



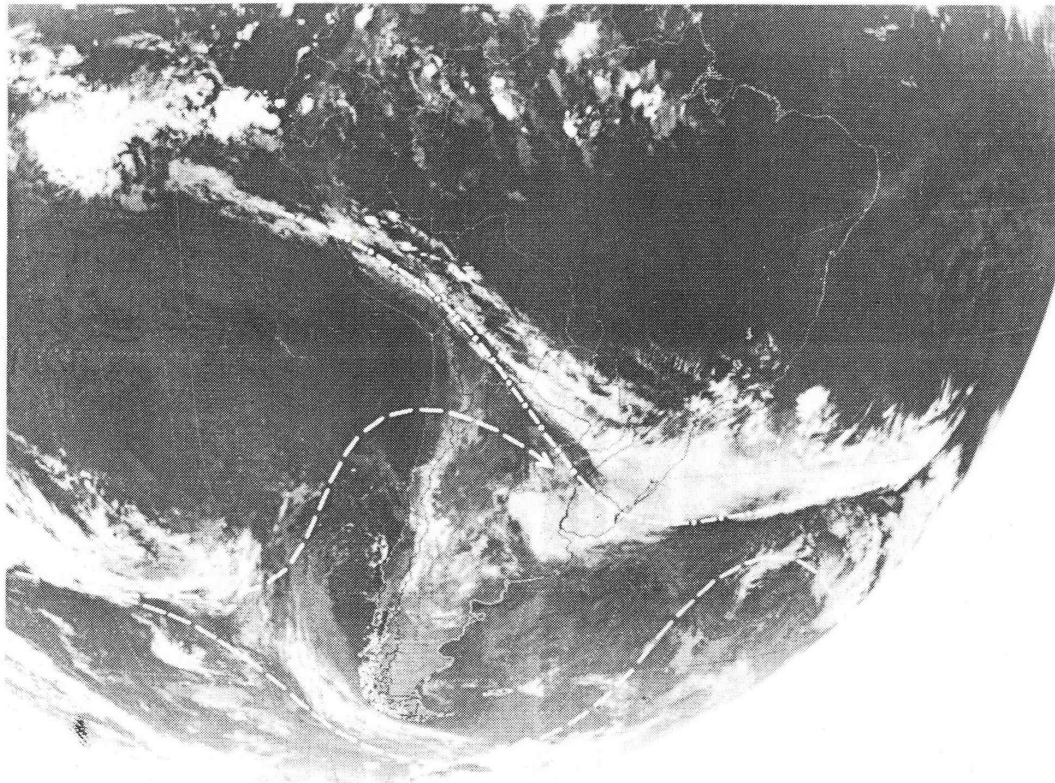
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COASTAL LANDFORMS DURING THE HOLOCENE EPOCH IN  
 SRI LANKA: ARE THEY COMPARABLE TO THOSE IN BRAZIL AND VENEZUELA?

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Coastal landforms in Sri Lanka exhibit considerable diversity according to their formative processes and regional variations of climate and geological structure (Katupotha 1988 a). Coral reefs, beachrock and mangrove swamps are specific features particularly characteristic of tropical coasts that are found in Sri Lanka. The tides around Sri Lanka are micro-tidal, ranging from MLWS at -37 cm and MHWS at +40 cm from the MSL (data based on Colombo datum level 38 cm below MSL). The phases of the tides have an obvious influence on the existence of living corals, tidal flats, marshes, mangrove swamps and shoals of beachrock. These features can be used as indicators of paleo sea levels and have historical and economic value of national interest.

Coral reefs in Sri Lanka are mainly of the fringing type. These formations occur along a) the southwestern coast from Ambalangoda to Matara, b) the eastern coast from Kalkudah to Periyamunai Point, c) the northeastern coast at Nilaveli and d) the northern coast at Keeramalai. Two barrier-like reefs occur at Vankalai and Silavaturai along the northwestern coast. The present living corals in front of Hikkaduwa, on the SW coast thrive from MLWS to 4 m in depth in lagoon reef area and 8 m in fringing reef areas with well-developed zonation (Mergner and Scheer, 1974).

Well developed buried coral deposits and extensive emerged shell deposits can be seen on the SW and south coasts and stretch 250 m to several kilometres inland from the present shore. These deposits are widely used in the manufacture of lime and chemicals and as chicken grit. Coates (1935) identified these buried coral deposits as debris, ca 6 m in thick that had been accumulated by storm waves. Deraniyagala (1958) observed that those corals were reefal in origin. <sup>14</sup>C dates of buried corals from southwest coast in several locations reveal that the upright branching and

massive corals thrived in inland bays or lagoons following the Holocene marine transgression (Katupotha, 1988 b, 1988 c, 1988 d). Dates from emerged coral reef patches (growth position) of SW and south coasts grouped into two categories: mid-Holocene ( $6,170 \pm 70$  -  $5,170 \pm 70$  yr B.P.) and Late Subboreal ( $3,210 \pm 70$  -  $2,330 \pm 60$  yr B.P.). When comparing the ages and the heights of the above mentioned 31 coral samples with the present MLWS level, it can be observed that the former MSL in both groups was at least 1 m or more higher than the present level (Katupotha, 1988 c).

