Department of the Interior

U.S. Geological Survey

# Surficial Sediments along a Shore Normal Profile of Central Isles Dernieres, Louisiana

by

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## Introduction

Coastal Louisiana has the highest rate of shoreline erosion in the United States (Sallenger and others, 1987). The physical attributes and geological processes of barrier islands along the central Louisiana Gulf coast are currently the center of comprehensive investigation being conducted jointly by the U.S. Geological Survey and the Louisiana Geological Survey. Of particular interest is the barrier island group of Isles Dernieres (Fig. 1), which is eroding at the rate of 0.33 square kilometers per year (Penland and Boyd, 1985).

The Isles Dernieres barrier island group lies off the central coast of Louisiana approximately 128 km south-southwest of New Orleans (Fig. 1). This barrier island chain is approximately 35 km long and extends from Wine Island/Cat Island Passes on the eastern end to Raccoon Point on the western end. The islands in this group range in width from 0.5 to 2 km and have very low relief (<1.5 m). The Isles Dernieres barrier island group is a consequence of the early LaFourche delta of the Mississippi River (Frazier, 1967). The geological development of the islands has been described in detail by Penland and Suter (1983).

Central Isles Dernieres (Fig. 2), the largest island of this chain, was the location of a beach and nearshore surficial sediment study. For this study a Temporary Bench Mark (TBM) was established as the central point of a shore normal profile as described by Circe' and Holland (1987). The profile serves as a reference for periodic changes in elevation and sediment characteristics. This report describes the textural analysis of the surficial sediments along the Central Isles Dernieres shore normal profile.

## Methods and Data Presentation

A suite of 21 samples was taken along the beach and nearshore area of Central Isles Dernieres in May 1987. The samples were collected along a transect corresponding to the established topographic/bathymetric profile which extended from the lagoonal side of the island, across the island, and offshore to a distance of 1162.7 m from the TBM (Fig. 2). The samples were collected by hand using a 15 cm long plastic tube, 3.8 cm in diameter. Any water collected with the samples was retained in order for the fine-grained fraction to settle and be analyzed.

Laboratory analysis included wet-sieving the entire sample through -1 phi and +4 phi sieves. Wet-sieving was done using a disaggregation/dispersion solution of 5 percent sodium hexametaphosphate (Calgon). The sand fraction was analyzed using a Rapid Sediment Analyzer (Schlee, 1966; Poppe and

Figure 1. Index map showing the location of Isles Dernieres barrier island group on the central Gulf coast of Louisiana (from Circe' and Holland, 1987).

