Sedflume Analysis Corte Madera, California

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Prepared for:

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Executive Summary

Sea Engineering, Inc. (SEI) conducted a Sedflume analysis for the San Francisco Bay Conservation and Development Commission (BCDC) on ten (10) sediment cores obtained from offshore of Corte Madera, California. These cores were collected in areas where depths ranged to 20 feet of water depth relative to the Mean Lower Low Water (MLLW) tidal datum. The primary goal of this work was to characterize the erosion properties of the sediments in the nearshore region. The Sedflume analysis determines sediment erosion rates, critical shear stress, particle size and wet bulk density at depth intervals down-core.

Since critical shear stress is a difficult parameter to quantify exactly, two methods of estimating it are employed for comparison purposes: a power law fitting method and a linear interpolation method. Both methods determine the critical shear stress at which the erosion rate equals 10^{-4} cm/s. The power law fit follows the regression methods of Roberts et al. (1998) and is further described in this report. The linear interpolation solves for the critical shear stress directly, using Sedflume data from intervals prior to, and immediately following, sediment erosion. Oftentimes, the results of the two methods are similar values. Yet, since there are inherent differences in the two methods, an attempt is made to describe the potential reason for result discrepancies. The following is a brief physical description of the cores and their characteristics. The ensuing report contains the core data from the comprehensive Sedflume analysis. Appendix A contains the particle size distribution analysis data.

Figure A. Sedflume core locations near Corte Madera, CA.

- **Core DP-T** was comprised of fine, soft, silty sand and mud of a lighter brown color (~1 cm thick) over a darker gray-colored silt and silty sand. A large number of benthic organisms (greater than 50) existed on the surface and extended approximately 1-2 cm above the surface. Worms and worm tubes were visible down-core throughout the analysis. Erosion was uneven and clumpy. Erosion rates increased as the depth into the core increased. The vertical mean of d_{50} (median particle size) in the core was 10.32 μm, fine silt. The mean bulk density in the core was 1.42 g/cm^3. The core mean values of the interpolated critical shear stresses are 0.96 and 1.07 Pa for both power law and linear interpolation manners of computing critical shear, respectively.

- **Core S3** was comprised of fine, soft silt and sandy silt of a lighter brown color (~1-2 cm thick) over a darker-colored gray– and brown-colored silt, clayey silt and sandy silt. A large number of plant material and benthic organisms existed on the surface and down-core. Worms and worm tubes were visible down-core during the analysis. Material was soft silt and clayey silt below the surface. Orange colored worms and shell hash were visible on the surface and down-core. Erosion occurred in clumps throughout the analysis and varied slightly with increasing depth into the core. The vertical mean of d_{50} in the core is 15.91 μm, fine silt. The core average bulk density is 1.37 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.29 and 0.33 Pa for both power law and linear interpolation, respectively.

- **Core S2** was comprised of fine, soft silt and sandy silt of a lighter brown color (~2cm thick) over a down-core varying dark- and light-colored gray– and brown-colored silt, clayey silt and sandy silt. A large number of worms and other benthic organisms existed on the surface and down-core. Orange colored worms and shell hash were visible on the surface and down-core. Erosion was uneven and clumpy throughout the analysis, eroding in several large clumps on a few occasions. The erosion rate data indicates typically consolidated sediment. The vertical mean of d_{50} in the core is 12.79 μm, fine silt. The core average bulk density is 1.36 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.27 and 0.36 Pa for both power law and linear interpolation, respectively.

- **Core S1** was comprised of fine, soft, silty mud of a lighter brown color (~2cm thick) over a down-core varying dark- and light-colored gray– and brown-colored silt, sandy silt and fine sand. A large number of worms and other benthic organisms existed on the surface. Orange colored worms and shell hash were visible down-core. Erosion was uneven and clumpy throughout the analysis. The erosion rate data indicates typically consolidated sediment. At the deepest interval, sediments become slightly easier-to-erode. The vertical mean of d_{50} in the core is 12.59 μm, fine silt. The core average bulk density is 1.41 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.99 and 1.02 Pa for both power law and linear interpolation, respectively. This core was much more difficult to erode at deeper depths, compared to cores S2 and S3 (located further offshore). The reason for this is unclear at the present time, as all other measured core parameters (particle sizes and bulk densities) between S1, S2 and S3 are similar. It is not uncommon for other factors (e.g. mineralogy, organic content) to significantly alter erosion properties.

- **Core ML-2** was comprised of soft, silty sediment of a lighter brown color (~2cm thick) over a darker brown-colored silt, sandy silt and fine sand below. A large number of benthic organisms (worms and worm tubes) and organic material (plant material) existed on the surface. Worms and worm tubes were visible down-core throughout the analysis. Shells and shell hash was observed down-core. Erosion was uneven and clumpy throughout the analysis. Material alternated between easier- and more difficult-to-erode as the depth into the core increased; a stiff layer was encountered at approximately 17 cm. The vertical mean of d_{50} in the core is 11.26 μm, fine silt The core average bulk density is 1.43 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.34 and 0.65 Pa for both power law and linear interpolation, respectively.

- **Core ML-1** was comprised of soft, silty sand and mud of a lighter brown color (~2 cm thick) over a darker gray- and brown-colored silt and sandy silt. A large number of benthic organisms existed on the surface and worm tubes were visible down-core throughout the analysis. Shells and shell pieces were observed down-core. Erosion was uneven across the core surface during the analysis. The erosion rate data shows evidence of material becoming more difficult to erode before becoming easier to erode as the depth into the core increases. Deeper than 10 cm, material becomes increasingly easier to erode. The vertical mean of d_{50} in the core is 10.18 μm, fine silt. The core average bulk density was 1.40 g/cm^3. The core mean-values of the interpolated critical shear stresses are 1.50 and 1.39 Pa for both power law and linear, respectively.

- **Core CJ2b** was comprised of fine, soft silt and sandy silt of a lighter brown color (~6-8 cm thick) over a darker-colored gray– and brown-colored silt, clayey silt and sandy silt. A large number of plant material and benthic organisms existed on the surface and down-core. The material contained small worms and shell pieces down-core. Material was comprised of stiff clayey silt below the surface. The erosion rate data indicates typically consolidated sediment. The vertical mean of d_{50} in the core is 10.75 μm, fine silt. The core average bulk density is 1.36 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.90 and 0.93 Pa for both power law and linear interpolation, respectively.

- **Core CJ3a** was comprised of fine, soft silt and sandy silt of a lighter brown color (~6-8 cm thick) over a darker-colored gray– and brown-colored silt, clayey silt and sandy silt. At a depth between 20 and 30 cm, some sandy silt and fine sand is visible. A large number of benthic organisms (worms and other moving organisms) existed on the surface and down-core. Shell hash and worms were visible down-core during the analysis. Worms and worm tubes were visible down-core during the analysis. Erosion was uneven and clumpy at times. The erosion rate data shows erosion rates varying slightly, but generally decreasing, with depth into the core. The vertical mean of d_{50} in the core is 15.31 μm, fine silt. The core average bulk density is 1.41 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.58 and 1.07 Pa for both power law and linear interpolation, respectively.

- **Core CJ3c** was collected near the navigation channel approaching Corte Madera. The core was comprised of sand and silt of a lighter brown color (~6-10 cm thick) over a darker-colored gray– and brown-colored silt and clayey silt. Very little benthic organisms existed on the surface. No worms were observed down-core. The down-core material was soft and loose, a mixture of silt and clayey-silt. Erosion occurred in clumps throughout the analysis. The erosion rate data shows erosion rates remaining relatively constant with increasing depth into the core. The vertical mean of d_{50} in the core is 8.09 μm, fine silt. The core average bulk density is 1.30 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.65 and 0.78 Pa for both power law and linear interpolation, respectively.

- **Core CMC** was the furthest shoreward core collected, and was sampled from the mouth of the stream channel. It was the most difficult to sample due to the coarse nature of the substrate material. The material comprised of fine, soft silt and sandy silt of a lighter brown color (~1-2cm thick) over a darker-colored gray– and brown-colored silt and sandy silt. Very few (3) orange worms existed on the surface. Down-core, a small number of additional worms were visible through the core barrel as well as gas bubbles trapped during the core extraction. At the deepest depths, coarse sand was observed and gravel and large woody debris were removed from the core at the end of the analysis. Erosion occurred in clumps throughout the analysis. The erosion rate data shows erosion rates remaining relatively constant with increasing depth into the core. The vertical mean of d_{50} in the core is 8.25 μm, fine silt. The core average bulk density is 1.37 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.72 and 0.68 Pa for both power law and linear interpolation, respectively.

CONTENTS

Introduction

Sea Engineering, Inc. (SEI) conducted a Sedflume analysis for the San Francisco BCDB on ten sediment cores obtained from offshore of Corte Madera, California. These cores were collected in areas where elevations ranged from 0 ft Mean Lower Low Water (MLLW) to approximately -20 ft MLLW. The primary goal of this work was to characterize the erosion rates and physical properties of the sediments within the nearshore region. The cores were eroded using Sedflume to determine erosion rates as a function of shear stress and depth. In addition, each core was sub-sampled periodically to determine sediment wet bulk density and particle size distribution at specific depths within the core. Critical shear stresses were determined through two interpolation techniques for each vertical interval sampled. The following report outlines the procedures used in the Sedflume analysis, presents the Sedflume data, and provides a description of the results.

Experimental Procedures

A detailed description of Sedflume and its application are given in McNeil et al (1996) and Roberts et al (1998). The following section provides a general description of the Sedflume analysis conducted for this study.

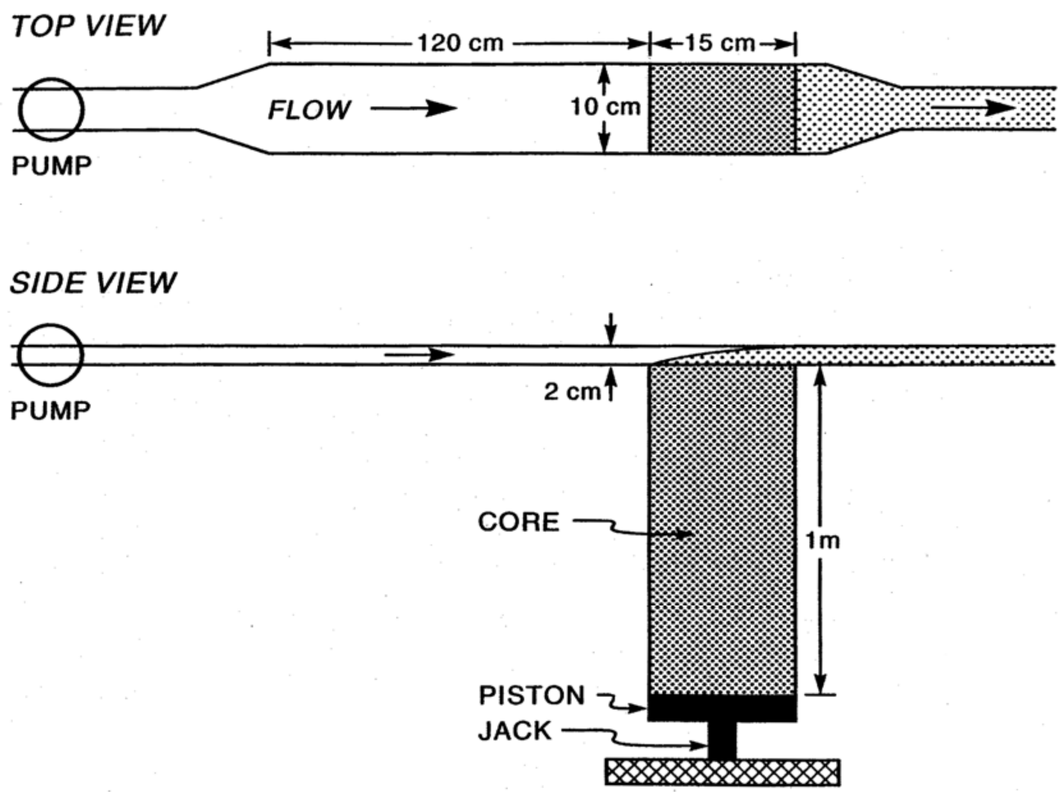

Figure 1. Sedflume Diagram

Description of Sedflume

Sedflume is shown in Figure 1 and is essentially a straight flume that has a test section with an open bottom through which a rectangular cross-section core containing sediment can be inserted. The main components of the flume are the core; the test section; an inlet section for uniform, fully-developed, turbulent flow; a flow exit section; a water storage tank; and a pump to force water through the system. The coring tube, test section, inlet section, and exit section are made of clear acrylic so that the sediment-water interactions can be observed. The coring barrel has a rectangular cross-section, 10 cm by 15 cm, and can be up to 1 m in length.

Water is pumped through the system from a 300 gallon storage tank, through a 5 cm diameter pipe, and then through a flow converter into the rectangular duct shown. This duct is 2 cm in height, 10 cm in width, and 120 cm in length; it connects to the test section, which has the same cross-sectional area and is 15 cm long. The flow converter changes the shape of the cross-section from circular to the rectangular duct shape while maintaining a constant cross-sectional area. A ball valve regulates the flow so that the flow into the duct can be carefully controlled. Also, there is a small valve in the duct immediately downstream from the test section that is opened at higher flow rates to keep the pressure in the duct and over the test section at atmospheric conditions.

At the start of each test, a core containing sediments collected from the site is prepared. The core and the sediment it contains are then inserted into the bottom of the test section. An operator moves the sediment upward using a piston that is inside the core and is connected to a hydraulic jack with a 1 m drive stroke. The jack is driven by the release of pressure that is regulated with a switch and valve system. By this means, the sediments can be raised and made level with the bottom of the test section. The speed of the hydraulic jack movement can be controlled at a variable rate in measurable increments as small as 0.5 mm.

Water is forced through the duct and the test section over the surface of the sediments. The shear produced by this flow causes the sediments to erode. As the sediments in the core erode, they are continually moved upward by the operator so that the sediment-water interface remains level with the bottom of the test and inlet sections. The erosion rate is recorded as the upward movement of the sediments in the coring tube over time.

Sedflume Core Collection

The sediment cores were collected from the nearshore Corte Madera region by SEI personnel on December 6th and 7th, 2010. At each coring location, a GPS system was used to position the vessel at the fixed sampling station. A pole was attached with clamps to the 10 cm by 15 cm rectangular core. A valve was temporarily affixed to the top of the core tube to provide suction when the core was pulled out of the sediment bed. The core was then lowered into the water and positioned perpendicular to the sediment bed. Pressure was applied by hand until at least 30 cm (approximately) and no more than 60 cm of the core penetrated into the sediment bed. At most of the coring locations, there was little to no difficulty extracting a sufficient core for analysis. At location CMC, however, hard substrate was encountered approximately 30 cm below the surface sediment making a sufficient recovery difficult. Several attempts were required to recover an acceptable core at this location.

After cores reached the water surface, they were immediately inspected visually for length and quality. Undisturbed surface sediments were present in each core. The cores were capped, filled with water to eliminate airspace for sloshing, and secured to minimize sediment disturbance. Cores were transferred from the vessel in a padded shipping container for transport to SEI's Santa Cruz Sedflume laboratory. Upon arrival at the Sedflume laboratory, all cores were visually inspected again to ensure that sediment structure and surface had been preserved. All cores were collected from the field in two days and were processed within 5 days of collection.

