RIVER MOUTH AND BEACH SEDIMENTS-
YANKEE POINT TO
HURRICANE POINT, CALIFORNIA

PART A. INTRODUCTION AND GRAIN SIZE ANALYSES

by

P. PAUSE
K. LESLIE
P. WILDE
and
P. HENSHAW

HYDRAULIC ENGINEERING LABORATORY
COLLEGE OF ENGINEERING

UNIVERSITY OF CALIFORNIA
BERKELEY
AUGUST, 1972
University of California  
Hydraulic Engineering Laboratory

Technical Report  
HEL-2-37

This work was supported by Contract 72-67-C-0015  
with the Coastal Engineering Research Center,  
Corps of Engineers, U.S. Army

RIVER MOUTH AND BEACH SEDIMENTS —  
YANKEE POINT  
TO  
HURRICANE POINT, CALIFORNIA

PART A - INTRODUCTION AND GRAIN SIZE ANALYSIS

by

P. Pause  
K. Leslie  
P. Wilde  
and  
P. Henshaw

Berkeley, California  
August 1972
17 of intertidal and stream samples from Monterey Bay - Point Sur Area are analysed for grain size properties. These samples were taken to provide source area information for the study of the offshore sediments of the Central California Continental Shelf. The data are presented graphically as cumulative weight percent curves and histograms with respect to grain size. The statistical parameters median, sorting coefficient, skewness and kurtosis are calculated for each sample.
INTRODUCTION

The following work is part of a continuing study of the sediments and sedimentary processes of the continental shelf of California done in cooperation between the University of California, Berkeley and the Coastal Engineering Research Center, U.S. Army Corps of Engineers. Sediment analyses of the samples were done at the University of California, Berkeley, utilizing the facilities of the Departments of Civil Engineering, and Geology, and the Institute of Marine Resources. The results of this study will be presented in three separate reports:

Part A Introduction and Grain Size Data (this volume)
Part B Mineralogical Data
Part C Interpretation and Summary of Results

The first two reports, Part A and B, raw data will be presented with little or no interpretation. In Part C the author's interpretation of the data plus background information and previous work in the study area will be given.
SAMPLE COLLECTION

The 17 samples used in this study were collected by P. Henshaw in the Spring of 1971. (See Fig. 1). The major purpose of this study is to provide samples for heavy mineral analyses which will be used to determine heavy mineral source areas; thus no attempt was made to statistically sample for grain size. As Trask (1956) has demonstrated, beach profiles and grain size distribution are seasonal and variable even on the same beach. The grain size data is to be used to determine the weight percent distribution in the most easily transported size, around 2mm, for correlation among samples as the heavy minerals of the sand fraction will be analysed as tracers and indicators of source area.

Approximately 0.5 to 1 liter of material was taken for each sample of which a split of about 200 grams were sieved for grain size analyses.
FIG. 1 SAMPLE LOCATIONS
BASE OVERLAY TO COAST AND GEODETIC SURVEY CHART 5402
Scale 1:210,668

CARMEL

Yankee Point

2401 Malpaso Cr.
2402 Soberanes Cr.
2404
2407
2406
2410
2408
2411
2414
2415
2417

Polo Canyon
Serrano Canyon
Los Piedras
Bixby Cr.

Hurricane Point

Little Sur Cr.

Pt. Sur

Big Sur R.

122°N
36°20'N

OCEAN

PACIFIC
Grain Size Analysis

The samples were sized through the following sieves in a Ro-Tap for ten minutes:

