澳洲帝汶海域瓦肯次盆地源自碳氫化合物的地下環境碳酸鹽膠結

Hydrocarbon-derived carbonate cementation in subsurface environments of the Vulcan Sub-basin, Timor Sea, Australia

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Localized carbonate cementation was found in the Eocene Grebe Sandstone of the Vulcan Sub-basin, Timor Sea, Australia. Those cements were previously interpreted as having resulted from microbial methane oxidation and sulfate reduction in a shallow subsurface environment and were related to hydrocarbon leakage. In this study, we reassessed those localized carbonate cements in the Grebe Sandstone, and obtained new findings.

Petrographical studies showed that (1) there were two facies of sands in the Grebe Sandstone: cemented, mostly fine-grained sands; and (2) loose, often coarse-grained sands. In addition, there were two types of carbonate cements in the Grebe Sandstone: (1) sparry to microsparry cements in calcareous, fine-grained sandstones; and (2) micritic to microsparry cements in limestones. Stable carbon isotopic values revealed that only the cements associated with sandstones were hydrocarbon-derived, and the resultant mineral is mainly calcite. Petrography, Stable oxygen isotopic values and trace elemental compositions of the interpreted hydrocarbon-derived calcite cements significantly differ from those of cold-seep carbonates at or near the sea floor. Our results support that the localized carbonate cements in the Grebe Sandstone are related

to hydrocarbon and occurred in shallow burial conditions.

Moreover, it was noted the hydrocarbon-derived carbonate mineralization only occurred in the fine-grained sands, not in the coarse-grained sands. In other word, the cementation was controlled not only by hydrocarbon leakage but also by the lithofacies of the host rock. We propose herein that the extent of hydrocarbon-related cementation alone cannot be used to evaluate the trap integrity as previously suggested by others.

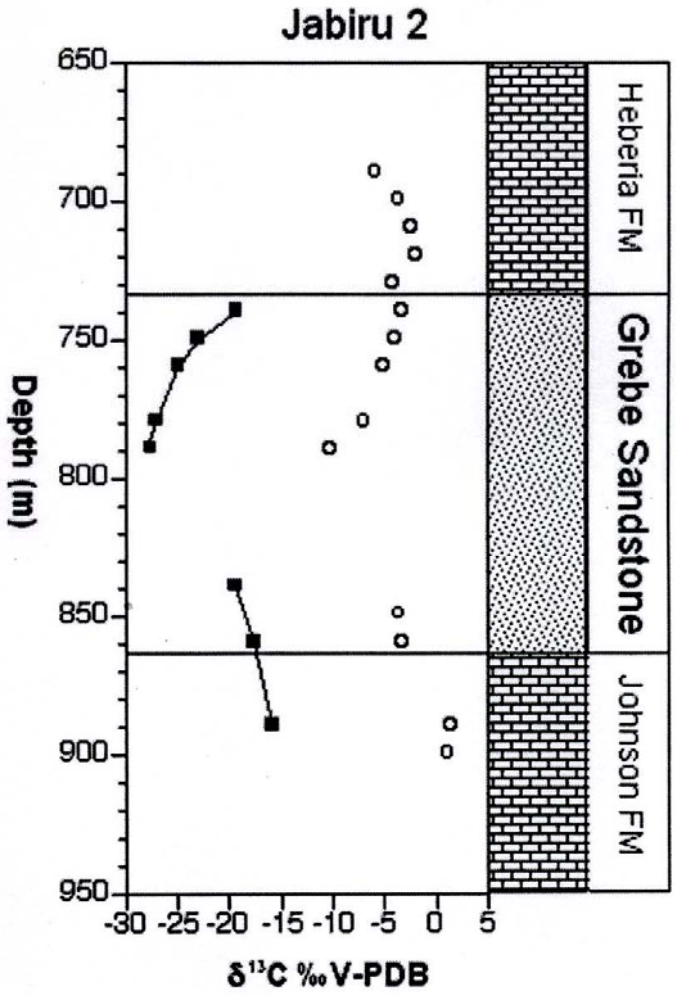

Figure 1: Stratigraphic variations in $\delta^{13}C$ compositions the well Jabiru 2. Solid square: cements of calcareous sandstone; open circle: matrix/cements of limestone.