Rapid land building activity along Vedaranniyam coast and its possible implications

The great Indian epic 'Ramayana' says that 'Lord Rama' has tried to cross over the Bay of Bengal so as to reach Sri Lanka from India three points along the southeastern fringe of the Indian coast. Firstly, he is said to have tried to cross from Vedaranniyam which is mythologically called as 'Kodiyakkara', secondly from Manamelkudi and finally crossed over to Sri Lanka from Rameswaran Island (Figure 1), as the former two coastal locations were widely separated from Sri Lanka by Bay of Bengal and the Rameswaran Island was nearer to Sri Lanka during that period. But, the recently acquired satellite data shows the huge accretion of sediments and rapid land building activity off Vedaranniyam coast (Figures 2 and 3). The geomorphic interpretations carried out using IRS 1A imagery and 14C and archaeological dating of such geomorphic features have shown that such ongoing sediment accretion phenomena off Vedaranniyam nose might in future connect the Vedaranniyam part of Indian peninsula with Jaffna peninsula of Sri Lanka if the sediment accumulation continues unabated. The sediment accretion in this area, therefore, requires detailed studies particularly in the context of the contemplated 'Sethumadram Project' for navigation through the Palk strait (Figure 1).

The Vedaranniyam area forms a spectacular triangular shaped coast in the southeastern part of India (Figures 1 and 2). The IRS 1A satellite data (Figure 2) shows rows of beach ridges (palaeo beaches) along a coastal length of 31 km from Chettipulam in the NNW to Kodiyakkara in the SSE. The digitally processed IRS 1A image (band 2, density sliced data) of 1990 shows offshore sand bars upto 27 km southeast of Vedaranniyam nose (Point Calimere) inside the sea.

Shell samples were collected from 1.2 to 3 m depth from four beach ridge complexes from NNW to SSE, at Chettipulam,
Maranganallur, Tettagudi and Kodiyyakkarai which are respectively 32 km, 22 km, 19 km and 1 km from the present day coast (Figure 2).

Existence of beach ridges upto Chettipuram indicates that the sea might have been upto Chettipuram and regressed to Kodiyyakkarai in the recent past. $^{14}$C dating of beach ridge at Chettipuram (1, Figure 2) shows an age of 6085 ± 223 y.B.P., at Maranganallur (2, Figure 2) 5646 ± 223 y.B.P., Tettagudi (3, Figure 2) 3370 ± 205 y.B.P. and Kodiyyakkarai (5, Figure 2) 1020 ± 80 y.B.P. The Vedaraneswarar temple located over the beach ridge at Vedaranmammal (4, Figure 2) suggests an approximate age of 1300 y.B.P. (7th century A.D) to the ridge here. The density slicing of IRS 1A band 2 data shows that the offshore bars have developed up to 27 km inside the sea (2, Figure 3), and as this data was obtained in 1990, it is reasonable to assume the same age to these offshore bars.

The $^{14}$C dates evaluated for the beach ridges show that the sea has gradually regressed due to the rapid accumulation of sediments and the development of cuspatte landforms in between Chettipuram and Kodiyyakkarai during these 6000 years. Our data has shown that the sea has regressed by 10 km in 439 years from Chettipuram to Maranganallur, by 4 km in 2076 years from Maranganallur to Tettagudi, by 8 km in 2270 years from Tettagudi to Vedaranmammal, by 8 km in 220 years from Vedaranmammal to Kodiyyakkarai and by 28 km in 1020 years from Kodiyyakkarai to present day offshore bars. These show that the beach ridges have grown at the approximate rate of 23 m/y (metres/year) from Chettipuram to Maranganallur, 2 m/y from Maranganallur to Tettagudi, 3.5 m/y from Tettagudi to Vedaranmammal, 36 m/y from Vedaranmammal to Kodiyyakkarai, 27.5 m/y from Kodiyyakkarai to the recently developed offshore bars of 1990. The above observations show that there is no strict linear relation between the rate of sediment accretion and the time period. Indeed, under such dynamic coastal regimes, linear relationship cannot be expected because of varying degrees and duration of the fluvial and physical oceanographic processes. But, however in average (excluding Maranganallur to Tettagudi and Tettagudi to Vedaranmammal) the land building activity is around 29 m/y and if this accretion rates maintained Vedaranmammal hose will get connected to Jaffna peninsula, just 12 km from the offshore bars (2, Figure 3), in another 400 years. Regionally from Chettipuram to present day offshore bars, the land has grown to a distance of 58 km in 6085 years, at an average rate of 10 m/y. At this rate the offshore bars will provide a land con-
The sediment building activity due to littoral currents seems to be very rapid in this area with the rate of 29 m/y and hence there is a possibility for such land building/connection in another 400 years. Ramasamy and Balaji\textsuperscript{2} on the basis of satellite imagery interpretation have identified that the Mio-Pliocene sandstone of Vedaranniyam area is undergoing an upliftment in post Mio-Pliocene period. Ramasamy et al\textsuperscript{3} have observed an anticlockwise rotational migration of Cauvery river in the area north and northwest of Chettipulam-Kodyakkarai during 2300–750 y.B.P. and attributed this to the ongoing upliftment of Mio-Pliocene sandstone and the resultant sediment accretion in Chettipulam-Kodyakkarai area. Ramasamy and Karthikeyan\textsuperscript{4} have observed further geomorphic and hydrogeochemical anomalies favouring ongoing land emergence in Vedaranniyam area. It is obvious therefore, that the tectonic upliftment has contributed substantially for such sediment accretion brought by littoral currents in Kodyakkarai–Jaffna peninsular sector and hence it can be confidently said that Vedaranniyam land segment will get connected with Jaffna peninsula ultimately.


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connection with Jaffna peninsula in another 1200 years. The graphical projection of the locations of the beach ridges versus their ages has shown a coarse linear relationship indicating that the Vedaranniyam nose will get connected with Jaffna peninsula in another 2400 years (Figure 4).