<table>
<thead>
<tr>
<th>U.S. Standard Mesh Number</th>
<th>Nominal Opening</th>
<th>Phi Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>3.962 mm</td>
<td>-2.0</td>
</tr>
<tr>
<td>8</td>
<td>2.362 mm</td>
<td>-1.25</td>
</tr>
<tr>
<td>10</td>
<td>1.981 mm</td>
<td>-1.0</td>
</tr>
<tr>
<td>14</td>
<td>1.397 mm</td>
<td>-0.5</td>
</tr>
<tr>
<td>18</td>
<td>0.991 mm</td>
<td>0</td>
</tr>
<tr>
<td>25</td>
<td>0.701 mm</td>
<td>+0.5</td>
</tr>
<tr>
<td>25</td>
<td>0.495 mm</td>
<td>+1.0</td>
</tr>
<tr>
<td>45</td>
<td>0.351 mm</td>
<td>+1.5</td>
</tr>
<tr>
<td>60</td>
<td>0.246 mm</td>
<td>+2.0</td>
</tr>
<tr>
<td>80</td>
<td>0.175 mm</td>
<td>+2.5</td>
</tr>
<tr>
<td>120</td>
<td>0.124 mm</td>
<td>+3.0</td>
</tr>
<tr>
<td>170</td>
<td>0.088 mm</td>
<td>+3.5</td>
</tr>
<tr>
<td>230</td>
<td>0.061 mm</td>
<td>+4.0</td>
</tr>
</tbody>
</table>

Data Format

The grain size information for each sample is presented in the following pages graphically as (1) a histogram where the width of each bar represents the size range considered and the height of the bar represents the weight percent of that size range; and (2) a cumulative frequency curve, which is a smooth curve drawn between points determined by adding weight percent values in successively smaller grain size classes. Points connected by dashed lines are
symmetrically extrapolated values and do not represent measured values.

Modes, or the order of frequency, are determined visually from the histogram, with the first mode being the size class with largest weight percent value.

Quartile and percentile values or grain size values at a given weight percent are determined visually from the cumulative curves and are used for calculating statistical measures below. The percentile and quartile subscripts given here indicate the percentage of the distribution coarser than the corresponding grain size value. For example, \( P_{10} \) refers to the grain size at which 10% of the distribution is coarser. This procedure does not conform to standard statistical usage but is less ambiguous for grain size work where by convention the cumulative curve is plotted in order of decreasing grain size, which is the reverse of statistical practice.

**Graphically Determined**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Grain Size at</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P_{10} )</td>
<td>10(^{th}) percentile</td>
</tr>
<tr>
<td>( Q_{25} )</td>
<td>25(^{th}) percentile (3(^{rd}) quartile)</td>
</tr>
<tr>
<td>( Q_{50} )</td>
<td>50(^{th}) percentile (2(^{nd}) quartile)</td>
</tr>
<tr>
<td>( Q_{75} )</td>
<td>MEDIAN</td>
</tr>
<tr>
<td>( P_{90} )</td>
<td>75(^{th}) percentile (1(^{st}) quartile)</td>
</tr>
<tr>
<td></td>
<td>90(^{th}) percentile</td>
</tr>
</tbody>
</table>
Calculated

\[ S_0 = \sqrt{\frac{Q_{25}}{Q_{75}}} \]

\[ S_k = \frac{Q_{25} - Q_{75}}{(Q_{50})^2} \]

\[ K = \frac{Q_{25} - Q_{75}}{2(P_{10} - P_{90})} \]

**SORTING COEFFICIENT:**
(Trask, 1932)
Degree of Scatter

**QUARTILE SKEWNESS:**
(Trask, 1932)
Symmetry of Distribution

**KURTOSIS:**
(Krumbein and Pettijohn, 1938, p. 238)
Comparison of Central Portion of Curve to Spread of Whole Curve
REFERENCES


SIZE ANALYSIS

Sample 2401
Sample description coarse grained granitic sand
Lat. 36° 28.90’N Long. 121° 56.16’W
Depth stream Fathoms
Malpaso Creek Meters Feet
Sample Weight 227.1 g

SIZE PARAMETERS

1st Mode 1.397 - 1.981 mm
2nd Mode 2.362 - 3.962 mm
3rd Mode

P_{10} 2.85
Q_{25} 2.05 mm
Median: Q_{50} 1.35 mm
Q_{75} 0.68 mm
P_{90} .325
Sorting Coef. 1.736
Skewness .765
Kurtosis .271
Mean
Sample 2402

