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Paleo-environmental evolution of Ratgama lagoon in Galle during the Holocene and abrupt coastal events

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Studying paleo-coastal environmental changes is important to understand the susceptibility of coastal systems to regional and global climatic and sea level changes, as well as to comprehend the impact of rapid abrupt events such as the 2004 Indian Ocean tsunami. This study aims to reconstruct the Holocene paleo-environental evolution of Ratgama lagoon in Galle in order to understand the past environmental conditions and sea level variations in the South-Western coast of Sri Lanka. Two sediment cores (RG1-260 cm and RG2-128 cm) were retrieved from Ratgama lagoon in proximal and distal locations relative to the present coastline. Textural properties of sediments including grain size and shape, chemical composition, gamma ray intensity, loss on ignition and micro and macro fossil content were used to infer the depositional environments, and provenance of sediments. Grain size, chemical composition and gamma ray intensity were analyzed at a 1 cm interval while organic matter content was analyzed at a 2 cm interval by loss on ignition. Ages of the recognized events were estimated using a published ^{14}C age-depth model. Based on proxy evidences three stratigraphic units could be recognized in both cores. Core RG1 contains unit II and unit III while core RG2 has unit I and unit II. Units III and I represent a closed lake system with less marine influence while Unit II represents a lagoon / bay with direct marine influence. Stratigraphic sequence and approximate ages derived from the published age model show that the Ratgama lake started flooding around 6200 yrs BP by the Holocene transgression and existed as a lagoon / bay, having a direct connection to the sea, till about 2800 yrs BP. Sea level stabilization or regression promoted emplacement of a barrier bar, ending the marine influence in to the lake. Beside the 2004 tsunami sand layer, a thick sand layer having evidence for a similar tsunami event that occurred approximately 3750 yrs BP, is found in both cores. Two more abrupt sand layers, which could also be recognized as possible tsunami horizons, were also identified in core RG2. According to the age estimates, these events correlate with local and regional records.

Keywords: Holocene, paleo-environment, sea level variation, stratigraphic unit

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