Dates of fossil shell deposits at the rims of emerged coastal embayments and lagoon floor along the southern coast vary between  $5,780 \pm 120$  and  $3,570 \pm 60$  yr B.P. It is indicated that the marine shells lived in a intertidal zone which extended 3 km or more from the present shore. Deposition and composition of those deposits show that the accumulation has been caused by three processes viz; i) the bulk of valves were piled up by wave action on the emerged coastal embayments in the mid-Holocene; ii) following the coastal progradation since Late Holocene (Late subboreal), the former lagoons gradually became dry beds, and shell was deposited in situ in the floors of marine or brackish pools and iii) the shells on the coastal low hilly areas and dune areas had been discarded by early inhabitants in the course their daily activities (Katupotha, 1988 c).

Weathering conditions, colour, constituents of the sand and height of the barrier ridges in the coastal lowlands of western part of Sri Lanka show four stages of parallel ridges during the Late Pleistocene and Holocene Epochs (Katupotha, 1988a). To the east of old ridges in stage I, the 'Red Earth' formation has been deposited by wind action following the lowering of sea levels during the Late Pleistocene and Early Holocene. It is suggested that the wetlands and beach ridges particularly in stages II, III and IV were formed gradually as result of the minor oscillations of sea level (temporary still-stand) since mid-Holocene.

Martin & Suguio (1978) have identified two categories of sea levels that were located at elevations higher than the present sea level which occurred 5,100 and 3,500 years ago, with two generations of Holocene beach ridges at Comprida Island. Besides, the relative sea level which has been subjected to two maxima ca 5,000 and 3,300 yr B.P. and to a minimum ca 3,800 yr B.P. along the coast of the State of São Paulo, Brazil during the past 6,000 years (Suguio *et al.*, 1979). Those reports emphasized that the beach ridges and wetlands of some parts of Brazilian coast have been formed following the



lowering of sea level after the mid-Holocene. The author inferred that the climatic conditions and the evolution of beach ridges during the Late Pleistocene and Holocene Epochs in Sri Lanka was similar or somewhat similar to the evolution of beach ridges along the tropical coast of Brazil.

Formation of beachrock is related to the ground water table and to the level of the sea and can be used as an indicator to the changing paleo sea levels. The collection of materials for radiometric dating, the obtaining of proper dates and the interpretation of dates are the major problem of sea level studies in the use of beachrock of high tidal range. But, it provides a useful indicator of paleo-HAT (Hopley 1986). Shoals of beachrock are exposed along the west, SW, south and east coasts in Sri Lanka, and are predominately cemented by biogenic carbonate sands, quartz grains and heavy minerals. They are of variable extent and size, and have been previously designated as 'coastal sandstones' (Coates 1935) and 'sandstone reefs' (Cooray 1967). Calcareous algae and marine shells from exposed beachrock on the west coast of Sri Lanka are dated as Late Holocene (Late Subboreal) and it is inferred that one stage of coastal progradation had begun after the above period (Katupotha, 1988 b). It is suggested that the beachrock reefs at different levels on the western continental shelf represents an age sequence during the Holocene Epoch.

Several lines of sandstone reefs occur along the Pernambuco on the NE coast of Brazil. In addition to the sandstone reefs the recent sediments consist mainly of fluvial and lacustrine deposits, beach and dune sand and mangrove muds. Mabesoone (1964) regarded that the age of these reefs must be Recent, as a consequence of the Holocene sea level rise and every line represents a temporary still-stand. There is possibility that the reef morphology and the evolution of adjacent coastal sediment environments are similar to those found along the west coast of Sri Lanka.

Evidences of sunken forests, submerged channels of some larger rivers and well-marked submerged beachrock and coral reefs at different levels on the continental shelf and buried coral deposits, emerged coral reef patches and shell deposits, Red Earth etc. prove that there have been paleo sea level changes in Sri Lanka. Similar paleo sea level changes can be found along many tropical coasts of Central and South America, Africa, South and SE Asia and Australia. But it is very difficult to compare such changes morphologically and chronologically, with that of the recorded evidences of many other countries due to the absence of detailed large scale bathymetric charts around

Sri Lanka and the lack of facilities for collection of samples and radiometric datings. Therefore, these areas need further research with help from IGCP and INQUA this task can be accomplished.

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