Lat. 36°28.88'N Long. 121°56.23W

Depth Stream Fathoms
Malpaso Creek Meters

Sample description medium grained granitic sand

Sample Weight 195.6 g

Size Parameters

1st Mode 0.495 - 0.701 mm

P10 0.85

Q25 0.72 mm

Sorting Coef. 1.231

Median: Q50 0.57 mm

Skewness 1.053

Q75 0.475 mm

Kurtosis 0.269

P90 0.395

Mean
SIZE ANALYSIS

Sample 2403
Lat. 36° 28.85' N Long. 121° 56.25' W
Depth Intertidal Fathoms

Sample description fine grained
granitic sand

Sample Weight 181.2

SIZE PARAMETERS

1st Mode 0.351 - 0.495 mm  
2nd Mode
3rd Mode

P_{10} .60
Q_{25} 0.501 mm  Sorting Coef. 1.251
Median:Q_{50} 0.38 mm  Skewness 1.110
Q_{75} 0.32 mm  Kurtosis .264
P_{90} .257  Mean

Millimeters

Weight Percent

Phi Units

100 90 80 70 60 50 40 30 20 10 0

-3 -2 -1 0 +1 +2 +3 +4 +5 +6

10.0 1.0 0.1 0.01
SIZE ANALYSIS

Sample 2404

Sample description Medium - coarse grained granitic sand

Lat. 36° 27.40'N Long. 121° 55.40'W

Depth Stream Fathoms

Soberanes Creek Meters

Feet

Sample Weight 200.2 g

Phi Units

100 90 80 70 60 50 40 30 20 10 0 -1 -2 -3

Weight Percent

Millimeters

10.0 1.0 0.1 0.01

SIZE PARAMETERS

1st Mode 0.495 - 0.991 mm

P10 1.83

Q25 1.29 mm

Sorting Coef. 1.712

2nd Mode

Median: Q50 0.73 mm

Skewness 1.065

3rd Mode

Q75 0.44 mm

Kurtosis 0.274

P90 0.278

Mean
SIZE ANALYSIS

Sample 2405
Lat. 36° 27.40N Long. 121° 55.44W
Sample description medium grained granitic sand
Depth Stream Fathoms
Soberanes Creek Meters
Sample Weight 198.8 g

<table>
<thead>
<tr>
<th>Phi Units</th>
<th>-3</th>
<th>-2</th>
<th>-1</th>
<th>0</th>
<th>+1</th>
<th>+2</th>
<th>+3</th>
<th>+4</th>
<th>+5</th>
<th>+6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Millimeters</td>
<td>0</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>40</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>80</td>
<td>90</td>
</tr>
</tbody>
</table>

SIZE PARAMETERS

1st Mode 1.397 - 1.981 mm
2nd Mode 2.362 - 3.962
3rd Mode

P₁₀ 2.88
Q₂₅ 2.10 mm
Median: Q₅₀ 1.37 mm
Q₇₅ 0.839 mm
P₉₀ 0.5

Sorting Coef. 1.327
Skewness .939
Kurtosis .265
Mean
SIZE ANALYSIS

Sample 2406

Sample description fine - coarse

granitic sand

Lat. 36° 26.51' N Long. 121° 55.30' W

Depth Stream Fathoms

Meters

Feet

Sample Weight 224.8 g

SIZE PARAMETERS

1st Mode 2.362 - 3.962 mm

Q25 2.56 mm

Median: Q50 1.4 mm

Q75 0.75 mm

P90 .445

2nd Mode .991 - 1.397 mm

Sorting Coef. 1.848

Skewness .980

Kurtosis .255

Mean

3rd Mode
**SIZE ANALYSIS**

Sample 2407  
Sample description fine - coarse grained granitic sand  

<table>
<thead>
<tr>
<th>Depth</th>
<th>Stream</th>
<th>Fathoms</th>
<th>Meters</th>
<th>Feet</th>
<th>Sample Weight</th>
<th>216.3 g</th>
</tr>
</thead>
</table>

