

Stratigraphic Controls on the Accumulation and Preservation of Organic Carbon in Fraser Island Coastal Dune Lakes Using Ground Penetrating Radar

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ABSTRACT

The purpose of this project is to determine what controls the accumulation and preservation of organic carbon in coastal sand dune lakes on North Stradbroke Island, Australia. Lakes with abundant organic carbon appear distinctly dark brown to black in color and are considerably more acidic than the clear “white lakes” found elsewhere on the island. Two lakes have been identified from previous work on North Stradbroke Island that are distinctly different in color and assumed organic carbon content. Appropriately named Brown Lake is notably dark brown in color with a bottom substrate consisting primarily of organic mud. Blue Lake is a clear, freshwater lake that is frequented by tourists and is located only 6 km southeast of Brown Lake. We hypothesize that the enrichment of organic carbon at Brown Lake is driven by percolation of water through B-horizons of podzols or a buried peat layer that is not present at Blue Lake. In order to test this, we propose to use a Ground Penetrating Radar to image the subsurface stratigraphy beneath both lakes by towing the instrument on a kayak across the lake surface in a grid format. Both of the potential organic carbon sources have unique radar facies signatures that could be identified. The total organic carbon of sediments is an important indicator for their hydrocarbon potential. Organic-rich units with a measured total organic carbon above 1% are recognized as having a high hydrocarbon potential. The bottom substrate in Lake Boomanjin, a brown lake on nearby Fraser Island, has been observed to contain up to 60% organic carbon. This study would provide insight into the stratigraphic controls on abundant organic carbon accumulation within a sandrich environment that is a modern analogue to sandstone reservoir units.