

The hydrology and hydrochemistry of deltas and their significance to deltaic hydrochemical/diagenetic processes and deltaic ecology

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Once a delta has aggraded/prograded to become emergent above the level of high tide its hydrology and hydrochemistry generally are complex. This is particularly the case for large deltas because they are comprised of a diverse suite of landforms and stratigraphic units, a range of water sources of different hydrochemistry, and a range of hydrologic recharge/discharge mechanisms. Deltas set in the various possible tidal ranges and climate types provide further variation on the dynamics of hydrology and hydrochemistry. In the midst of standard salinity gradients and intra-annual variations resulting from seasonal river inflows, the size and complexity of the delta, and the size of an estuary where a delta may reside, there are important localized interactions between the different open water bodies around deltas, such as river to sea interactions, or sea to estuary to river interactions. Whether adjoined by seawater or open estuarine waters (into which the delta has been prograding) or dissected by distributary channels with waters that can vary seasonally from marine to brackish to freshwater, the core of a delta may contain a freshwater lens similar to that under an oceanic island that interacts hydrologically on its margins with the open ocean or with an enclosing estuarine water body or with the river channels. The freshwater lens has a saline/freshwater contact similar to the Ghyben-Herzberg saline and freshwater relation.

Local areas on the subaerial delta plain, comprising contrasting mud-floored lagoons/ponds or sandy cheniers, or abandoned channels, are affected by river inflow, or rain, or evaporation, and develop salinities and hydrochemically specific surface and near-surface water bodies and groundwater bodies, respectively, that perturbate the salinity/hydrochemistry of the main body of the delta groundwater. The delta is characterised by fluctuating watertables and hydrochemistry of groundwater and the marine and estuarine water between wet and dry seasons, the dynamics of discharge, intrusion and seepage that occur between the delta groundwater and marine or estuarine water, and the wetlands on the delta. The various water bodies and their hydrodynamic and hydrochemical characteristics and interactions are underlying determinants of the biota resident on the deltaic wetlands and determinants of diagenetic products that occur within a delta. Western Australian deltas and intra-estuarine deltas serve as case studies of the hydrology and hydrochemistry of deltaic systems.

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