**SIZE PARAMETERS**

<table>
<thead>
<tr>
<th>Mode</th>
<th>Phi Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Mode</td>
<td>1.397 - 1.981 mm</td>
</tr>
<tr>
<td>2nd Mode</td>
<td>2.362 - 3.962 mm</td>
</tr>
<tr>
<td>3rd Mode</td>
<td>-----------</td>
</tr>
</tbody>
</table>

- P_{10} 3.23
- Q_{25} 2.16 mm
- Q_{50} 1.27 mm
- Q_{75} 0.66 mm
- P_{90} 0.365
- Sorting Coef. 1.809
- Skewness .884
- Kurtosis .262

**Millimeters**

\[ \begin{array}{cccccccc}
\text{Phi Units} & -3 & -2 & -1 & 0 & +1 & +2 & +3 & +4 & +5 & +6 \\
\text{Weight Percent} & & & & & & & & & & \\
\end{array} \]
# SIZE ANALYSIS

Sample: 2408  
Sample description: coarse grained granitic sand

<table>
<thead>
<tr>
<th>Lat.</th>
<th>Long.</th>
<th>Sample Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>36° 25.04'N</td>
<td>121° 54.73'W</td>
<td>146.8 g</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Depth</th>
<th>Stream</th>
<th>Fathoms</th>
<th>Meters</th>
<th>Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sample Weight:** 146.8 g

### SIZE PARAMETERS

<table>
<thead>
<tr>
<th>Mode</th>
<th>Size (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>23.962</td>
</tr>
<tr>
<td>2nd</td>
<td>1.397 - 1.981</td>
</tr>
<tr>
<td>3rd</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>( P_{10} )</td>
<td>6.0</td>
</tr>
<tr>
<td>( Q_{25} )</td>
<td>4.45 mm</td>
</tr>
<tr>
<td>Median: ( Q_{50} )</td>
<td>2.5 mm</td>
</tr>
<tr>
<td>( Q_{75} )</td>
<td>1.01 mm</td>
</tr>
<tr>
<td>( P_{90} )</td>
<td>0.529</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Coefficient</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorting Coef.</td>
<td>2.099</td>
</tr>
<tr>
<td>Skewness</td>
<td>0.719</td>
</tr>
<tr>
<td>Kurtosis</td>
<td>0.314</td>
</tr>
<tr>
<td>Mean</td>
<td></td>
</tr>
</tbody>
</table>
SIZE ANALYSIS

Sample 2409
Sample description medium grained

Lat. 36° 25.05'N Long. 121° 54.84'W

Depth Stream Fathoms
Meters
Feet

Sample Weight 168.4 g

SIZE PARAMETERS

1st Mode 0.495 - 0.701 mm

P_{10} 0.85
Q_{25} 0.700 mm

Sorting Coef. 1.140

Median: Q_{50} 0.539 mm

Skewness 1.01

Kurtosis .267

Mean

P_{90} .324
SIZE ANALYSIS

Sample 2410
Lat. 36° 25.06'N Long. 121° 54.84'W
Depth Intertidal Fathoms

Sample description medium grained granitic sand

Sample Weight 246.3 g

Phi Units

1st Mode 0.701 - 0.991 mm
2nd Mode
3rd Mode

P10 1.21
Q25 1.03 mm
Median: Q50 0.81 mm
Q75 0.58 mm
P90 0.425 mm

Sorting Coef. 1.333
Skewness .911
Kurtosis .287
Mean
### SIZE ANALYSIS

**Sample** 2411  
**Sample description** fine-coarse grained granitic sand with rock fragments  
**Lat.** 36°25.06'N **Long.** 121°54.22'W  
**Depth** Stream Fathoms  
**Palo Colorado** Meters  
**Canyon** Feet  
**Sample Weight** 229.4 g

#### Size Parameters

<table>
<thead>
<tr>
<th>Mode</th>
<th>Width (mm)</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Mode</td>
<td>2.362 - 3.962</td>
<td></td>
</tr>
<tr>
<td>2nd Mode</td>
<td>1.397 - 1.981</td>
<td></td>
</tr>
<tr>
<td>3rd Mode</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**P10** 3.06  
**Q25** 2.11 mm  
**Median:**Q50 1.25 mm  
**Q75** 0.59 mm  
**P90** .31  

