PREDICTING AND DETECTING CARBONATE CEMENTED ZONES WITHIN LATROBE GROUP RESERVOIRS OF THE GIPPSLAND BASIN

*Mark Bunch[1]**

Australian School of Petroleum, University of Adelaide, Australia, mark.bunch@adelaide.edu.au[1]

A wireline log model predicts carbonate cemented zones within Late Cretaceous to Paleocene reservoir sandstones of the Latrobe Group, Gippsland Basin. Predictions match published evidence. These sandstones were once heavily cemented prior to development of secondary porosity that produced the world-class petroleum reservoirs we see today. Cemented zones that remain must act as obstructions to reservoir fluid migration. They may also react with the mild carbonic acid that will be introduced by CO_2 storage operations of the future. Model predictions show that cemented zones are sparse, spatially sporadic and fall well below seismic resolution at modern-day reservoir depths. Their significance and irregular spatial occurrence mean there is a need to map their distribution.

Synthetic seismograms generated for a number of Gippsland Basin wells predict high amplitude seismic reflectors away from major lithostratigraphic boundaries. Many occur where cemented zones are predicted. An investigation of the complex seismic trace demonstrates seismic sensitivity to these zones in the frequency range 100-125 Hz. An elevated moving average of instantaneous frequency correlates with some of them. Others are indicated by a change in the difference of normalised instantaneous amplitude between the original frequency-filtered complex trace and a frequency-filtered complex trace composed of sinusoids with the same magnitude and phase (arithmetic averages of the original complex trace). These subtle phase disturbances at high seismic frequencies are hypothesized to be caused by the presence of thin cemented zones. This idea is tested using instantaneous attributes of 3D seismic survey data available across the Gippsland Basin.