

Paper 1

Depositional history and origin of porosity in a small carbonate platform of Central Luconia, offshore Sarawak

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Recently acquired 3D seismics, wireline logs and selected core samples were used for a detailed reconstruction of the growth history of the platform as well as the sequence of diagenetic events and the origin of porosity. Platform growth started in the Late Oligocene/Early Miocene probably by coalescence of isolated patch reefs. Growth history includes phases of progradation, backstepping and occasional collapse of the platform

flanks. The most pronounced seismic reflectors in the platform are produced by the change from clean carbonate to overlying argillaceous carbonate during flooding events (transgressive systems tracts). Some of these flooding events are preceded by lowstands and exposure of the platform top. Platform growth was terminated by gradual submergence (drowning) indicated by smooth, concentric seismic reflectors forming a convex mound. During the growth cycle of the platform, the flanks increased in height from less than 50 m to over 250 m. The broad western and eastern flanks were controlled by bundles of low-offset faults that were active during platform growth. The narrow northern and southern flanks occupy the space between two fault zones. During the late stage of platform growth large landslides occurred along the fault zones. The slide masses can be traced seismically about 1.5 km into the basin; associated layers of carbonate sand and rubble are indicated by high-amplitude basinal reflectors and can be traced out into the basin. Modern day analogue data suggest that these deposits could extend all the way across the basin to the base of slope of the neighbouring platform.

Three different processes have significantly contributed to porosity in the carbonate rocks: selective leaching during exposure, dolomitization and leaching during deep burial, probably by warm fluids rising from depth. Quantitatively, the last group is by far the most important. As most of the carbonate porosity formed by carbonate dissolution under deep burial, the slide masses and related turbidites may contain highly porous rocks in the basins between the platforms. These bodies may contain hydrocarbon reservoirs that are separated from the charged platforms where their upslope ends are enveloped in clay-rich hemipelagic sediment. In other places, the porous slides and turbidites may establish connections between neighbouring platforms.