

SEDIMENTATION HISTORY AND DYNAMICS IN A COASTAL HAWAIIAN POND

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Ordry Pond is a 5m deep, closed basin on the leeward coastal plain of Oahu, Hawaii, containing a 9000-year record of aquatic sedimentation. Alternations of carbonate, diatomaceous, and organic-rich sediment in the pond reflect changes in water column chemistry in response to climate and land use variations. These sediments, therefore, contain a history of local land character and climate, perhaps including ENSO events. The pond is highly eutrophic, nearly entirely anoxic, and is dominated by microbial sulfate reduction of organic matter. The entire water column is oversaturated with respect to calcite ($IAP/K = \sim 15x$). Profiles of dissolved calcium, magnesium, and carbon indicate precipitation of carbonate in the upper water column. The water column chemistry and modeled sediment production are consistent with analyses of the uppermost sediments. The deeper sediments consist of dramatically laminated carbonate and organic matter with common diatomaceous layers. Carbonate $\delta^{18}O$ increases and $\delta^{13}C$ decreases with carbonate content (reverse trends with increasing organic matter content), indicating: carbonate lamina represent evaporative periods, organic laminae represent wet periods, and organic matter oxidation promoted carbonate precipitation. Diatomaceous laminae are interpreted as flocculated diatom mats. Carbonate mineralogy alternates between aragonite and calcite intervals, perhaps corresponding to such global climatic events as the mid-Holocene sea level highstand, the Medieval warm period, and the Little Ice Age. The upper sediments, however, are organic-rich and faintly banded. This dramatic change in sediment character is coincident with decline of local native forests approximately 920 yr BP and the first human settlement of Oahu.