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Paleolimnology and Natural Versus Anthropogenic Influx During the Late Holocene from Vembanad Wetland, Ramsar Site, Kerala, India

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Abstract: A multi-proxy study of diatoms, palynofacies, and grain size was conducted on a 100 cm core from Arookutty, Vembanad wetland, Kerala, India, to reconstruct paleolimnological changes during the late Holocene, with a focus on natural versus anthropogenic influences. Four distinct depositional phases, from ca. 500 BCE to ca. 400 CE, were identified, aligning with the Roman Warm Period (RWP). The period from ca. 500 BCE to ca. 450 BCE shows high freshwater and marine planktic diatoms, augmented by silicoflagellates and terrestrial organic matter, with a low dinocyst presence, suggesting a dynamic aquatic environment. The period from ca. 450 BCE to ca. 350 BCE is marked by a high sand content, indicating significant runoff and terrestrial influx, along with increased freshwater and marine planktic diatoms and evidence of human activity in the area. Similarly, the period from ca. 350 BCE to ca. 50 CE is characterized by high sand content and strong anthropogenic influences, with a rise in silicoflagellates, pointing to rising sea levels and high monsoonal precipitation. The period from ca. 50 CE to ca. 400 CE initially shows a decrease in sand and an increase in mud, reflecting a weakening southwest monsoon, likely due to solar variations. However, from ca. 300 CE to ca. 400 CE, sand content rises again, accompanied by high terrestrial influx and dinocysts, while silicoflagellates diminish completely. Thus, despite the dominance of the RWP, the coastal region experienced an extended period of reduced monsoonal activity for a particular span.

Keywords: diatoms; palynofacies; grain size; Vembanad wetland; Roman Warm Period (RWP); India

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1. Introduction

The Holocene epoch, the most recent geological period, has experienced significant climate variability and relative sea-level fluctuations, marked by rapid changes, such as polar cooling, increased aridity, and shifts in atmospheric circulation [1,2]. These global climatic oscillations have been documented in various records, including the Greenland ice cores [3,4], deep sea cores from the North Atlantic [5,6], the Mediterranean [7,8], the Tropical Atlantic [9,10], and the Antarctic regions [11,12], as well as in lake sediments [13,14],