

# **The Evolution of a Holocene Barrier Estuary Revealed through Multivariate Analysis of Sediment Properties, Tuggerah Lake, New South Wales, Australia**

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Existing conceptual models of estuary evolution have addressed the roles played by sea-level change, sediment supply and hydrodynamic processes on the temporal and spatial variation of facies within estuaries. These models can be used in a predictive manner, by relating the diagnostic structures and facies of modern estuarine sub-environments to their equivalents in the rock record. The present study is an attempt to depict changes in the estuary over time, using the proxy record of environmental change recorded within the sediments.

Supported by a comprehensive radiocarbon timescale, We have utilized a battery of techniques to describe in detail the vertical variation in sediment texture, organic and inorganic geochemistry, foram content and magnetic properties within four cores collected from Tuggerah Lake. We have related the vertical changes in sediment properties to known changes in sea level and to the inferred influence, at a particular core site, of changes in the relative supply of marine and terrestrial sediment, of changes in organic matter sources and productivity and to processes associated with reductive diagenesis. Outcomes of the study include the geochemical discrimination of marine and fluvial sediments, enabling the qualitative allocation of the relative contribution of each source to a particular sediment horizon, and the identification of palaeo-environmental factors that contribute to the character and content of organic matter within the sediments.