Measurements of Sediment Erosion Rates

The sediment core was inserted into the Sedflume test section using the hydraulic jack until the sediment surface was even with the bottom of the Sedflume channel. A measurement was made of the core length. The flume was then run at a specific flow rate corresponding to a particular shear stress (McNeil et al., 1996). Erosion rates are obtained by measuring the core length at different time intervals, taking the difference between each successive measurement, and dividing by the time interval as shown in Equation 1:

$$E = \frac{\Delta z}{T} \qquad (1)$$

E = Erosion rate
Δz = Amount of sediment eroded
T = Time

In order to measure erosion rates at several different shear stresses using only one core, the following procedure was used. Starting at a low shear stress, the flume was run sequentially at higher shear stresses with each succeeding shear stress being twice the previous one. Generally, a flow rate was applied until 10 minutes had expired or 2 cm of sediment had eroded. The shear stress cycle was halted if the next increase in shear stress would erode more than 2 cm in 20 seconds (for this analysis, measurements less than 20 seconds in duration are not considered to hold a high degree of accuracy). The time interval was recorded for each run with a stopwatch.

This cycle was repeated until all of the sediment had eroded from the core. If after three cycles a particular shear stress showed a rate of erosion less than 10^{-4} cm/s, it was dropped from the cycle; if after many cycles the erosion rates decreased significantly, a higher shear stress was included in the cycle. If the composition of the material changes at a sediment interface resulting in an observable change of erosion properties, the present cycle was stopped and a new cycle started at the lowest shear stress.

Determination of Critical Shear Stress

The critical shear stress of a sediment bed, τ_{cr}, is defined quantitatively as the shear stress at which a very small, but accurately measurable, rate of erosion occurs. For Sedflume studies, this rate of erosion has been practically defined as 10^{-4} cm/s. This represents 1 mm of erosion in approximately 15 minutes. Since it is difficult to measure τ_{cr} exactly at 10^{-4} cm/s, erosion rates were determined above and below 10^{-4} cm/s. The τ_{cr} was then determined by two interpolation techniques, linear and power law regression.

Measurement of Sediment Bulk Properties

In addition to erosion rate measurements, samples were collected at periodic intervals to determine the water content, bulk density, and particle size distribution of the sediments. Sub-samples were collected from the undisturbed sediment surface as well as the sediment surface at the end of each shear stress cycle. This allowed 4-5 samples to be collected approximately every 5 cm for analysis.

Bulk density was determined in the SEI mobile Sedflume laboratory by water content analysis using methods outlined in Hakanson and Jansson (2002). This consisted of determining the wet and dry weight of the collected sample to determine the water content, W, from Equation 2.

$$W = \frac{M_w - M_d}{M_w} \quad (2)$$

W = water content
M_w = wet weight of sample
M_d = dry weight of sample

Once the water content was calculated, the bulk density, ρ_b, was determined from Equation 3.

$$\rho_b = \frac{\rho_w \rho_s}{\rho_w + (\rho_s - \rho_w)W} \quad (3)$$

ρ_w = density of water (1 g/cm^3)
ρ_s = density of sediment particle (2.65 g/cm^3)

Particle size distributions were determined using laser diffraction analysis in the SEI Santa Cruz, CA laboratory. Samples collected from the Sedflume core were prepared and inserted into a Beckman Coulter LS 13 320. Each sample was analyzed in three 1-minute intervals and the results of the three analyses were averaged. This method is valid for particle sizes between 0.04 and 2000 μm. Any fraction over 2000 μm was weighed and compared to total sample weight to determine the weight percentage greater than 2000 μm. Table 1 summarizes all measurements conducted during the Sedflume analysis.

Table 1. Parameters measured and computed during the Sedflume analysis.

Measurement	Definition	Units	Detection Limit
Bulk Density, ρ_b (wet/dry weight)	$\rho_b = \frac{\rho_w \rho_s}{\rho_w + (\rho_s - \rho_w)W}$	g/cm^3	Same as water content
Water Content	$W = \frac{M_w - M_d}{M_w}$	unit less	0.1g in sample weight ranging from 10 to 50 g
Particle Size Distribution	Distribution of particle sizes by volume percentage using laser diffraction	μm	0.04 μm – 2000 μm
Erosion Rate	$E = \Delta z/T$	cm/s	$\Delta z > 0.5$mm $T > 15$s
Critical Shear Stress τ_{cr}	Shear stress when erosion rate equals 10^{-4} cm/s	N/m^2	0 to 10.0 N/m^2 This value is interpolated as described in the text.

W = water content
M_w = wet weight of sample
M_d = dry weight of sample
Δz = amount of sediment eroded
T = time
ρ_w = density of water (1 g/cm^3)
ρ_s = density of sediment (2.65 g/cm^3)

Erosion Rate Comparisons

A useful method of analyzing sediment characteristics at a specific site is to compare the inter-core and intra-core Sedflume erosion rates. This method provides a means to quantify the erosion susceptibility within each core as well as the general erosion susceptibility of the coring site. In this analysis, each core has been sub-sampled into approximately five separate depth intervals (shear cycles). Following the methods of Roberts et al (1998), the erosion rate for each interval can be approximated by

$$E = A\tau^n \rho^m \tag{4}$$

where E is the erosion rate (cm/s), τ is the shear stress (N/m^2) and ρ is the sediment bulk density (g/cm^3). A, n and m are constants that depend on the sediment characteristics. The equation used in this analysis is an abbreviated variation of Equation 4:

$$E = A\tau^n \tag{5}$$

where the sediment bulk density parameter is a function of the constant A. The variation of erosion rate with density cannot be typically determined in the field due to natural variation in other sediment properties (e.g. mineralogy and particle size). Therefore, the density term for a particular interval of approximately constant density is lumped into the constant A. For each depth interval, the measured Sedflume erosion rates (E) and applied shear stresses (τ) were used to determine the A and n constants that provide a best fit power law curve to the data for that interval. With good fits (i.e. $r^2 > 0.80$), these parameters can be used to predict erosion rates for the core interval of interest. A correlation of 0.80 was used as a criteria threshold for acceptance in this analysis.

From this process an average erosion rate for a particular core can also be determined, and the erosion rate at each depth interval can be directly compared to this average. The result is an erosion rate *ratio* which provides an estimation of the erosion susceptibility of each depth interval relative to the core average. This procedure highlights the depths of the core that will erode more rapidly, and those that will tend to resist erosion, relative to the other intervals in the core. Intervals for which the r^2 is less than 0.80 or containing less than three data points are omitted from this comparison and will show up as blank intervals in the following bar plots.

In addition, a site-wide erosion rate average can be estimated that incorporates the interval data from all sampled cores. The erosion rate for each depth interval within a core is compared to the site-wide average and a graph of the erosion rate ratios for all of the cores is created. Again, the procedure highlights the cores and depth intervals at which the most rapid erosion would be expected (relative to the other core locations), and a spatial assessment of erosion probability can be generated.

In this analysis, two interpolation techniques were used to determine values of critical shear stress: a power law interpolation and a linear interpolation. For the former, a power law curve was created (in the form of Equation 5) by solving for the variables A and n by maximizing the correlation (r^2) to the measured data points. A solution for the critical shear stress can then be computed from Equation 5 by inserting an erosion rate of 10^{-4} cm/s. For the latter, a simple linear interpolation solves for the critical shear stress at an erosion rate of 10^{-4} cm/s based on the measured Sedflume data.

Results and Discussion

Figure 2 shows a map of the coring site with the coring locations. Table 2 provides the core location, coordinates, coring date and the depth of water (at the time of coring) for the Corte Madera cores.

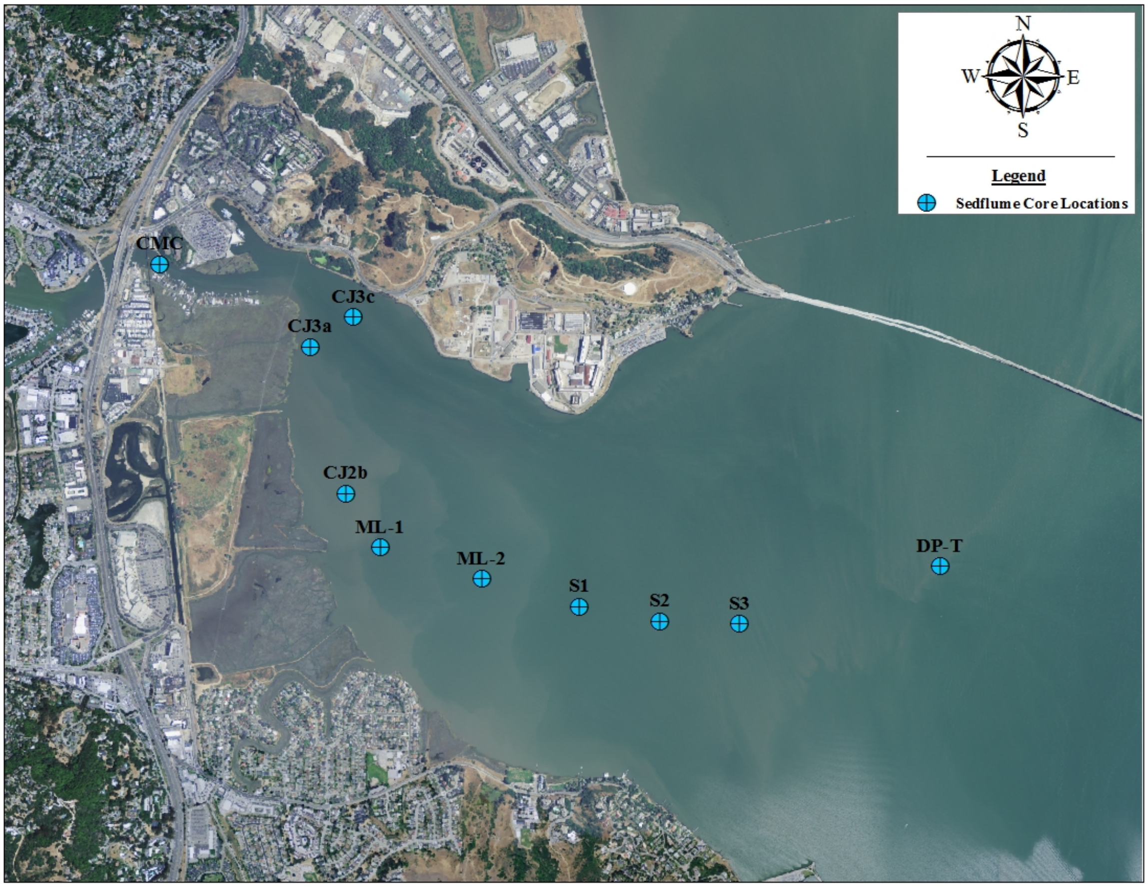

Figure 2. Map of core locations (aerial imagery from Cal-Atlas).

Table 2. Core collection information.

Core Location	Lat (ºN)	Long (ºW)	Coring Date	Time (PST)	Depth ft (m)*
DP-T	37.93053611	122.4684167	12/7/2010	08:00	13.1 (4.0)
S3	37.92776111	122.4797278	12/7/2010	12:30	11.5 (3.5)
S2	37.927825	122.4842	12/7/2010	12:00	9.5 (2.9)
S1	37.92839167	122.4888111	12/7/2010	09:30	6.6 (2.0)
ML-2	37.92954444	122.4943639	12/6/2010	14:45	4.6 (1.4)
ML-1	37.93085556	122.5001194	12/6/2010	14:00	4.3 (1.3)
CJ2b	37.93323056	122.5021167	12/6/2010	13:15	5.2 (1.6)
CJ3a	37.93974722	122.5043167	12/6/2010	12:30	5.2 (1.6)
CJ3c	37.94112778	122.5019556	12/7/2010	09:00	16.4 (5.0)
CMC	37.94331667	122.5129139	12/6/2010	16:15	11.8 (3.6)

* Depths are measured from the water surface and are not corrected to any datum.

Core DP-T

Core DP-T was collected in approximately 4.0 meters water depth. Upon extraction, the core was comprised of fine, soft, silty sand and mud of a lighter brown color (~1 cm thick) over a darker gray-colored silt and silty sand. The lighter sediment color likely indicates greater oxidation of the sediments near the surface. A large number of benthic organisms (greater than 50) existed on the surface and extended approximately 1-2 cm above the surface. Worms and worm tubes were visible down-core throughout the analysis. Erosion was uneven and clumpy.

Figure 3 shows a photo of core DP-T prior to the analysis aligned vertically with the measured erosion rate data. The plot shows each shear stress applied to the core, ranging from 0.1 to 9.0 Pa, as a function of depth. Variations in erosion rate for each applied shear stress are shown. Figure 4 shows the bulk density and d_{50} (median particle size) as a function of depth. For all erosion rate plots in this report, erosion rates of zero are represented by 1 x 10^{-5} cm/s on the graph. The sediment surface (depth = 0) is plotted at the top of all graphs with depth into the sediments increasing down the Y-axis.

The erosion rate data shows evidence of material becoming easier-to-erode with increasing depth; erosion rates increase as the depth into the core increases. At a depth of approximately 10 cm a small layer of more-difficult-to-erode sediment was encountered. The median particle sizes remain relatively constant with depth, varying between 8.11 μm and 11.75 μm. The vertical mean of d_{50} in the core is 10.32 μm, fine silt. The bulk densities also remain relatively constant with depth, after increasing from the surface value. They ranged from 1.36 g/cm^3 to 1.46 g/cm^3, with a core average of 1.42 g/cm^3. The core mean values of the interpolated critical shear stresses are 0.96 and 1.07 Pa for both power law and linear interpolation manners of computing critical shear, respectively. Results from both interpolation techniques followed similar trends down-core, though the computed values differed slightly.

Figure 5 displays the erosion susceptibility for the depth intervals in core DP-T. For all erosion susceptibility plots in this report, the bar plot y-axis depths represent the starting depth of the different intervals (shear stress cycles) within each core. The vertical dashed line denotes an average erosion rate ratio of 1.0. Ratios above this line denote intervals that are more susceptible to rapid erosion than ratios below this line, relative to the core vertical average erosion rate. Missing bars denote data that failed to meet quality threshold criteria (i.e. power law fits that had a correlation [r^2] less than 0.80 with data were omitted).

Table 3 summarizes the variables resulting from the power law fit to the data in each shear stress cycle. A and n values for which the correlation was less than 0.80 are omitted. Table 4 summarizes the bulk density, d_{50}, and interpolated critical shear stresses, τ_{cr}, for specific core depths.