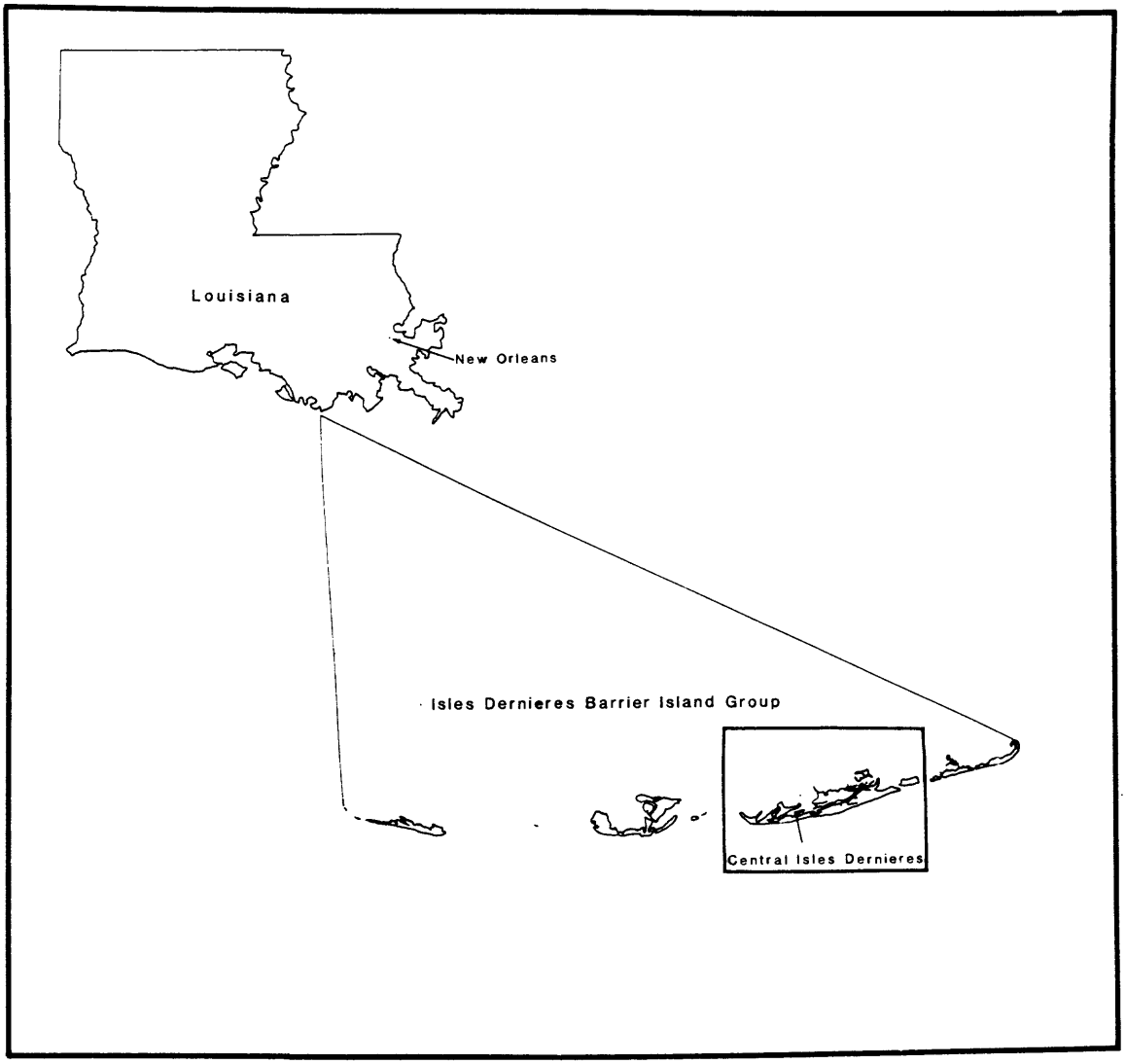
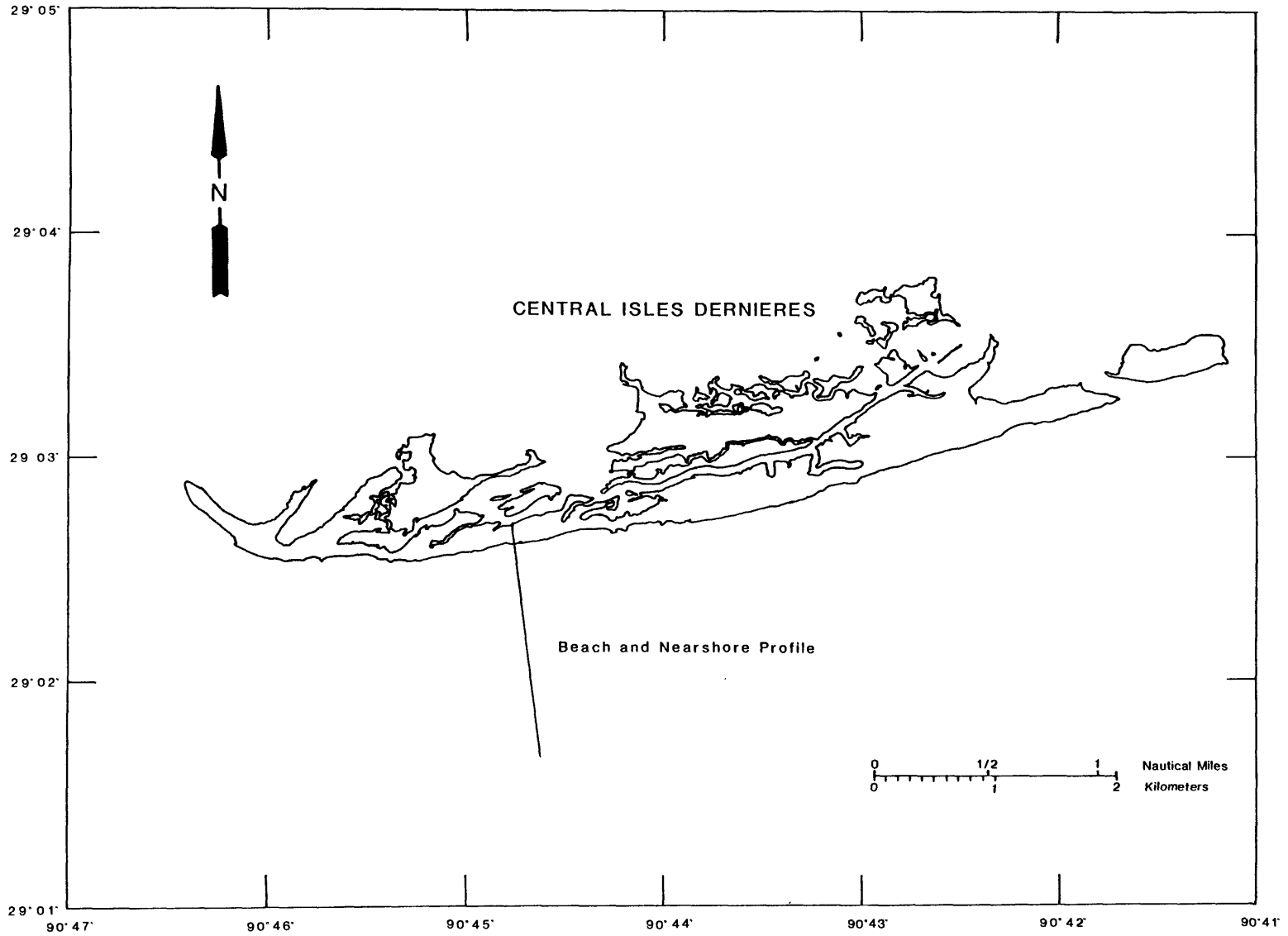

