

Development of Multiphase Karstification in Central Luconia Carbonates – Imaging and Modeling the Unpredictable

Coca, Spencer¹, Laurent Bourdon², Laurent Alessio³ (1) Sarawak Shell Berhad, Miri, Malaysia (2) Woodside Energy Ltd, Perth, Australia (3) CS Mutiara Petroleum Co, Kuala Lumpur, Malaysia

Three major karstification events associated with the TB 3.1, 3.2, and 3.4 sequence boundaries have been identified in Central Luconia carbonate build-ups. Extensive karstification characterised by development of dendritic cave systems stands testimony to periods of prolonged subaerial exposures that affected dozens of gas bearing carbonate platforms. Since presence of intra-reservoir Karst has an important impact on field development and well placement its identification and realistic modelling becomes crucial.

Advanced seismic volume interpretation techniques consisting of spectral decomposition, acoustic impedance opacity rendering, and structurally oriented semblance filtering were used to image the complex palaeo-cave networks in some of the major producing gas fields offshore Sarawak. Subsequently, imaged Karst networks were extracted from seismic by means of bodychecking and imported as geocellular bodies in a reservoir modelling package, where full field dual property models were generated. These models were then used on a field scale for well planning and reservoir management purposes, but were also merged into a regional 3-D-Karst model that facilitated regional sequence stratigraphic understanding. Geometrical analysis of modelled Karst shows a close resemblance to modern day analogues in the Bahamas with a core area in the centre of the platform and dendritic drainage towards the margins where mapped palaeo-mixing zones are indicative of former shorelines. In the inter-tidal realm blue holes that are connected to peri-platform Neptunian Dykes could be extracted from seismic.