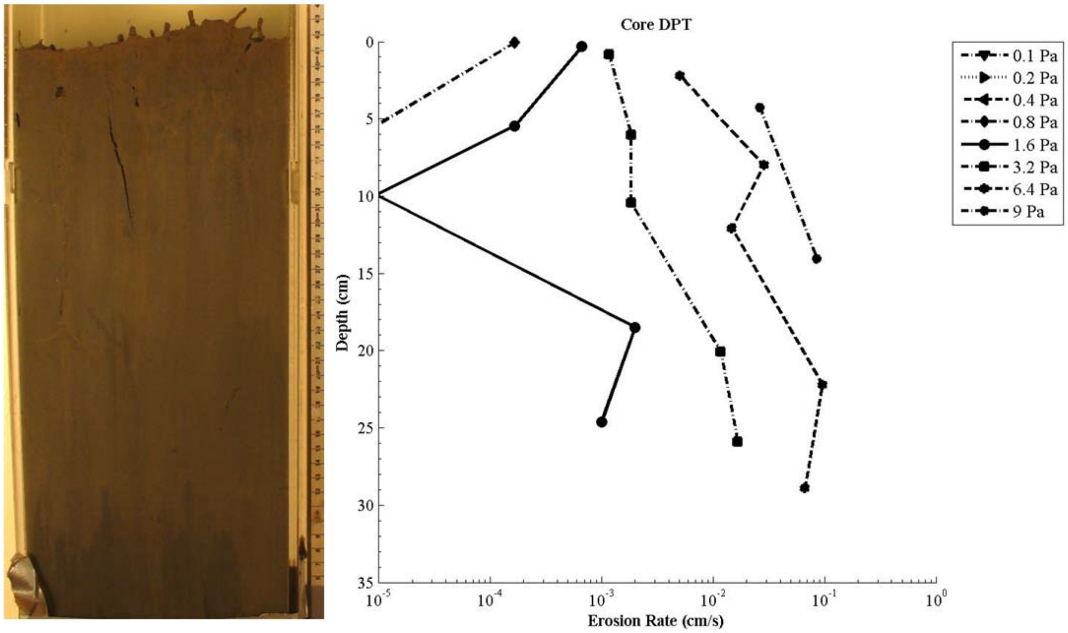

Figure 3. Picture of core DP-T aligned with Sedflume erosion rate data.

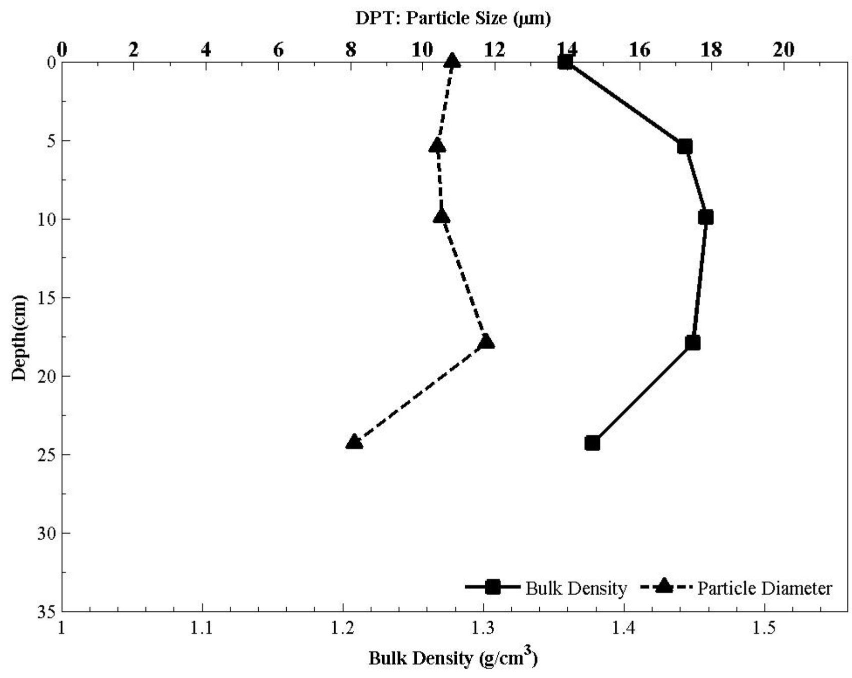

Figure 4. Bulk density and median particle size (d_{50}) with depth for core DP-T.

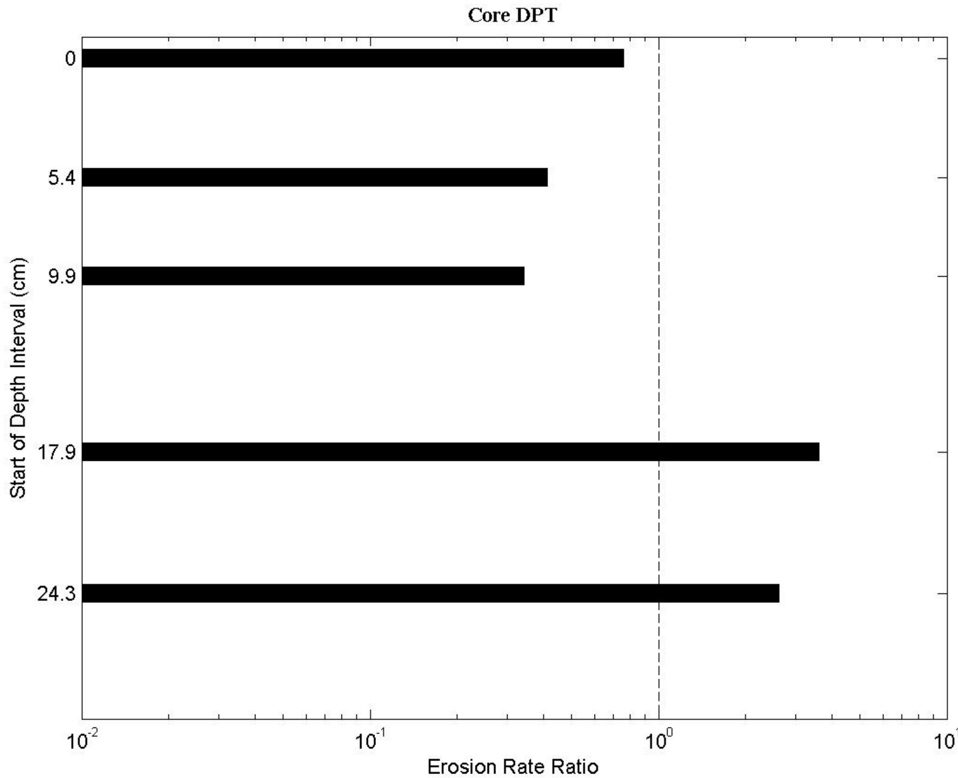

Figure 5. Intra-core erosion rate ratios for core DP-T. Dashed line is core average erosion rate.

Table 3. Power law best-fit variables for specified depth intervals in core DP-T.

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0.00	4.25	0.00022	1.90	0.94
2	5.40	8.00	0.00003	3.71	1.00
3	9.90	14.05	0.00002	3.61	0.98
4	17.90	22.25	0.00051	2.79	1.00
5	24.30	28.90	0.00031	3.03	0.96

Table 4. Bulk density, median particle size and critical shear stress with depth for core DP-T.

Depth (cm)	d_{50} (µm)	ρ_b (g/cm^3)	Power Law τ_{cr} (Pa)	Linear Interpolation τ_{cr} (Pa)
0.00	10.82	1.36	0.66	0.64
5.40	10.41	1.44	1.42	1.28
9.90	10.53	1.46	1.47	1.69
17.90	11.75	1.45	0.56	0.84
24.30	8.11	1.38	0.69	0.88
Mean	**10.32**	**1.42**	**0.96**	**1.07**

Core S3

Core S3 was collected in approximately 3.5 meters water depth. Upon extraction, the core consisted of fine, soft silt and sandy silt of a lighter brown color (~1-2cm thick) over a darker-colored gray– and brown-colored silt, clayey silt and sandy silt. The lighter sediment color on the surface and below likely indicates greater oxidation of the sediments in those regions from benthic activity. A large number of plant materials and benthic organisms existed on the surface and down-core. Worms and worm tubes were visible down-core during the analysis. Material was soft silt and clayey silt below the surface. Orange colored worms and shell hash were visible on the surface and down-core. Erosion occurred in clumps throughout the analysis.

Figure 6 shows a photo of core S3 prior to the analysis aligned vertically with the measured erosion rate data. The plot shows each shear stress applied to the core, ranging from 0.1 to 3.2 Pa, as a function of depth. Variations in erosion rate for each applied shear stress are shown. Figure 7 shows the bulk density and d_{50} (median particle size) as a function of depth.

The erosion rate data shows erosion rates varying slightly with increasing depth into the core. At a depth of approximately 10 cm, the material becomes slightly easier-to-erode before becoming stiffer again. The median particle sizes remain relatively constant with depth, varying between 9.32 μm and 14.54 μm, with a spike of 33.72 μm at a depth of approximately 13 cm. The vertical mean of d_{50} in the core is 15.91 μm, fine silt. The bulk densities generally increase with depth from 1.27 g/cm^3 to 1.39 g/cm^3 with a spike of 1.53 g/cm^3 at a depth of approximately 13 cm. The core average bulk density is 1.37 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.29 and 0.33 Pa for both power law and linear interpolation manners of computing critical shear, respectively. Results from both interpolation techniques followed similar trends down-core, though the computed values differed slightly.

Figure 8 displays the erosion susceptibility for the depth intervals in core S3. Table 5 summarizes the variables resulting from the power law fit to the data in each shear stress cycle. A and n values for which the correlation was less than 0.80 are omitted. Table 6 summarizes the bulk density, d_{50}, and interpolated critical shear stresses, τ_{cr}, for specific core depths.

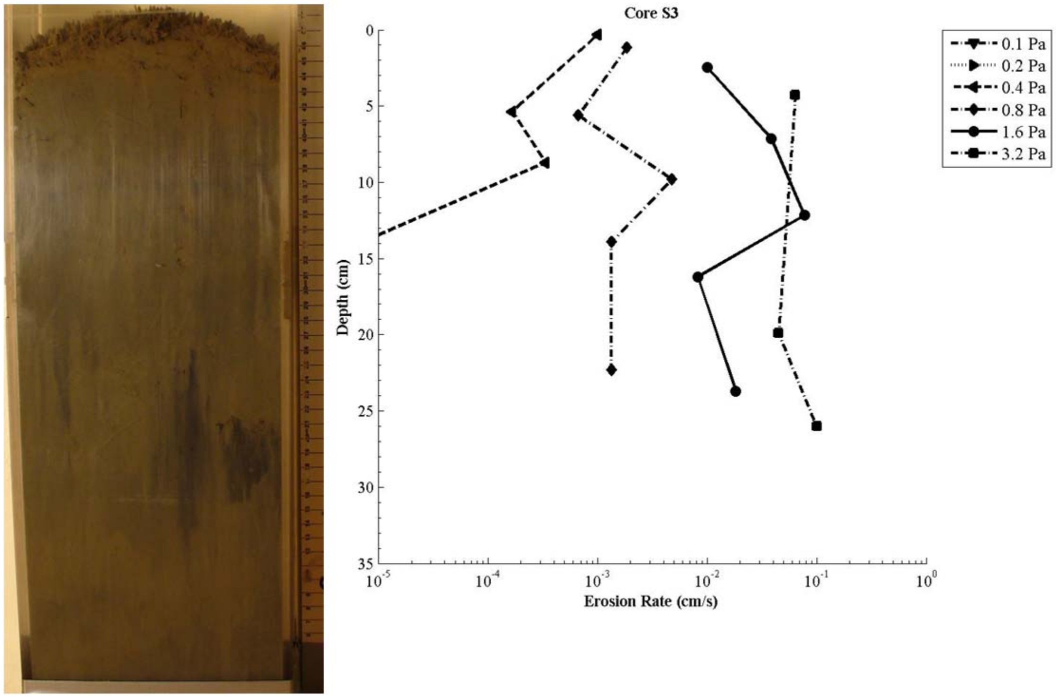

Figure 6. Picture of core S3 aligned with Sedflume erosion rate data.

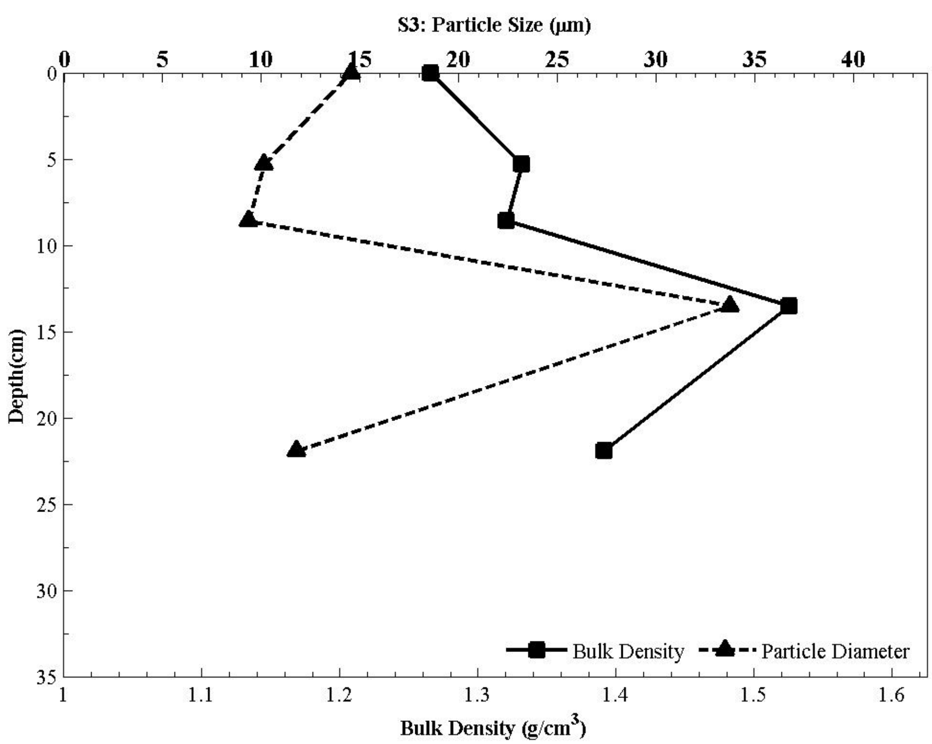

Figure 7. Bulk density and median particle size (d_{50}) with depth for core S3.

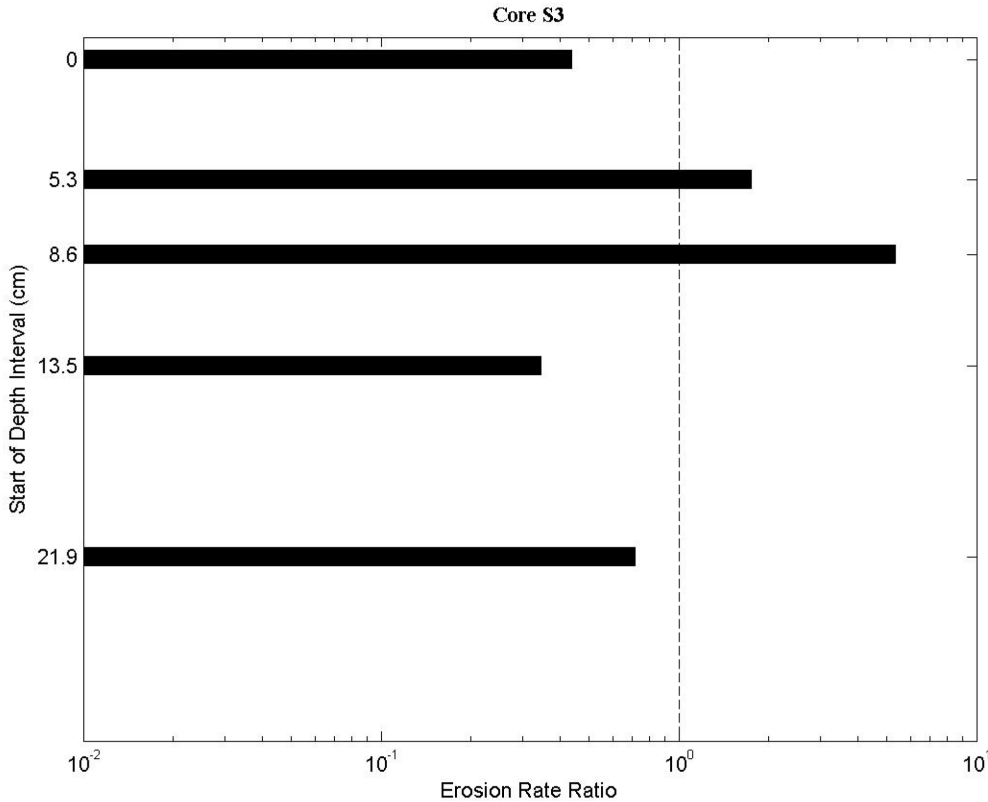

Figure 8. Intra-core erosion rate ratios for core S3.