Louisiana
New Orleans
Isles Dernieres Barrier Island Group
Central Isles Dernieres

Figure 2. Central Isles Dernieres with location of shore normal profile (modified from Circe' and Holland, 1987).


29° 05'
29° 04'
29 03'
29° 02'
29° 01'
90° 47'
90° 46'
90° 45'
90° 44'
90° 43'
90° 42'
90° 41'
N
CENTRAL ISLES DERNIERES
Beach and Nearshore Profile
0
1/2
1
Nautical Miles
0
1
2
Kilometers

others, 1985). A Model TA II Coulter Counter was utilized for the silt/clay fractions following techniques described by Shideler (1976).

The results of the laboratory analyses are shown in Table 1 which lists the percentages (by dry weight) of the total sample for sand, silt, and clay. Mean grain size and standard deviation (sorting) values are also given.

The profile of the beach and nearshore areas is presented in Figure 3 a. Offshore profile and sample locations are not shown. The distances are in meters from the TBM. Elevations (above and below mean sea level) are also in meters (Fig. 3a). The textural composition of the samples collected along the shore normal transect in the beach and nearshore areas are shown in Figure 3 b, c, and d. Percentages have been plotted on a log scale and are calculated on a dry weight basin. Mean grain size and sorting values (standard deviation) of the transect samples in the beach and nearshore are shown in Figure 3 e and f.

