the cessation of the growth of the carbonates. Middle to Late Miocene sediments of up to 2 seconds (some 2,000 m) thick has been observed to fill the sub-basins. The post-rift clastic half-graben fills are differentiated by two main phases of hiatus in sedimentation. The Late Miocene (SB3.1) and Early Pliocene (SB3.4) lowstands are consistently observed throughout the study area; typified by erosional truncations, incised channels and thick, seismically transparent transgressive shales above the unconformity. The fluvio-marine sediments of the Middle Pliocene to recent are dominated by sea-level fluctuations; evidence for the latest lowstand is still preserved in form of the proto-Rajang channel.

At the same time, the West Luconia Rim in the northern part of the study area underwent another phase of major structural deformation during the Late Miocene to Early Pliocene. Large highly faulted, anticlinal structures of significant sizes formed where the Half-Grabens intersect with the West Luconia province. Origin of these can be attributed to wrench-related inversion on some of the extensional faults in association with basement highs.

The sedimentological and structural history of the area produced a variety of trapping configurations. These include structural rollover traps, footwall traps, inversion traps and stratigraphic carbonate traps. This variety, together with the possibility of source rock development within the deeper part of the half-grabens, results in a diverse portfolio of leads.