Table 5. Power law best-fit variables for specified depth intervals in core S3.

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0.00	4.25	0.0045	2.04	0.96
2	5.30	7.15	0.0039	3.93	0.93
3	8.60	12.15	0.0119	3.93	1.00
4	13.50	19.90	0.0024	2.54	1.00
5	21.90	26.00	0.0031	3.11	0.99

Table 6. Bulk density, median particle size and critical shear stress with depth for core S3.

Depth (cm)	d_{50} (µm)	ρ_b (g/cm^3)	Power Law τ_{cr} (Pa)	Linear Interpolation τ_{cr} (Pa)
0.00	14.54	1.27	0.15	0.22
5.30	10.15	1.33	0.39	0.32
8.60	9.37	1.32	0.30	0.26
13.50	33.72	1.53	0.29	0.43
21.90	11.76	1.39	0.33	0.43
Mean	**15.91**	**1.37**	**0.29**	**0.33**

Core S2

Core S2 was collected in approximately 2.9 meters water depth. Upon extraction, the core consisted of fine, soft silt and sandy silt of a lighter brown color (~2cm thick) over a down-core varying dark- and light-colored gray– and brown-colored silt, clayey silt and sandy silt. The lighter sediment color on the surface and below likely indicates greater oxidation of the sediments in those regions from benthic activity. A large number of worms and other benthic organisms existed on the surface and down-core. Orange colored worms and shell hash were visible on the surface and down-core. Erosion was uneven and clumpy throughout the analysis, eroding in several large clumps on a few occasions.

Figure 9 shows a photo of core S2 prior to the analysis aligned vertically with the measured erosion rate data. The plot shows each shear stress applied to the core, ranging from 0.1 to 6.4 Pa, as a function of depth. Variations in erosion rate for each applied shear stress are shown. Figure 10 shows the bulk density and d_{50} (median particle size) as a function of depth.

The erosion rate data indicates typically consolidated sediment, with erosion rates generally decreasing with increasing depth into the core. At the deepest interval, sediments become slightly easier to erode. The median particle sizes remain relatively constant with depth, varying between 9.32 μm and 16.76 μm. The vertical mean of d_{50} in the core is 12.79 μm, fine silt. The bulk densities increase with depth before decreasing, ranging from 1.30 g/cm^3 to 1.46 g/cm^3 and down to 1.20 g/cm^3 at the deepest interval. The core average bulk density is 1.36 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.27 and 0.36 Pa for both power law and linear interpolation manners of computing critical shear, respectively. Results from both interpolation techniques followed similar trends down-core, though the computed values differed slightly. The difference in down-core averages can be partly attributed to a missing value for the power law interpolation at the last interval (the power law fit did not meet the correlation threshold of $r^2 = 0.80$).

Figure 11 displays the erosion susceptibility for the depth intervals in core S1. Table 7 summarizes the variables resulting from the power law fit to the data in each shear stress cycle. A and n values for which the correlation was less than 0.80 are omitted. Table 8 summarizes the bulk density, d_{50}, and interpolated critical shear stresses, τ_{cr}, for specific core depths.

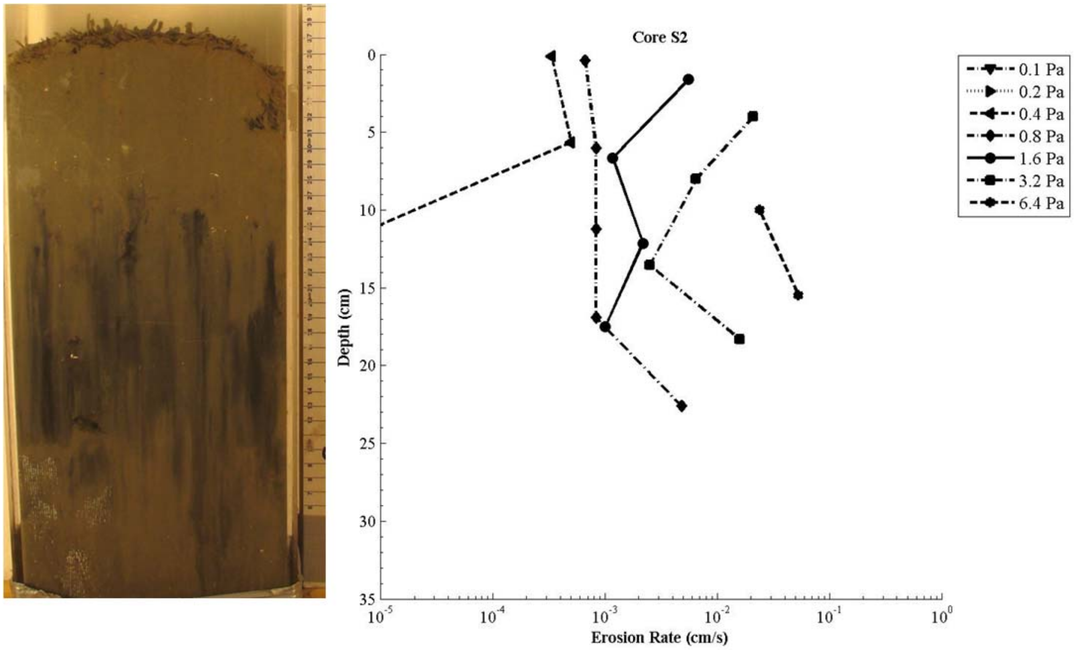

Figure 9. Picture of core S2 aligned with Sedflume erosion rate data.

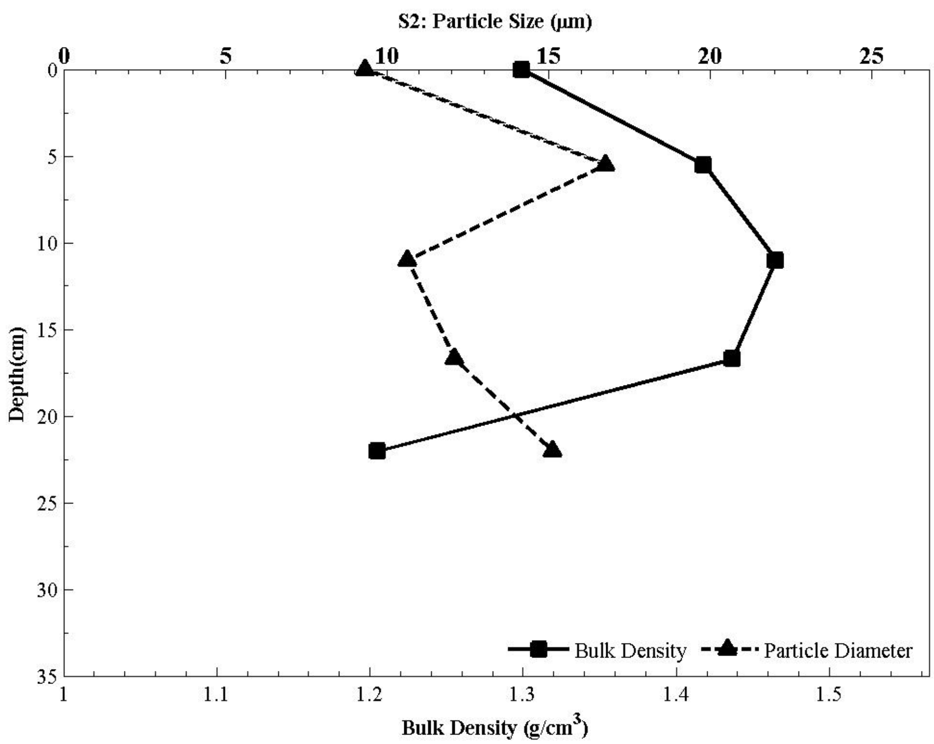

Figure 10. Bulk density and median particle size (d_{50}) with depth for core S2.

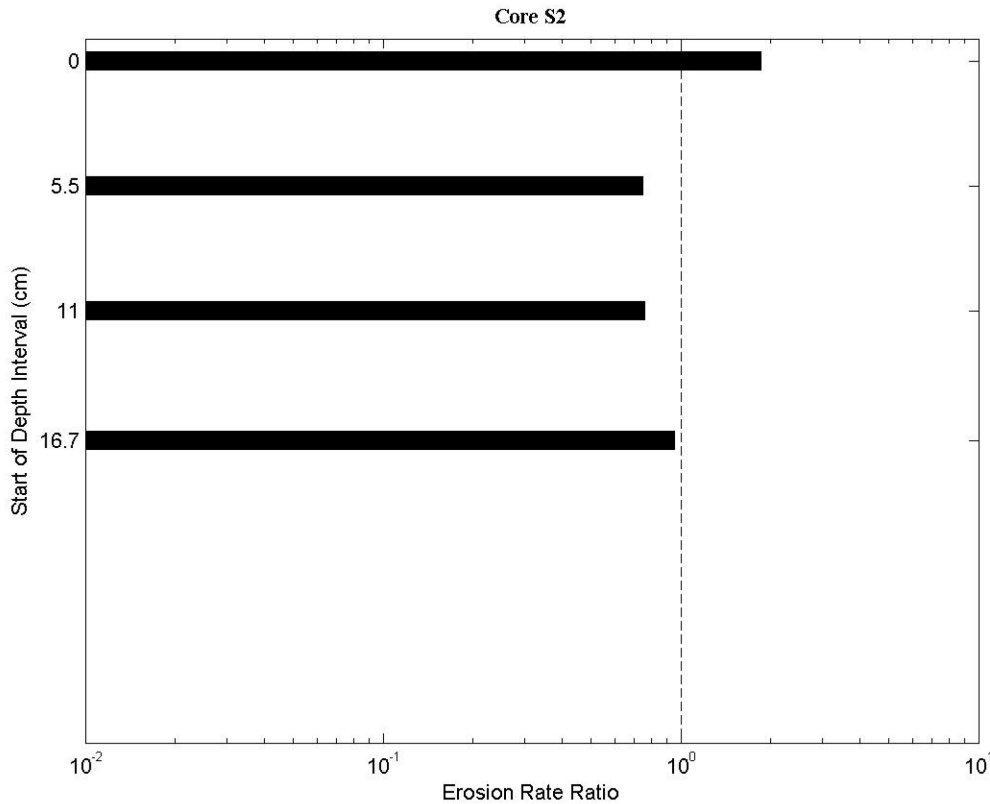

Figure 11. Intra-core erosion rate ratios for core S2.

Table 7. Power law best-fit variables for specified depth intervals in core S2.

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0.00	4.00	0.0017	2.10	0.97
2	5.50	10.00	0.0012	1.41	0.92
3	11.00	15.50	0.0009	1.82	0.82
4	16.70	18.30	0.0009	2.13	0.80
5	22.00	22.60	-	-	0.50

Table 8. Bulk density, median particle size and critical shear stress with depth for core S2.

Depth (cm)	d_{50} (µm)	ρ_b (g/cm^3)	Power Law τ_{cr} (Pa)	Linear Interpolation τ_{cr} (Pa)
0.00	9.32	1.30	0.26	0.26
5.50	16.76	1.42	0.17	0.24
11.00	10.64	1.46	0.30	0.45
16.70	12.10	1.44	0.36	0.45
22.00	15.13	1.20	-	0.41
Mean	**12.79**	**1.36**	**0.27**	**0.36**

Core S1

Core S1 was collected in approximately 2.0 meters water depth. Upon extraction, the core consisted of fine, soft, silty mud of a lighter brown color (~2cm thick) over a down-core varying dark- and light-colored gray– and brown-colored silt, sandy silt and fine sand. The lighter sediment color on the surface and below likely indicates greater oxidation of the sediments in those regions from benthic activity. A large number of worms and other benthic organisms existed on the surface. Orange colored worms and shell hash were visible down-core. Erosion was uneven and clumpy throughout the analysis.

Figure 12 shows a photo of core S1 prior to the analysis aligned vertically with the measured erosion rate data. The plot shows each shear stress applied to the core, ranging from 0.1 to 9.0 Pa, as a function of depth. Variations in erosion rate for each applied shear stress are shown. Figure 13 shows the bulk density and d_{50} (median particle size) as a function of depth.

The erosion rate data indicates typically consolidated sediment, with erosion rates generally decreasing with increasing depth into the core. At the deepest interval, sediments become slightly easier-to-erode. The median particle sizes remain relatively constant with depth, varying between 10.90 µm and 15.20 µm. The vertical mean of d_{50} in the core is 12.59 µm, fine silt. The bulk densities generally increase with depth, ranging from 1.31 g/cm^3 to 1.48 g/cm^3. The core average bulk density is 1.41 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.99 and 1.02 Pa for both power law and linear interpolation manners of computing critical shear, respectively. Results from both interpolation techniques followed similar trends down-core, though the computed values differed slightly.

The critical shear stress values for core S1 are significantly higher than those computed at cores S2 and S3, and the reason for this large difference is unclear at the present time. It is noteworthy to point out that although median particle sizes and bulk densities between the three cores are similar, it is not uncommon for other factors (e.g. mineralogy, organic content) to significantly alter erosion properties.

Figure 14 displays the erosion susceptibility for the depth intervals in core S1. Table 9 summarizes the variables resulting from the power law fit to the data in each shear stress cycle. A and n values for which the correlation was less than 0.80 are omitted. Table 10 summarizes the bulk density, d_{50}, and interpolated critical shear stresses, τ_{cr}, for specific core depths.

