

# Depositional Characteristics and Accumulation Model of Peaty Sediments in the Southwest Coast of Sri Lanka

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Tropical peat lands are a major terrestrial carbon sink during the Holocene, but there is considerable uncertainty in the accumulation of carbon in a changing climate. In this study, our objective was to measure baseline carbon cycling data for understanding depositional mechanism and peat accumulates in the southwest coast of Sri Lanka. Sedimentary facies were identified using a representative peat core sample (54 cm in depth) at Telwatta. Geochemical characteristics of peaty sediments were determined using proximate, X-ray diffraction (XRD), Fourier-transform infrared spectroscopy (FTIR), atomic absorption spectroscopy (AAS) analyses. Chronology was determined using accelerated mass spectrometry (AMS)  $^{14}\text{C}$  data for a coral sample at International Chemical Analysis Inc laboratory, USA. Core log data indicate mainly clayey peat deposit under minerogenic sediments and coral fragments, suggesting an ancient buried peat land. Temporal variations of moisture (range from 1.55 to 16.89%), ash (range from 88.66 to 99.43%), and volatile (range from 6.27 to 14.03%) contents show an irregular distribution with depth. However, total organic carbon values drastically increase in the upper sedimentary succession (0-30 cm in depth, range from 2.40 to 3.58%, average =  $5.23\% \pm 0.01$ ) compared to lower sedimentary succession (range from 3.69 to 4.14%, average =  $4.10\% \pm 0.01$ ), suggesting that reduction of microbial activity and decomposition rates with the depth. The calculated humification index based on FTIR peak intensities suggests that sapric humus condition in the upper sedimentary succession (Humification Index-H1) due to plant remain easily identifiable and no amorphous material. XRD analysis indicates the calcite ( $26.8^\circ$ ) and aragonite ( $20.9^\circ$ ) phases in coral samples. Fe range from 65.24 to 212.50 ppm) element distributions in core samples suggest the development of the anoxic and acidic condition of core samples. Radiometric dating of the inland coral fragment at 23 cm in depth is 3435 cal yr B.P., reflecting inland coral formation during the middle Holocene sea-level rise over the southwest coast. In summary, southwest coast of Sri Lanka was characterized by long-term carbon sequestration after middle Holocene seawater invasion, at the rate of 0.07 mm per year under the warmest climate regimes.

*Keywords:* Carbon sequestration, Holocene, Sea-level changes, Tropical peat land