



The Role of Faulting on the Growth of a Carbonate Platform: Evidence from 3D Seismic Analysis and Section Restoration

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Tectonics in addition to other environmental factors impacts the growth of carbonate platforms and plays an important role in shaping the internal architecture of the platforms. Detailed of faults and fractures development and healing in carbonate environment have not been explored sufficiently. Using 3D seismic and well data, we attempt to reconstruct the structural evolution of a Miocene carbonate platform in Central Luconia Province, offshore Malaysia. Luconia Province is located in the NW coast of Borneo and has become one of the largest carbonate factories in SE Asia. Seismic interpretations including seismic attribute analysis are applied to the carbonate platform to discern its sedimentology and structural details. Detailed seismic interpretations highlight the relationships of carbonate deposition with syn-depositional faulting. Branching conjugate faults are common in this carbonate platform and have become a template for reef growth, attesting lateral facies changes within the carbonate environments. Structural restoration was then appropriately performed on the interpreted seismic sections based on sequential restoration techniques, and provided images different from those of horizon flattening methods. This permits us to compensate faults' displacement, remove recent sediment layers and finally restore the older rock units prior to the fault motions. It allows prediction of platform evolution as a response to faulting before and after carbonate deposition and also enhances the pitfalls of interpretation. Once updated, the reconstructions allow unravelling of the un-seen geological features underneath the carbonate platform, such as paleo-structures and paleo-topography which in turn reflects the paleo-environment before deformations took place. Interestingly, sections balancing and restoration revealed the late-phase (Late Oligocene-Early Miocene) rifting of South China Sea, otherwise difficult to visualize on seismic sections. Later it is shown that this carbonate platform was possibly originated from two or more connected reef build-ups. The platform evolution in terms of tectonic influences on carbonate growth and development may serve as a case example for re-evaluation of pre-Late Miocene structures as a new potential target for hydrocarbon exploration in Central Luconia Province. Eventually, techniques used in this study might be of interest to oil and gas explorers in carbonate system.