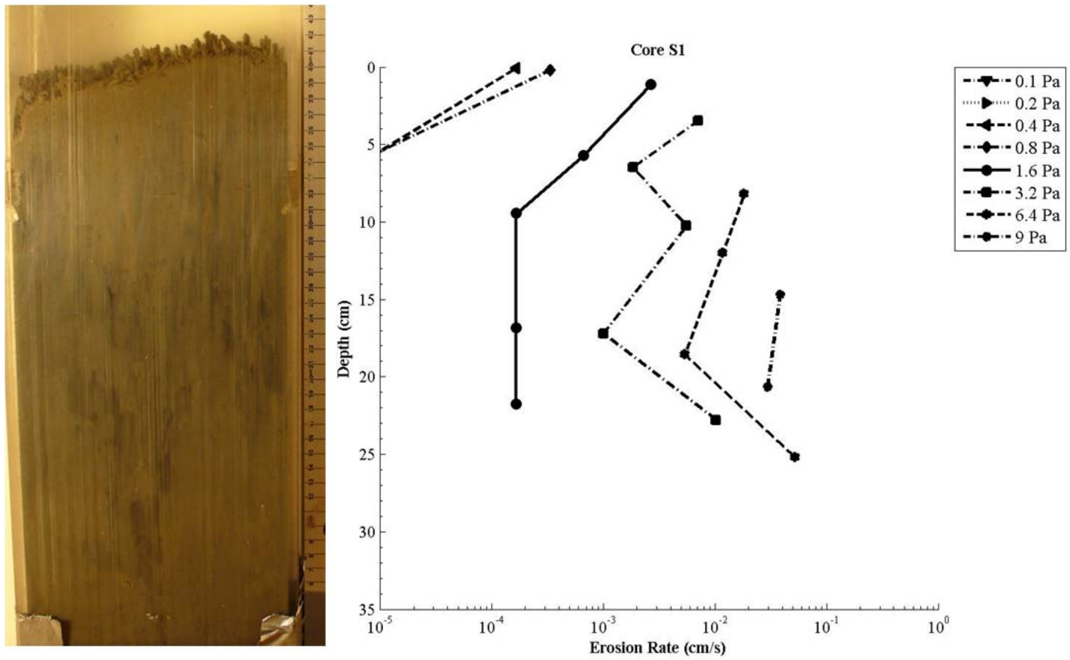

Figure 12. Picture of core S1 aligned with Sedflume erosion rate data.

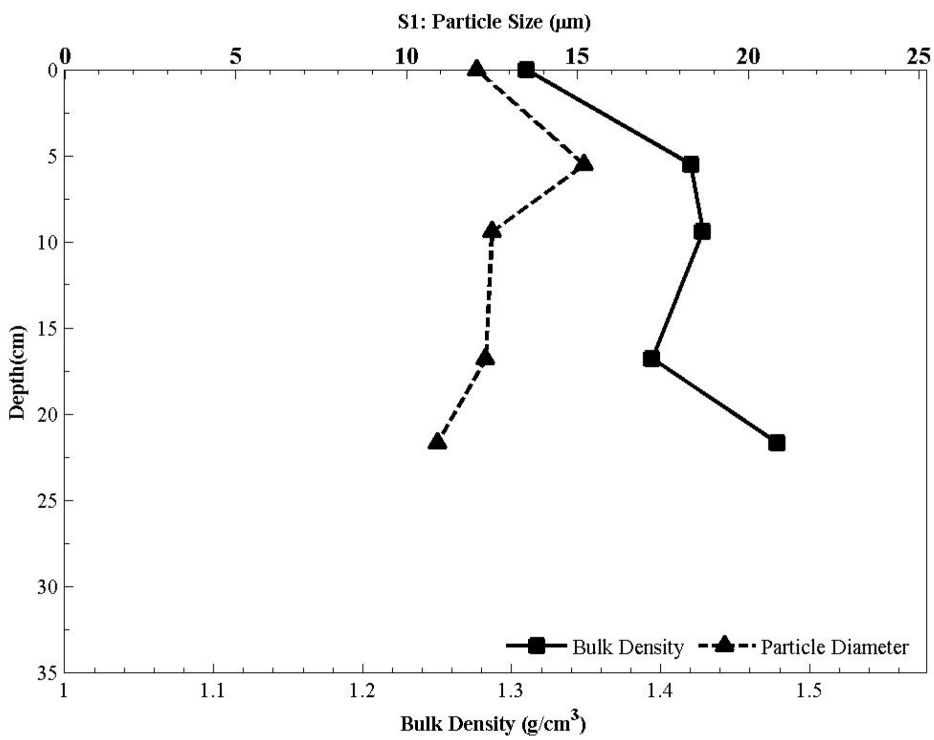

Figure 13. Bulk density and median particle size (d_{50}) with depth for core S1.

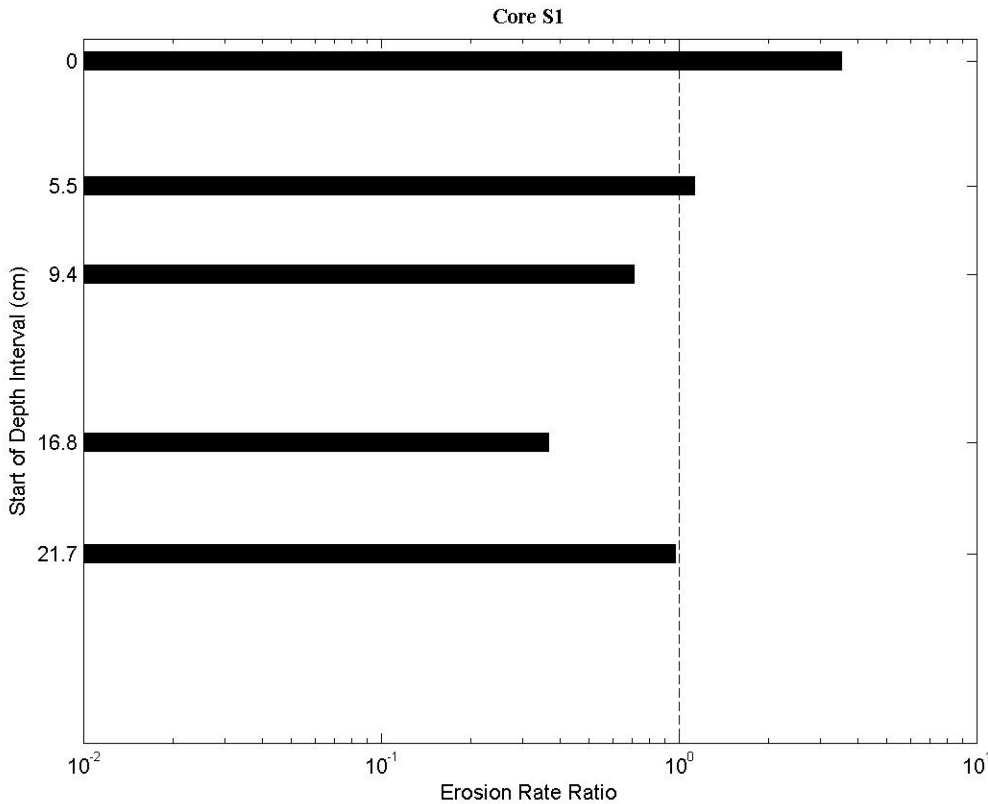

Figure 14. Intra-core erosion rate ratios for core S1.

Table 9. Power law best-fit variables for specified depth intervals in core S1.

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0.00	3.45	0.00080	1.92	0.96
2	5.50	8.20	0.00018	2.38	0.95
3	9.40	14.70	0.00007	2.93	0.92
4	16.80	20.65	0.00004	2.87	0.98
5	21.70	25.20	0.00004	4.14	0.94

Table 10. Bulk density, median particle size and critical shear stress with depth for core S1.

Depth (cm)	d_{50} (μm)	ρ_b (g/cm^3)	Power Law τ_{cr} (Pa)	Linear Interpolation τ_{cr} (Pa)
0.00	12.06	1.31	0.34	0.32
5.50	15.20	1.42	0.79	0.92
9.40	12.49	1.43	1.13	1.28
16.80	12.31	1.39	1.40	1.28
21.70	10.90	1.48	1.28	1.28
Mean	**12.59**	**1.41**	**0.99**	**1.02**

Core ML-2

Core ML-2 was collected in approximately 1.4 meters water depth. Upon extraction, the core consisted of soft, silty sediment of a lighter brown color (~2cm thick) over a darker brown-colored silt, sandy silt and fine sand below. The lighter sediment color likely indicates greater oxidation of the sediments near the surface. A large number of benthic organisms (worms and worm tubes) and organic material (plant material) existed on the surface. Worms and worm tubes were visible down-core throughout the analysis. Shells and shell hash was observed down-core. Erosion was uneven and clumpy throughout the analysis.

Figure 15 shows a photo of core ML-2 prior to the analysis aligned vertically with the measured erosion rate data. The plot shows each shear stress applied to the core, ranging from 0.1 to 6.4 Pa, as a function of depth. Variations in erosion rate for each applied shear stress are shown. Figure 16 shows the bulk density and d_{50} (median particle size) as a function of depth.

The erosion rate data shows variation down-core; sediments alternate between easier- and more difficult-to-erode as depth increases; a stiff layer was encountered at approximately 17 cm. The median particle sizes remain relatively constant with depth, varying between 9.69 µm and 13.85 µm. The vertical mean of d_{50} in the core is 11.26 µm, fine silt. The bulk densities also vary slightly with depth, ranging from 1.37 g/cm^3 to 1.47 g/cm^3. The core average bulk density is 1.43 g/cm^3.

The core mean-values of the interpolated critical shear stresses are 0.34 and 0.65 Pa for both power law and linear interpolation manners of computing critical shear, respectively. The core has relatively uniform erosion rates with the exception of a difficult to erode layer at a 17 cm depth into the sediment. The interpolated critical shear stress is the highest in the core at 1.61 Pa. As an artifact of the power law fit, however, the critical shear stress at this depth is only 0.19 Pa. This is likely the result of a very thin, difficult-to-erode layer at 17 cm overlying an easier-to-erode layer. The power law interpolation technique blends these two sediments in one layer and skews the results.

Figure 17 displays the erosion susceptibility for the depth intervals in core ML-2. Table 11 summarizes the variables resulting from the power law fit to the data in each shear stress cycle. A and n values for which the correlation was less than 0.80 are omitted. Table 12 summarizes the bulk density, d_{50}, and interpolated critical shear stresses, τ_{cr}, for specific core depths.

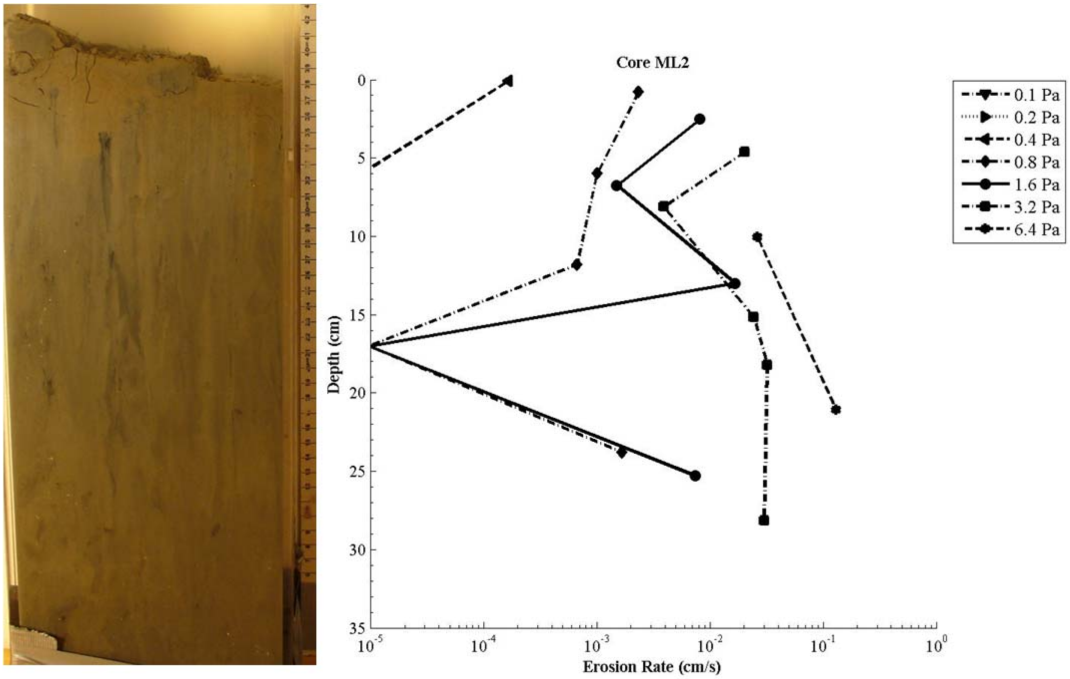

Figure 15. Picture of core ML-2 aligned with Sedflume erosion rate data.

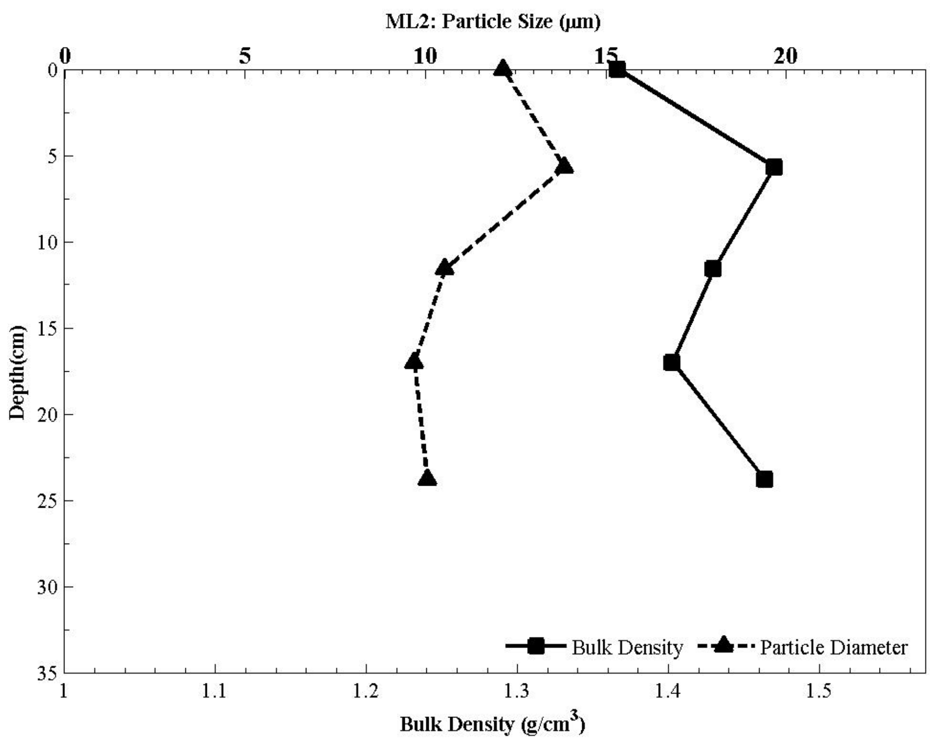

Figure 16. Bulk density and median particle size (d_{50}) with depth for core ML-2.