## Conclusion

The plots characterize the beach and nearshore transect as a predominantly well-sorted fine sand. Areas of poorly-sorted sandy-silt occur in the nearshore troughs. Offshore samples were generally very fine sand and only moderately sorted.

Table 1. Location and grain size analysis of samples. Distance is in meters measued from the TBM (negative numbers are landward of TBM): the values for each sediment classification are the percent dry weight of the sample. Mean grain size and standard deviation are expressed as phi values. Sediment classification is from Folk, (1974).

| sample | distance | % sand | % silt | % clay | mean grain size | standard deviation |
|---|---|---|---|---|---|---|
| 87-01 | -50.00 | 98.80 | 0.87 | 0.32 | 2.65 | 0.51 |
| 87-02 | -40.00 | 99.12 | 0.76 | 0.13 | 2.53 | 0.33 |
| 87-03 | -30.00 | 99.21 | 0.71 | 0.08 | 2.41 | 0.55 |
| 87-04 | -20.00 | 99.38 | 0.51 | 0.11 | 2.61 | 0.30 |
| 87-05 | -10.00 | 99.43 | 0.46 | 0.11 | 2.55 | 0.45 |
| 87-06 | 0.00 | 99.58 | 0.32 | 0.10 | 2.50 | 0.49 |
| 87-07 | 10.00 | 99.63 | 0.31 | 0.06 | 2.62 | 0.26 |
| 87-08 | 20.00 | 99.42 | 0.48 | 0.10 | 2.56 | 0.42 |
| 87-09 | 30.00 | 99.71 | 0.26 | 0.03 | 2.58 | 0.36 |
| 87-10 | 40.00 | 99.14 | 0.64 | 0.21 | 2.66 | 0.44 |
| 87-11 | 99.10 | 96.99 | 2.68 | 0.33 | 2.97 | 0.65 |
| 87-12 | 108.60 | 66.62 | 30.86 | 8.80 | 4.48 | 1.93 |
| 87-13 | 111.50 | 90.34 | 2.92 | 0.46 | 3.03 | 0.72 |
| 87-14 | 126.00 | 98.18 | 1.62 | 0.21 | 3.16 | 0.57 |
| 87-15 | 146.00 | 95.77 | 3.56 | 0.67 | 3.21 | 0.78 |
| 87-16 | 190.80 | 33.93 | 57.76 | 8.31 | 4.91 | 1.75 |
| 87-17 | 577.80 | 94.25 | 4.81 | 0.94 | 3.53 | 0.75 |
| 87-18 | 701.00 | 90.63 | 8.14 | 1.23 | 3.60 | 0.89 |
| 87-19 | 852.30 | 86.54 | 11.89 | 1.57 | 3.78 | 0.93 |
| 87-20 | 980.00 | 90.53 | 8.18 | 1.29 | 3.59 | 0.91 |
| 87-21 | 1162.70 | 89.53 | 8.83 | 1.64 | 3.60 | 1.03 |

Figure 3. Topography and bathymetry offshore normal profile on Central Isles Derniers (a); percent dry weight distribution of sand (b); silt (c); and clay (d).