**Sorting Coef.** 1.891  
**Skewness** .797  
**Kurtosis** .276  
**Mean**
SIZE ANALYSIS

Sample 2413
Lat. 36° 22.08' N Long. 121° 54.08' W
Sample description fine-medium
Depth Stream Fathoms
Las Piedras Meters
Creek Feet
Sample Weight 202.6 g

Size Parameters

1st Mode 0.351 - 0.495
P10 .78
Q25 0.60 mm
Median: Q50 0.45 mm
 Sorting Coef. 1.323

2nd Mode

3rd Mode

Q75 0.343 mm
P90 .265
Mean
Skewness 1.016
Kurtosis .250
**SIZE ANALYSIS**

Sample: 2414  
Sample description: fine-grained granitic sand

Lat: 36° 22.81'N  Long: 121° 54.09'W

Depth: Intertidal  
Fathoms:  
Meters:  
Feet:  
Sample Weight: 211.9 grams

**SIZE PARAMETERS**

1st Mode: 0.351 - 0.495 mm  
P_{10} = 1.10  
Q_{25} = 0.63 mm  
Skewness = 1.287

2nd Mode:  
Median: Q_{50} = 0.405 mm

3rd Mode:  
Q_{75} = 0.335 mm  
P_{90} = 0.315  
Kurtosis = 0.188

Sorting Coef. = 1.371  
Mean: 

---

**PHI UNITS**

-100 -90 -80 -70 -60 -50 -40 -30 -20 -10 0 +1 +2 +3 +4 +5 +6

**MILLIMETERS**

10.0 2.0 1.0 0.1 0.01
SIZE ANALYSIS

Sample  2415
Sample description  Medium grained arkosic sand

Lat. 36° 22.30'N Long. 121° 54.01'W

Sample Weight  172.4 g

Depth  Stream  Fathoms
Bixby Creek  Meters

Feet

Phi Units

100

3 - 2 -1 0 +1 +2 +3 +4 +5 +6

Size Parameters

1st Mode  0.701 - .991 g

P_{10}  1.2
Q_{25}  0.95 mm
Sorting Coef.  1.414
Skewness  .895
Kurtosis  .202
Mean

2nd Mode

Median: Q_{50}  0.71 mm

Q_{75}  0.475 mm

P_{90}  .32
SIZE ANALYSIS

Sample 2416

Sample description fine-medium grained granitic sand

Lat. 36° 22.29'N Long. 121° 54.08'W

Depth Stream Fathoms
Bixby Creek Meters

Sample Weight 209.8 g

<table>
<thead>
<tr>
<th>Phi Units</th>
<th>100</th>
<th>90</th>
<th>80</th>
<th>70</th>
<th>60</th>
<th>50</th>
<th>40</th>
<th>30</th>
<th>20</th>
<th>10</th>
<th>0</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Millimeters</th>
<th>10.0</th>
<th>1.0</th>
<th>0.1</th>
<th>0.01</th>
</tr>
</thead>
</table>

**SIZE PARAMETERS**

1st Mode 0.351 - 0.495 mm

\( P_{10} = 0.701 \)

\( Q_{25} = 0.56 \) mm

Sorting Coef. 1.283

Median: \( Q_{50} = 0.445 \) mm

Skewness 0.962

2nd Mode

3rd Mode

\( Q_{75} = 0.34 \) mm

Kurtosis 0.255

\( P_{90} = 0.27 \)

Mean
SIZE ANALYSIS

Sample 2417
Lat. 36° 22.30' N Long. 121° 54.12' W
Depth Intertidal Fathoms
Sample description fine grained
granitic sand

Sample Weight 198.1 g

SIZE PARAMETERS

1st Mode 0.246 - 0.351 mm
P10 .475
Q25 .375 mm
2nd Mode
Median: Q50 0.31 mm
3rd Mode
Q75 0.25 mm
F90 .209
Sorting Coef. 1.225
Skewness .976
Kurtosis .235
Mean

Phi Units

Millimeters

22