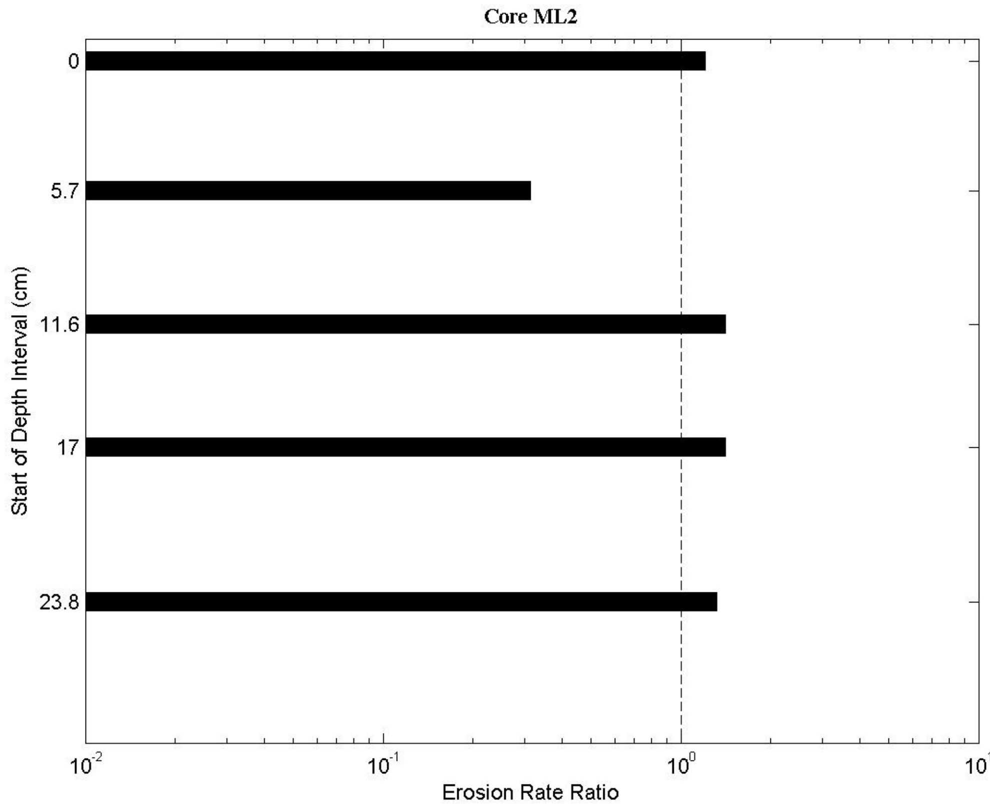

Figure 17. Intra-core erosion rate ratios for core ML-2.

Table 11. Power law best-fit variables for specified depth intervals in core ML-2.

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0.00	4.60	0.00215	2.26	0.94
2	5.70	10.05	0.00099	1.55	0.91
3	11.60	15.15	0.00191	2.59	0.83
4	17.00	21.10	0.00302	2.03	1.00
5	23.80	28.15	0.00270	2.09	1.00

Table 12. Bulk density, median particle size and critical shear stress with depth for core ML-2.

Depth (cm)	d_{50} (µm)	ρ_b (g/cm^3)	Power Law τ_{cr} (Pa)	Linear Interpolation τ_{cr} (Pa)
0.00	12.16	1.37	0.26	0.32
5.70	13.85	1.47	0.23	0.44
11.60	10.53	1.43	0.32	0.46
17.00	9.69	1.40	0.19	1.61
23.80	10.05	1.46	0.21	0.42
Mean	**11.26**	**1.43**	**0.24**	**0.65**

Core ML-1

Core ML-1 was collected in approximately 1.3 meters water depth. Upon extraction, the core consisted of soft, silty sand and mud of a lighter brown color (~2 cm thick) over a darker gray- and brown-colored silt and sandy silt. The lighter sediment color likely indicates greater oxidation of the sediments near the surface. A large number of benthic organisms existed on the surface and extended approximately 1 cm above the surface. Worms and worm tubes were visible down-core throughout the analysis. Shells and shell pieces were observed down-core. Erosion was uneven across the core surface during the analysis.

Figure 18 shows a photo of core ML-1 prior to the analysis aligned vertically with the measured erosion rate data. The plot shows each shear stress applied to the core, ranging from 0.1 to 9.0 Pa, as a function of depth. Variations in erosion rate for each applied shear stress are shown. Figure 19 shows the bulk density and d_{50} (median particle size) as a function of depth.

The erosion rate data shows evidence of material becoming more difficult to erode before becoming easier to erode as the depth into the core increases. Deeper than 10 cm, material becomes increasingly easier to erode. The median particle sizes remain relatively constant with depth, varying between 9.25 μm and 11.48 μm. The vertical mean of d_{50} in the core is 10.18 μm, fine silt. The bulk densities increase from the surface value before decreasing again at the deepest location. They ranged from 1.25 g/cm^3 to 1.46 g/cm^3, with a core average of 1.40 g/cm^3. The core mean-values of the interpolated critical shear stresses are 1.50 and 1.39 Pa for both power law and linear interpolation manners of computing critical shear, respectively. Results from both interpolation techniques followed similar trends down-core, though the computed values differed slightly.

Figure 20 displays the erosion susceptibility for the depth intervals in core ML-1. Table 13 summarizes the variables resulting from the power law fit to the data in each shear stress cycle. A and n values for which the correlation was less than 0.80 are omitted. Table 14 summarizes the bulk density, d_{50}, and interpolated critical shear stresses, τ_{cr}, for specific core depths.

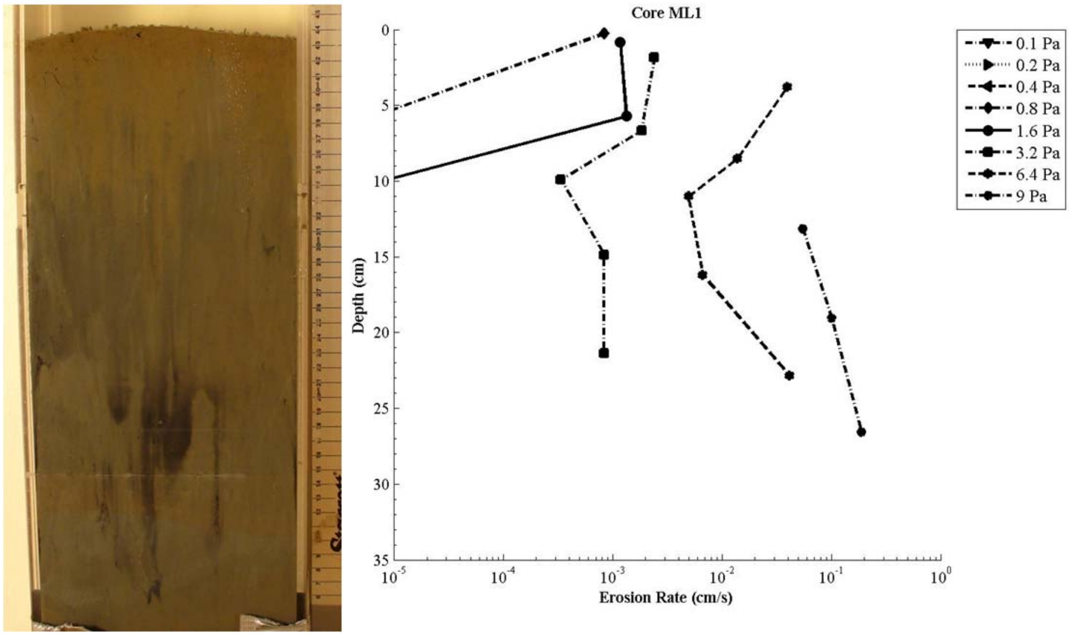

Figure 18. Picture of core ML-1 aligned with Sedflume erosion rate data.

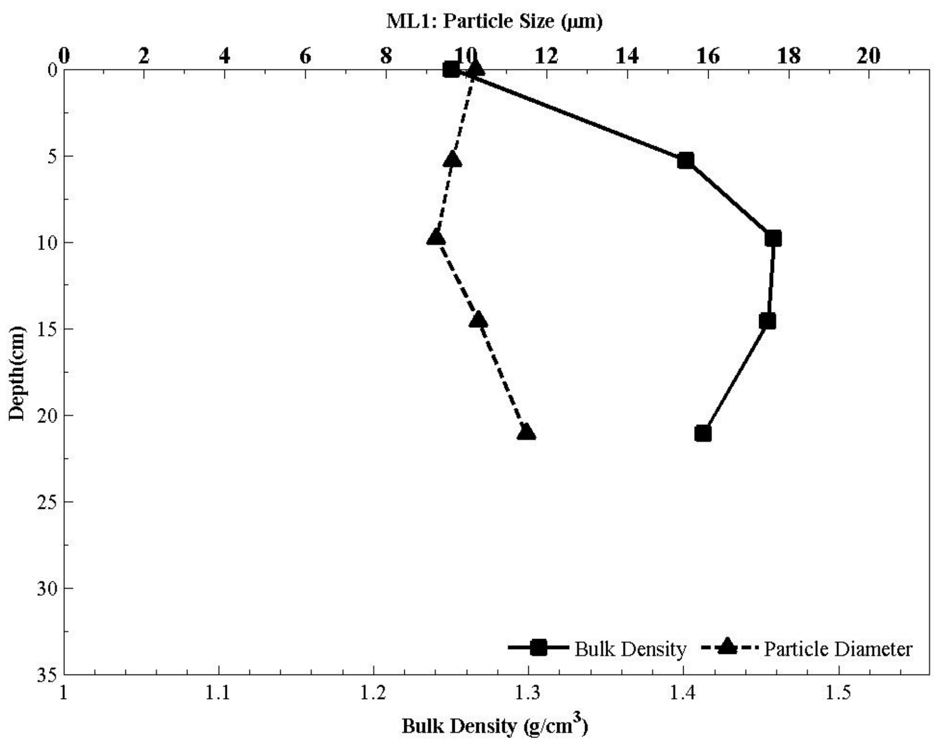

Figure 19. Bulk density and median particle size (d_{50}) with depth for core ML-1.

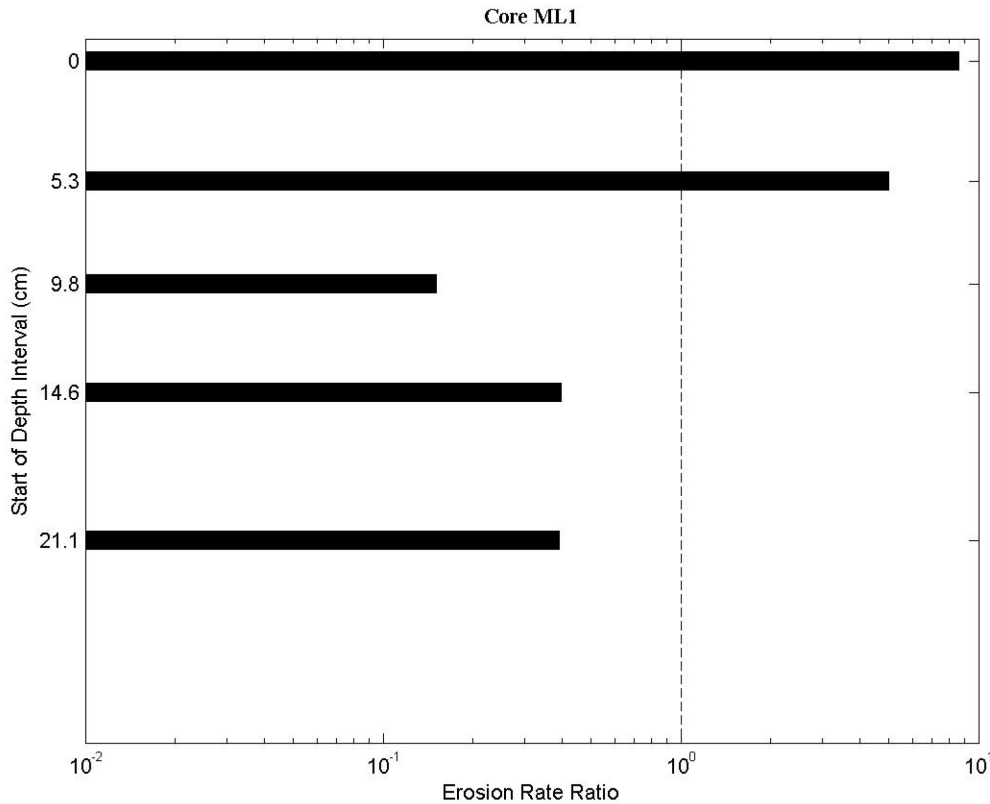

Figure 20. Intra-core erosion rate ratios for core ML-1.

Table 13. Power law best-fit variables for specified depth intervals in core ML-1.

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0.00	3.80	0.000728	1.77	0.82
2	5.30	8.50	0.000456	1.68	0.85
3	9.80	13.15	0.000001	4.78	0.97
4	14.60	19.05	0.000004	4.39	0.93
5	21.10	26.55	0.000002	5.30	1.00

Table 14. Bulk density, median particle size and critical shear stress with depth for core ML-1.

Depth (cm)	d_{50} (µm)	ρ_b (g/cm^3)	Power Law τ_{cr} (Pa)	Linear Interpolation τ_{cr} (Pa)
0.00	10.22	1.25	0.33	0.45
5.30	9.65	1.40	0.41	0.86
9.80	9.25	1.46	2.57	2.08
14.60	10.30	1.45	2.08	1.79
21.10	11.48	1.41	2.12	1.79
Mean	**10.18**	**1.40**	**1.50**	**1.39**

Core CJ2b

Core CJ2b was collected in approximately 1.6 meters water depth. Upon extraction, the core consisted of fine, soft silt and sandy silt of a lighter brown color (~6-8 cm thick) over a darker-colored gray– and brown-colored silt, clayey silt and sandy silt. The lighter sediment color on the surface and below likely indicates greater oxidation of the sediments in those regions from benthic activity. A large number of plant material and benthic organisms existed on the surface and down-core, thought not extending above the surface as high as the offshore core locations. Small number of worms and worm tubes were visible down-core during the analysis. The material contained small worms and shell pieces down-core. Material consisted of stiff clayey silt below the surface.

Figure 21 shows a photo of core CJ2b prior to the analysis aligned vertically with the measured erosion rate data. The plot shows each shear stress applied to the core, ranging from 0.1 to 9.0 Pa, as a function of depth. Variations in erosion rate for each applied shear stress are shown. Figure 22 shows the bulk density and d_{50} (median particle size) as a function of depth.

The erosion rate data indicates typically consolidated sediment, with erosion rates generally decreasing with increasing depth into the core. The median particle sizes increase below the surface before decreasing at the deepest depths; varying between 8.51 μm and 13.50 μm. The vertical mean of d_{50} in the core is 10.75 μm, fine silt. The bulk densities increase from the surface value before decreasing with depth; the down-core range is 1.25 g/cm^3 to 1.41 g/cm^3. The core average bulk density is 1.36 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.90 and 0.93 Pa for both power law and linear interpolation manners of computing critical shear, respectively. Results from both interpolation techniques followed similar trends down-core, though the computed values differed slightly.

Figure 23 displays the erosion susceptibility for the depth intervals in core S3. Table 15 summarizes the variables resulting from the power law fit to the data in each shear stress cycle. A and n values for which the correlation was less than 0.80 are omitted. Table 16 summarizes the bulk density, d_{50}, and interpolated critical shear stresses, τ_{cr}, for specific core depths.

