

## **Foot of the Continental Slope of Sri Lanka**

***Dhammika A. Tantrigoda and M.M.P.M. Fernando,***  
*Department of Physics,*  
*University of Sri Jayewardenepura, Nugegoda.*

*Received on : 11-02-04*

*Accepted on : 12-18-04*

### **Abstract**

Foot of the continental slope of Sri Lanka has been determined using satellite bathymetry information downloaded from NOAA database (<http://topex.ucsd.edu>) employing the second derivative method. Foot of the continental slope of Sri Lanka is situated at an average distance of about 47 km. Its maximum and minimum distances from the zero height contour are 127 km. and 16 km. Almost 70% of the foot of continental slope occurs in the depth range of 2600 -3800 m.

**Key words : Continental Margin, Continental Slope**

### **1. Introduction**

United Nations Convention on the Law of the Sea (UNCLOS) provides a comprehensive legal and scientific framework for addressing various issues related to oceanic areas ( United Nations, 1983, 1993). One of the most important achievements of UNCLOS is the successful formulation of a set of criteria that determines the sea area that a maritime country can claim.

Continents and oceans are two geologically different large regions interfaced by a smaller region known as the continental margin. A Continental margin consists of three morphologically distinct parts called continental shelf, slope and rise. Continental margin is generally considered as the natural prolongation of the land territory, which is submerged under water. Therefore a maritime country should have the right to claim the sea area up to the outer edge of the continental margin. This position has been accepted by the UNCLOS and has been explicitly stated so in the paragraph 1 of the article 76. A technically sound as well as legally acceptable method of delimiting the outer edge of the continental margins has been given in the paragraph 4(a) of the article 76 of the convention. This method can be used successfully to delimit outer edge of the continental margins of many coastal states. However, it has been pointed out that application of article 76 would give rise to inequitable results to states such as Sri Lanka in the southern part of the Bay of Bengal in view of the special nature of morphology of their continental shelves. In response to submission made by the government of Sri Lanka with regard to this

situation a special method of establishing maritime boundaries for countries south of Bay of Bengal, which satisfy certain conditions, has been formulated during the Third United Nations Conference on the Law of the Sea held in 1982. This special method and relevant conditions have been incorporated in the Annex II of the final act as a statement of understanding.

When a maritime country is demarcating its maritime boundaries either using the article 76 or the Annex II, it is first necessary to determine the foot of the continental slope of the adjacent sea area. This is because most of the measurements related to the demarcating of maritime boundaries have to be made from the foot of the continental slope. The following section describes a study carried out to determine the position of the foot of the continental slope of Sri Lanka in view of its importance in demarcating the maritime boundaries of Sri Lanka.

## **2. Determination of foot of the continental slope of Sri Lanka**

There are different methods of determining the foot of the continental slope. Some are based on the knowledge of the Geology and Geophysics (Talwani and Eldholm, 1973; Talwani, 1989; Arkani-Hamed, 1993) and others are based on the knowledge of bathymetry. Foot of the continental slope of Sri Lanka has been determined using the knowledge of the bathymetry of the surrounding Indian Ocean. This method assumes that the point at which a bathymetry profile undergoes maximum change in slope as the foot of the continental slope. This point can be identified as the point that the second derivative of a bathymetry profile takes a maximum value (Shimeld, 1997). Usually several secondary maxima can be observed in the second derivative profile and therefore the correct maximum has to be selected carefully.

Available ship-borne bathymetry information is not sufficient for the present study. Therefore bathymetry information derived from geoidal undulation measurements made by artificial satellites (<http://topex.ucsd.edu>) was used. Reliability of satellite-derived data was first checked by comparing with the available ship-borne data and found they are in very good agreement. The point at which the foot of the continental slope of eighty-five bathymetry profiles occurs were determined using the second derivative method. A smooth line that passes through these points can be considered as the foot of the continental slope of Sri Lanka and it has been depicted in Fig 1.

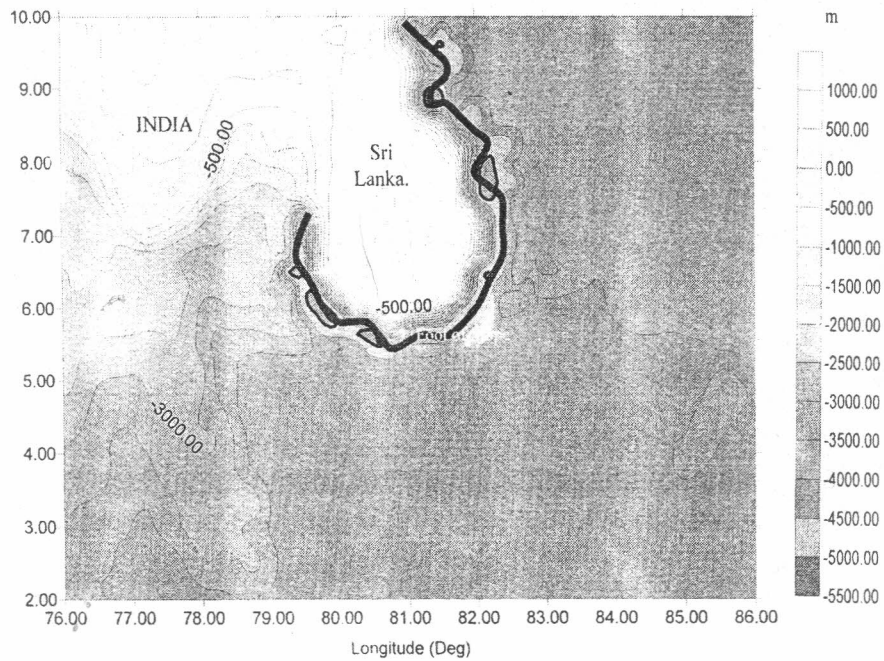
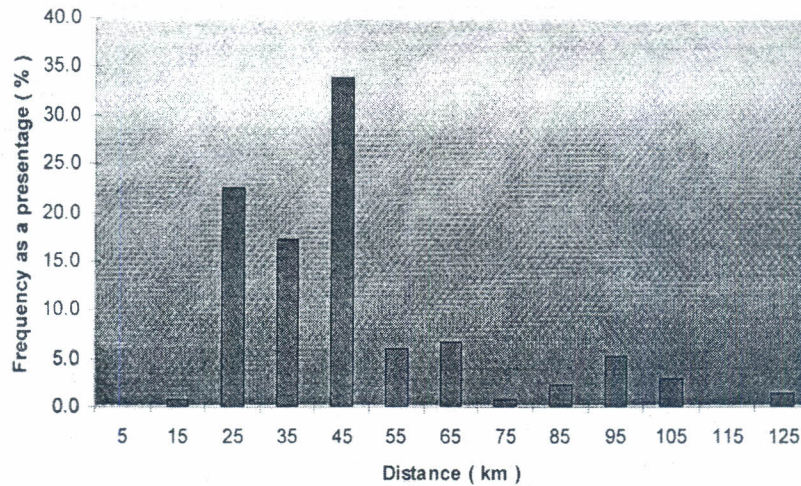