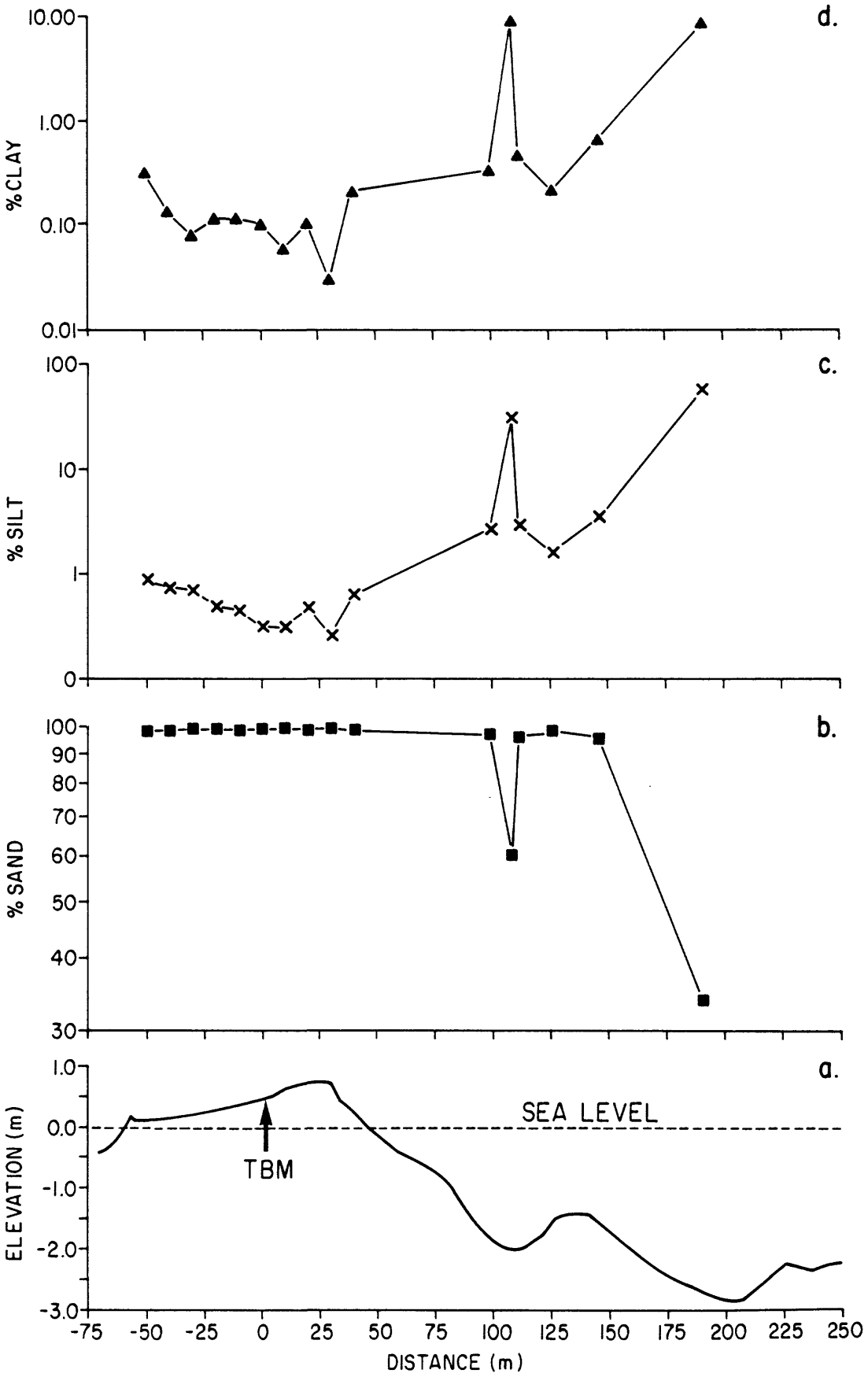
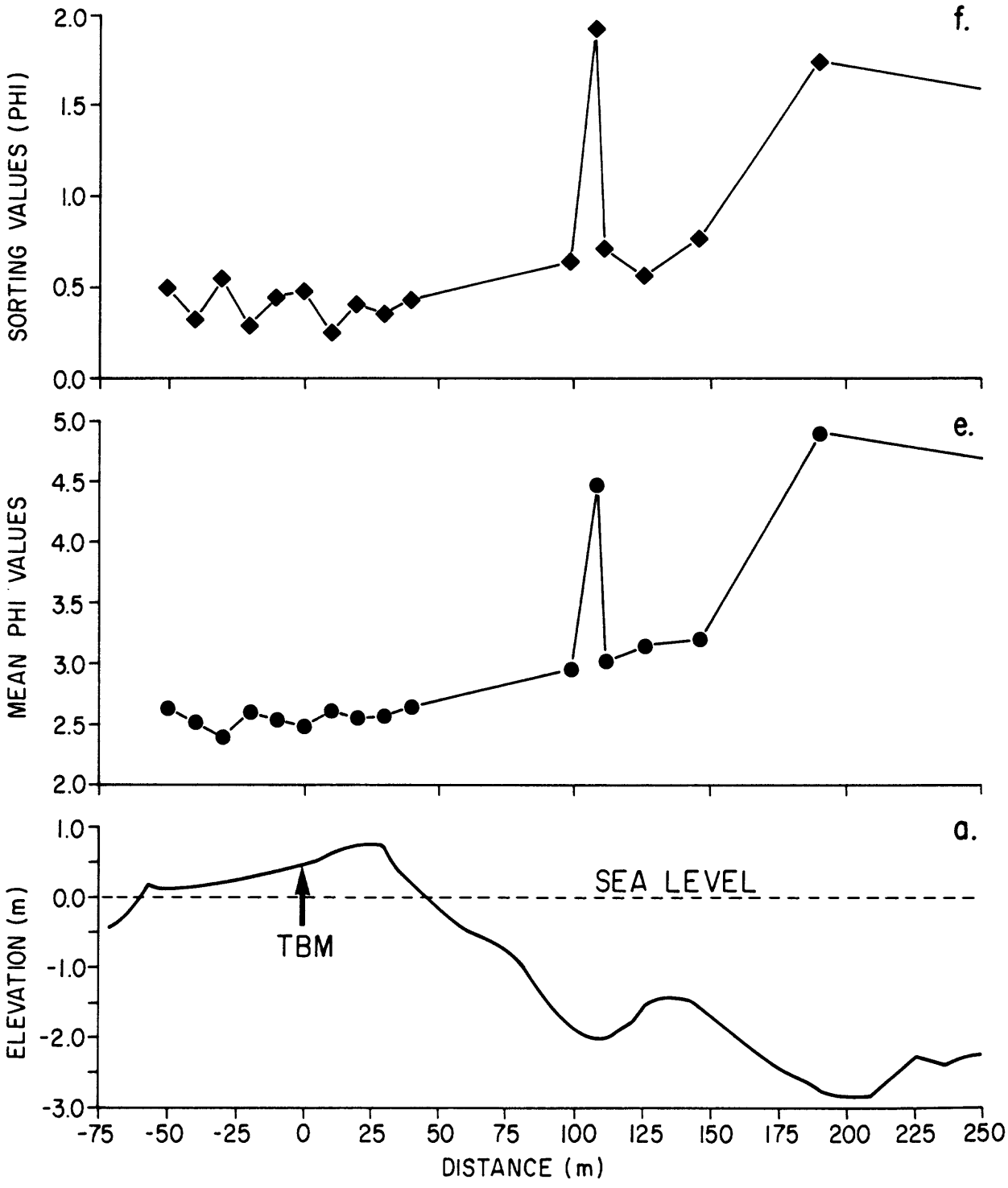

d.
10.00
1.00
0.10
0.01
% CLAY
c.
100
10
1
0
% SILT
b.
100
90
80
70
60
50
40
30
% SAND
a.
1.0
0.0
-1.0
-2.0
-3.0
ELEVATION (m)
SEA LEVEL
TBM
-75
-50
-25
0
25
50
75
100
125
150
175
200
225
250
DISTANCE (m)

Figure 3 (cont'd). The bathymetry and topography of the normal profile is shown in 3a. Mean grain size and sorting valves along the profile are presented in Fig. 3 e and f respectively.


f.
SORTING VALUES (PHI)
2.0
1.5
1.0
0.5
0.0
e.
MEAN PHI VALUES
5.0
4.5
4.0
3.5
3.0
2.5
2.0
a.
ELEVATION (m)
1.0
0.0
-1.0
-2.0
-3.0
SEA LEVEL
TBM
-75
-50
-25
0
25
50
75
100
125
150
175
200
225
250
DISTANCE (m)

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