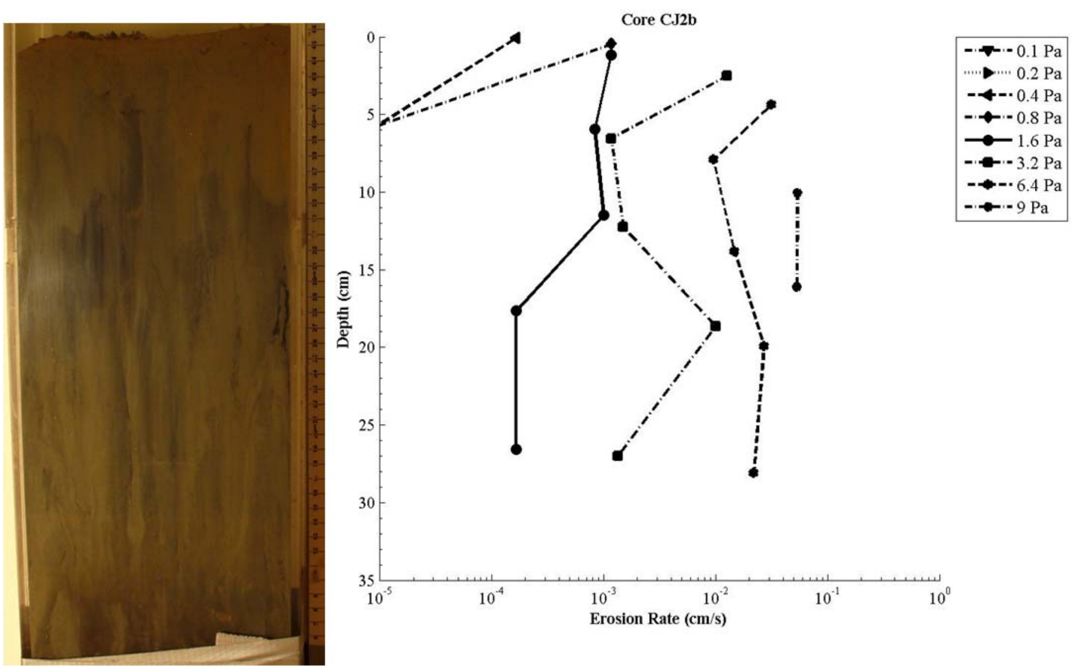

Figure 21. Picture of core CJ2b aligned with Sedflume erosion rate data.

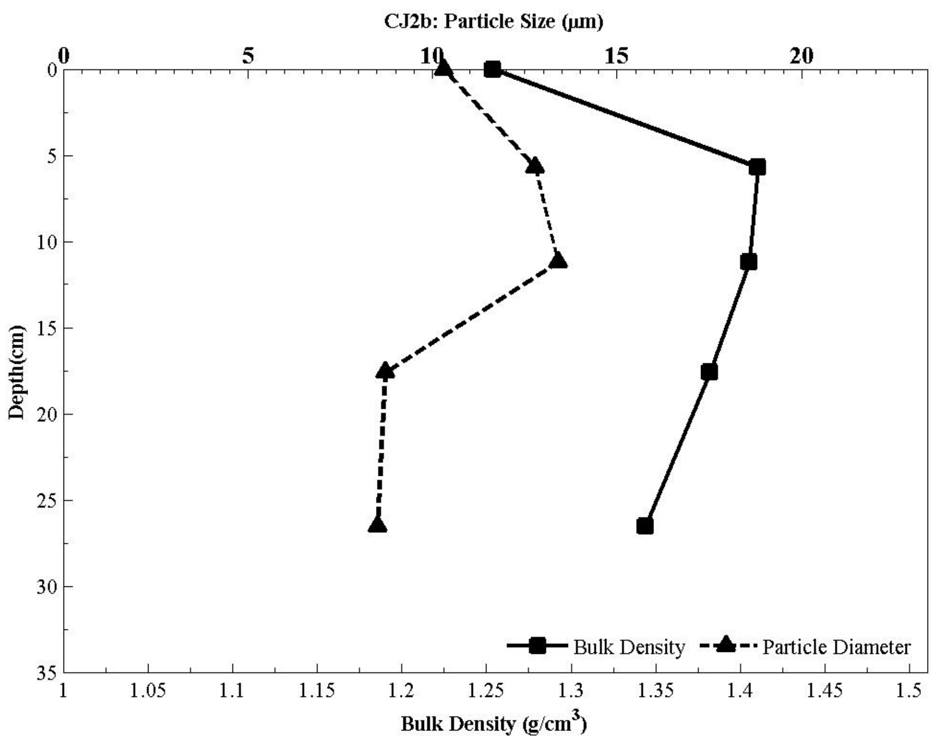

Figure 22. Bulk density and median particle size (d_{50}) with depth for core CJ2b.

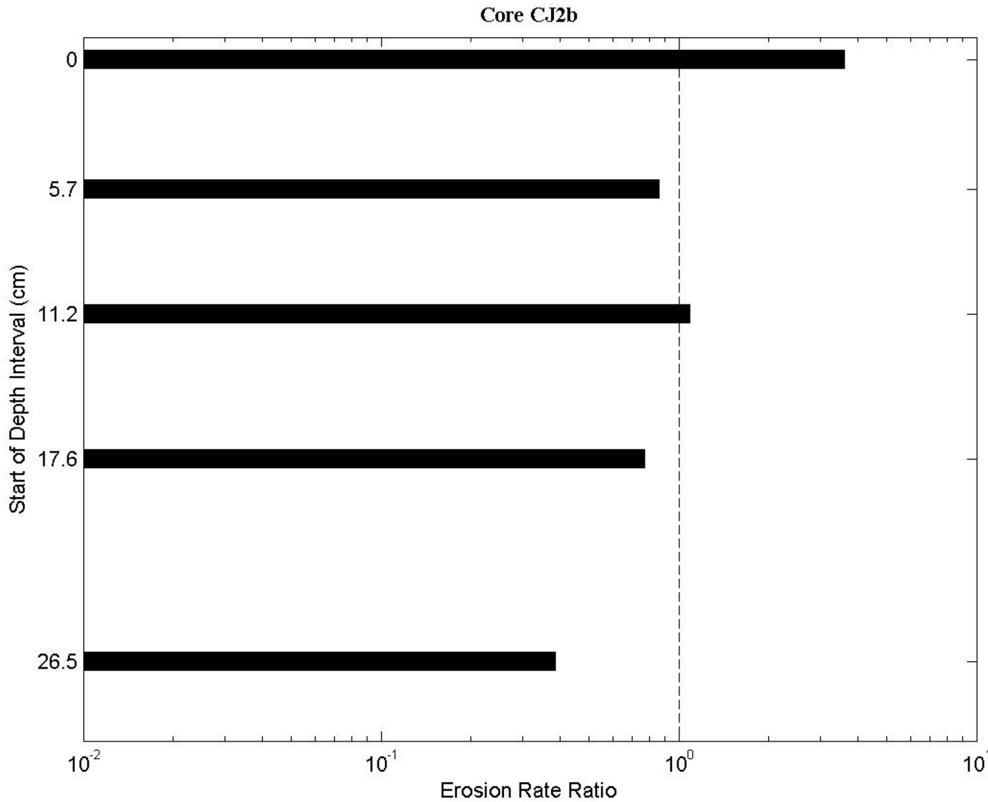

Figure 23. Intra-core erosion rate ratios for core CJ2b.

Table 15. Power law best-fit variables for specified depth intervals in core CJ2b.

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0.00	4.35	0.00103	1.86	0.94
2	5.70	10.05	0.00016	2.38	0.88
3	11.20	16.10	0.00021	2.35	0.91
4	17.60	19.95	0.00005	3.67	0.89
5	26.50	28.10	0.00003	3.52	0.99

Table 16. Bulk density, median particle size and critical shear stress with depth for core CJ2b.

Depth (cm)	d_{50} (μm)	ρ_b (g/cm^3)	Power Law τ_{cr} (Pa)	Linear Interpolation τ_{cr} (Pa)
0.00	10.32	1.25	0.28	0.32
5.70	12.79	1.41	0.82	0.90
11.20	13.40	1.41	0.73	0.88
17.60	8.72	1.38	1.21	1.28
26.50	8.51	1.34	1.43	1.28
Mean	**10.75**	**1.36**	**0.90**	**0.93**

Core CJ3a

Core CJ3a was collected in approximately 1.6 meters water depth. Upon extraction, the core consisted of fine, soft silt and sandy silt of a lighter brown color (~6-8 cm thick) over a darker-colored gray– and brown-colored silt, clayey silt and sandy silt. At a depth between 20 and 30 cm, some sandy silt and fine sand is visible. The lighter sediment color on the surface and below likely indicates greater oxidation of the sediments in those regions from benthic activity. A large number of benthic organisms (worms and other moving organisms) existed on the surface and down-core. Shell hash and worms were visible down-core during the analysis. Worms and worm tubes were visible down-core during the analysis. Erosion was uneven and clumpy at times.

Figure 24 shows a photo of core CJ3a prior to the analysis aligned vertically with the measured erosion rate data. Variations in erosion rate for each applied shear stress are shown. Figure 25 shows the bulk density and d_{50} (median particle size) as a function of depth.

The erosion rate data shows erosion rates varying slightly, but generally decreasing, with depth into the core, indicative of typically consolidated material. At a depth of approximately 15 cm, the material becomes slightly easier-to-erode before becoming stiffer again. The median particle sizes decrease with depth from 22.98 µm to 8.32 µm. The vertical mean of d_{50} in the core is 15.31 µm, fine silt. The bulk densities remain generally constant with depth from 1.34 g/cm^3 to 1.42 g/cm^3 with a spike of 1.55 g/cm^3 at a depth of approximately 6 cm. The core average bulk density is 1.41 g/cm^3.

The core mean-values of the interpolated critical shear stresses are 0.58 and 1.07 Pa for both power law and linear interpolation manners of computing critical shear, respectively. This large difference is, again, partially a result of a missing power law interpolation value at the final interval and the occurrence of a very difficult to erode layer (which causes a large linear interpolated critical shear stress).

In addition, the power law interpolation at a depth of 6.30 cm (0.16 Pa) was much smaller than the linearly interpolated value (0.85 Pa). This is probably the result of a difficult-to-erode layer overlying an easier-to-erode layer (evident by the sudden increase in erosion rate from applied shear stresses 0.8 Pa to 1.6 Pa at this depth, [Figure 24]). The power law interpolation technique cannot differentiate between the two layers and likely skews the results.

Figure 26 displays the erosion susceptibility for the depth intervals in core CJ3a. Table 17 summarizes the variables resulting from the power law fit to the data in each shear stress cycle. A and n values for which the correlation was less than 0.80 are omitted. Table 18 summarizes the bulk density, d_{50}, and interpolated critical shear stresses, τ_{cr}, for specific core depths.

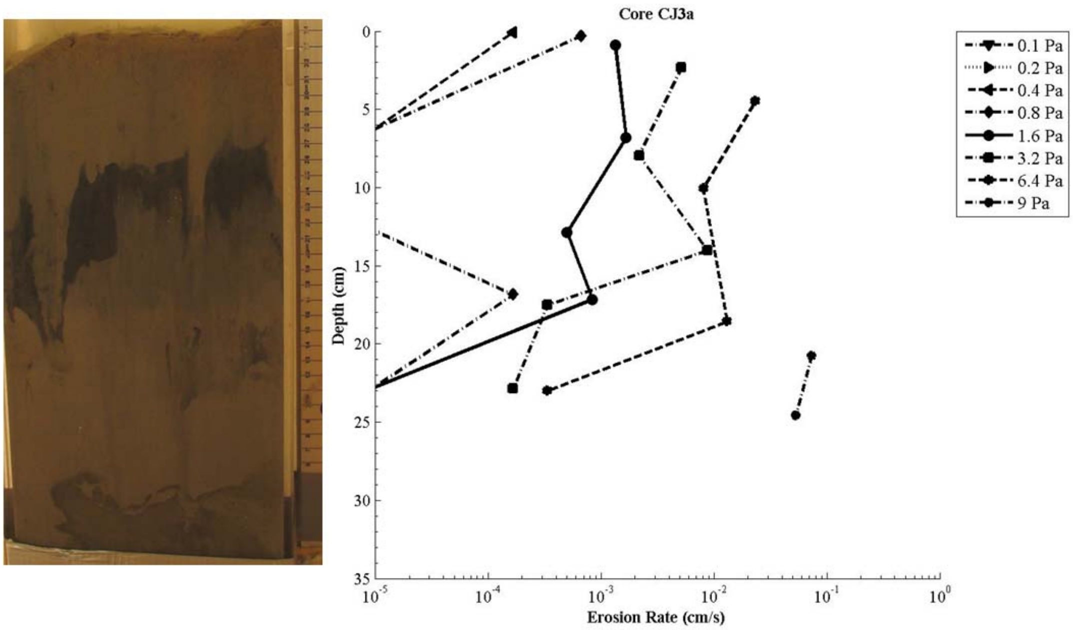

Figure 24. Picture of core CJ3a aligned with Sedflume erosion rate data.

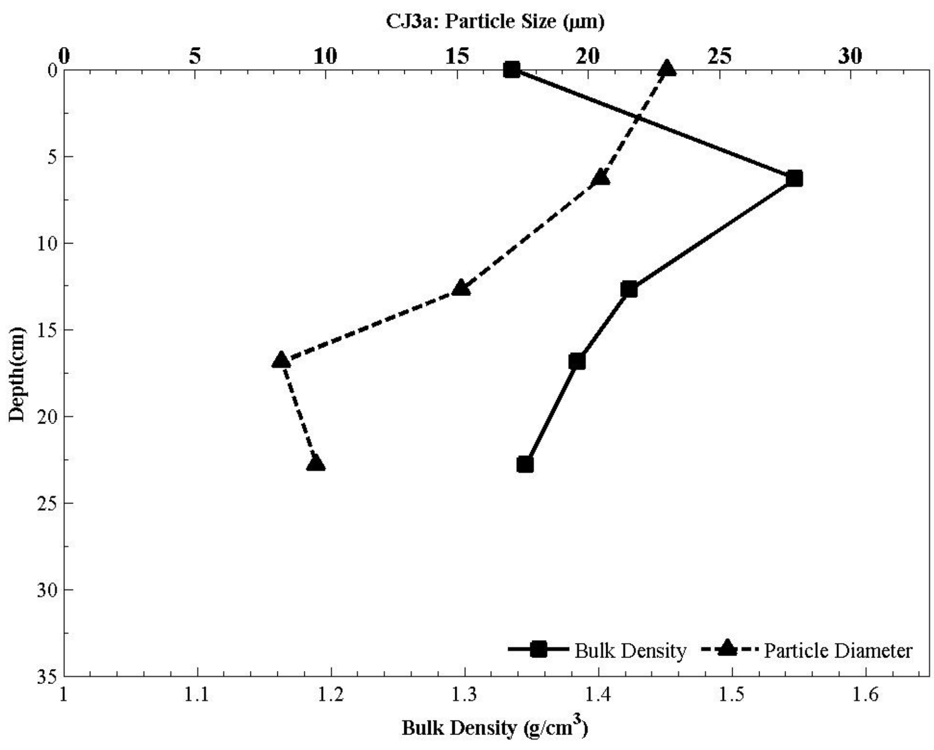

Figure 25. Bulk density and median particle size (d_{50}) with depth for core CJ3a.