Fig. 1 Foot of the continental slope of Sri Lanka.

### 3. Discussion

As can be seen from Fig.1 foot of the continental slope of Sri Lanka is situated very close to the zero height contours or the coastal line. Distribution of distance of foot of the slope from the zero height contour is depicted in Fig. 2 and Table 1. It is clear from this histogram that almost 60% of the length of the line along which foot of the continental slope occurs is situated in the distance range of 35 km to 50 km from the zero height contour. Maximum and minimum values of this distance are 127 km and 16 km respectively while its average value is 47 km. Maximum distance occurs in the NE side of the island of the coast near Trincomalle while minimum distance occurs SE side of the island off the coast between Hikkaduwa and Galle.

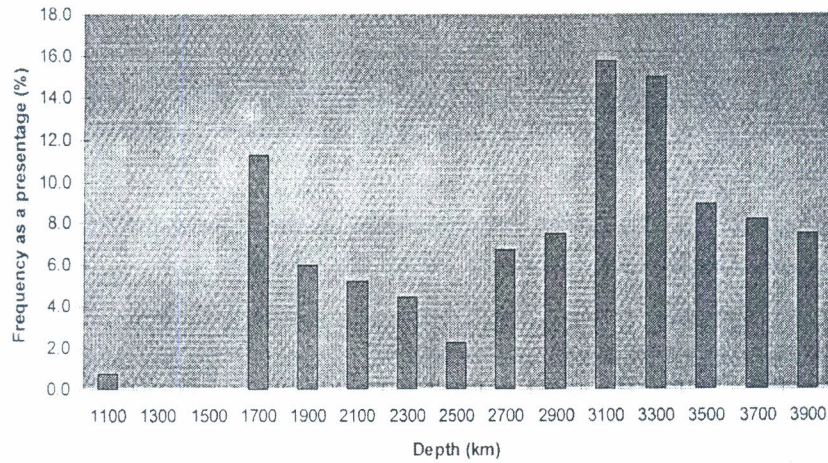
Fig. 2 Distribution of the distance from the baseline to the foot of the continental slope of Sri Lanka.



Distance (km)	Frequency
0.0-10.0	0
10.0-20.0	1
20.0-30.0	30
30.0-40.0	23
40.0-50.0	45
50.0-60.0	8
60.0-70.0	9
70.0-80.0	1
80.0-90.0	3
90.0-100.0	7
100.0-110.0	4
110.0-120.0	0
120.0-130.0	2
	133

It was further observed that the depth at which the foot of the continental slope occurs also varies around the island. Distribution of these depths is given in the histogram of Fig. 3 and Table 2. As can be seen from this histogram that almost 70% of the depth at which foot of the continental slope occurs is in the range 2600m to 3800 m. Maximum and minimum values of these depths are 3990 m and 1155 m respectively and its average value is 2846 m.

Fig. 3 Distribution of the depths at which the foot of the continental slope of Sri Lanka occurs.



Depth (m)	Frequency
1000-1200	1
1200-1400	0
1400-1600	0
1600-1800	15
1800-2000	8
2000-2200	7
2200-2400	6
2400-2600	3
2600-2800	9
2800-3000	10
3000-3200	21
3200-3400	20
3400-3600	12
3600-3800	11
3800-4000	10
	133

#### 4. Acknowledgement

Authors wish to thank the National Science Foundation of Sri Lanka for providing the financial assistance for this study (Grant no. RG/2000/P03)

## **5. Reference**

Arkani-Hamed, J. 1993. The bulk magnetization contrast the ocean-continent boundary in east coast of North America. *Geophysical Journal International*, 115. 152-158.

Shimeld, J. 1997. Estimating the maximum change in bathymetric gradient: A study in support of the United Nations Law of the Sea, Article 76. Internal Report, Geology Survey of Canada.

Talwani, M. and Eldholm, O. 1973. Boundary between continental and oceanic crust at the margin of rifted continents, *Nature*, 241, 325-331.

Talwani, M. 1989. Ocean-continent transition: Structure, In James, E.D.(ed.), *Encyclopedia of Solid Geophysics*, New York.

United Nations, 1983. *United Nations Convention on the Law of the Sea*, New York.

United Nations Division for the Ocean Affairs and Law of the Sea, 1993. *The Law of the Sea: Definition of the Continental Shelf*, New York.