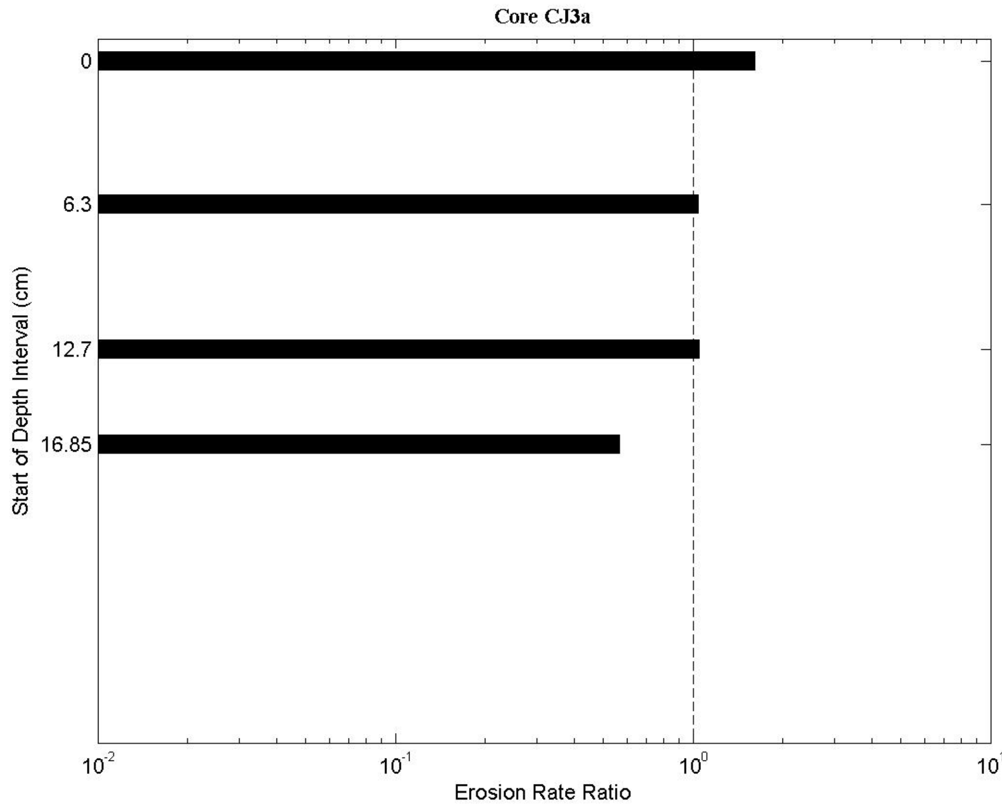

Figure 26. Intra-core erosion rate ratios for core CJ3a.

Table 17. Power law best-fit variables for specified depth intervals in core CJ3a.

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0.00	4.45	0.0008	1.72	0.99
2	6.30	10.05	0.0008	1.14	0.87
3	12.70	14.00	0.0001	4.12	1.00
4	16.85	20.75	0.0002	2.32	0.80
5	22.80	24.55	-	-	0.67

Table 18. Bulk density, median particle size and critical shear stress with depth for core CJ3a.

Depth (cm)	d_{50} (µm)	ρ_b (g/cm^3)	Power Law τ_{cr} (Pa)	Linear Interpolation τ_{cr} (Pa)
0.00	22.98	1.34	0.30	0.32
6.30	20.46	1.55	0.16	0.85
12.70	15.15	1.42	1.08	0.96
16.85	8.32	1.38	0.80	0.64
22.80	9.62	1.35	-	2.56
Mean	**15.31**	**1.41**	**0.58**	**1.07**

Core CJ3c

Core CJ3c was collected in approximately 5.0 meters water depth from near the navigation channel approaching Corte Madera. Upon extraction, the core consisted of sand and silt of a lighter brown color (~6-10 cm thick) over a darker-colored gray– and brown-colored silt and clayey silt. The lighter sediment color on the surface and below likely indicates greater oxidation of the sediments in those regions from benthic activity. Very little benthic organisms existed on the surface. No worms were observed down-core. The down-core material was soft and loose, a mixture of silt and clayey-silt. Erosion occurred in clumps throughout the analysis.

Figure 27 shows a photo of core CJ3c prior to the analysis aligned vertically with the measured erosion rate data. Variations in erosion rate for each applied shear stress are shown. Figure 28 shows the bulk density and d_{50} (median particle size) as a function of depth.

The erosion rate data shows erosion rates remaining relatively constant with increasing depth into the core. At a depth of approximately 17 cm, the material becomes slightly easier-to-erode before becoming stiffer again. The median particle sizes remain relatively constant with depth, varying between 7.49 µm and 8.72 µm. The vertical mean of d_{50} in the core is 8.09 µm, fine silt. The bulk densities generally increase with depth from 1.20 g/cm^3 to 1.37 g/cm^{3}abefore decreasing at the deepest sample location to 1.30 g/cm^3. The core average bulk density is 1.30 g/cm^3.

The core mean-values of the interpolated critical shear stresses are 0.65 and 0.78 Pa for both power law and linear interpolation manners of computing critical shear, respectively. Results from both interpolation techniques followed similar trends down-core, though the computed values differed slightly. At a depth of 16.5 cm, the power law interpolation technique result (0.25 Pa) was much smaller than the linear interpolation value (0.82 Pa). This is an artifact of the power law technique as the layer at which this occurs appears to jump from a more difficult-to-erode layer to a much easier-to-erode layer.

Figure 29 displays the erosion susceptibility for the depth intervals in core CJ3c. Table 19 summarizes the variables resulting from the power law fit to the data in each shear stress cycle. A and n values for which the correlation was less than 0.80 are omitted. Table 20 summarizes the bulk density, d_{50}, and interpolated critical shear stresses, τ_{cr}, for specific core depths.

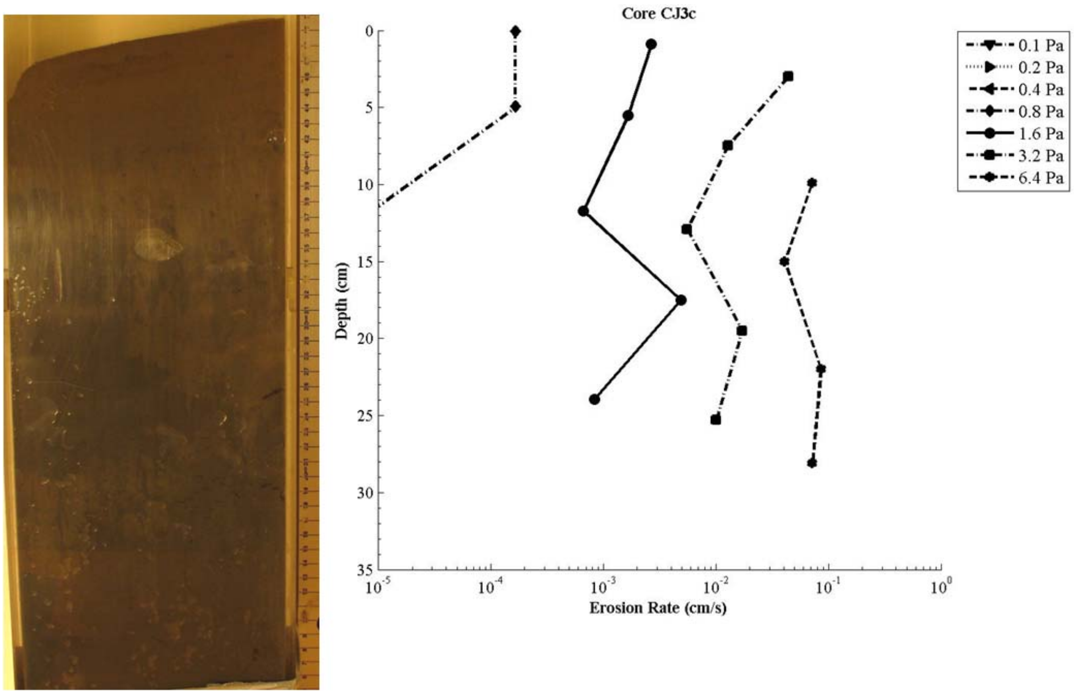

Figure 27. Picture of core CJ3c aligned with Sedflume erosion rate data.

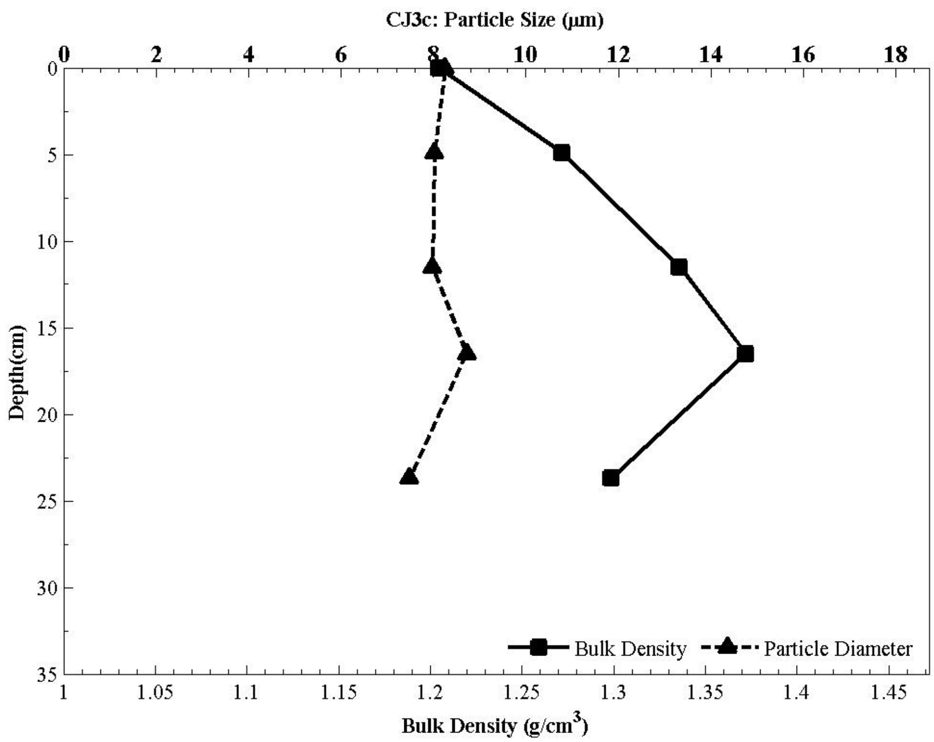

Figure 28. Bulk density and median particle size (d_{50}) with depth for core CJ3c.

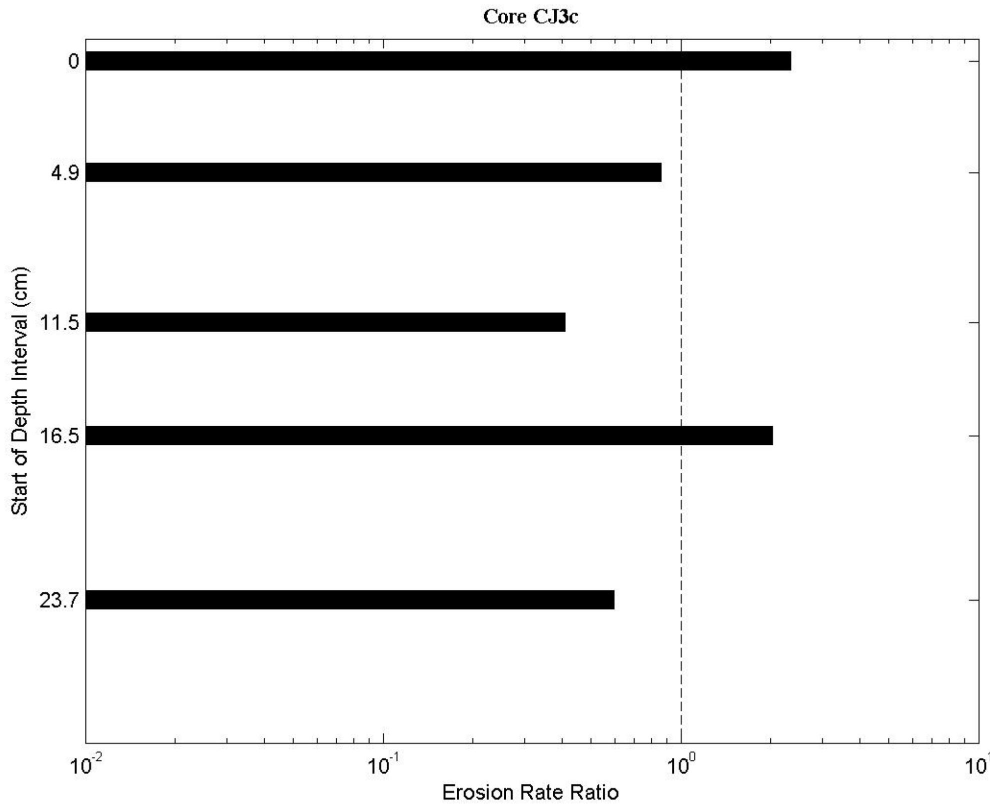

Figure 29. Intra-core erosion rate ratios for core CJ3c.

Table 19. Power law best-fit variables for specified depth intervals in core CJ3c.

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0.00	3.00	0.0004	4.02	1.00
2	4.90	9.90	0.0004	2.92	1.00
3	11.50	15.00	0.0002	2.97	1.00
4	16.50	22.00	0.0017	2.07	1.00
5	23.70	28.10	0.0002	3.22	1.00

Table 20. Bulk density, median particle size and critical shear stress with depth for core CJ3c.

Depth (cm)	d_{50} (μm)	ρ_b (g/cm^3)	Power Law τ_{cr} (Pa)	Linear Interpolation τ_{cr} (Pa)
0.00	8.26	1.20	0.71	0.64
4.90	8.02	1.27	0.64	0.64
11.50	7.98	1.34	0.84	0.92
16.50	8.72	1.37	0.25	0.82
23.70	7.49	1.30	0.81	0.90
Mean	**8.09**	**1.30**	**0.65**	**0.78**

Core CMC

Core CMC was collected in approximately 3.6 meters water depth. Extraction was difficult, requiring several attempts to recover an acceptable core. The recovered core consisted of approximately 25 cm of silt and sandy silt over larger pieces of gravel and other coarse material (difficult to penetrate with the core barrel). Upon analysis, the core consisted of fine, soft silt and sandy silt of a lighter brown color (~1-2cm thick) over a darker-colored gray– and brown-colored silt and sandy silt. The lighter sediment color on the surface and below likely indicates greater oxidation of the sediments in those regions from benthic activity. Very few (3) orange worms existed on the surface. Down-core, a small number of additional worms were visible through the core barrel as well as gas bubbles trapped during the core extraction. At the deepest depths, coarse sand was observed. Beneath the coarse sand, the base of the core consisted of gravel, large woody debris and shells. One large piece of wood was observed to be approximately 10 cm long by 4 cm diameter. Erosion occurred in clumps throughout the analysis.

Figure 30 shows a photo of core CMC prior to the analysis aligned vertically with the measured erosion rate data. Variations in erosion rate for each applied shear stress are shown. Figure 31 shows the bulk density and d_{50} (median particle size) as a function of depth.

The erosion rate data shows erosion rates remaining relatively constant with increasing depth into the core. At depths deeper than 20 cm, though, the material becomes an order of magnitude easier-to-erode. At this depth (and deeper) the material is coarser and less cohesive than the surface layers. The median particle sizes remain relatively constant with depth, varying between 7.28 µm and 9.02 µm. The vertical mean of d_{50} in the core is 8.25 µm, fine silt. The bulk densities generally increase with depth from 1.30 g/cm^3 to 1.44 g/cm^3. The core average bulk density is 1.37 g/cm^3. The core mean-values of the interpolated critical shear stresses are 0.72 and 0.68 Pa for both power law and linear interpolation manners of computing critical shear, respectively. Results from both interpolation techniques followed similar trends down-core, though the computed values differed slightly.

Figure 32 displays the erosion susceptibility for the depth intervals in core CMC. Table 21 summarizes the variables resulting from the power law fit to the data in each shear stress cycle. A and n values for which the correlation was less than 0.80 are omitted. Table 22 summarizes the bulk density, d_{50}, and interpolated critical shear stresses, τ_{cr}, for specific core depths.

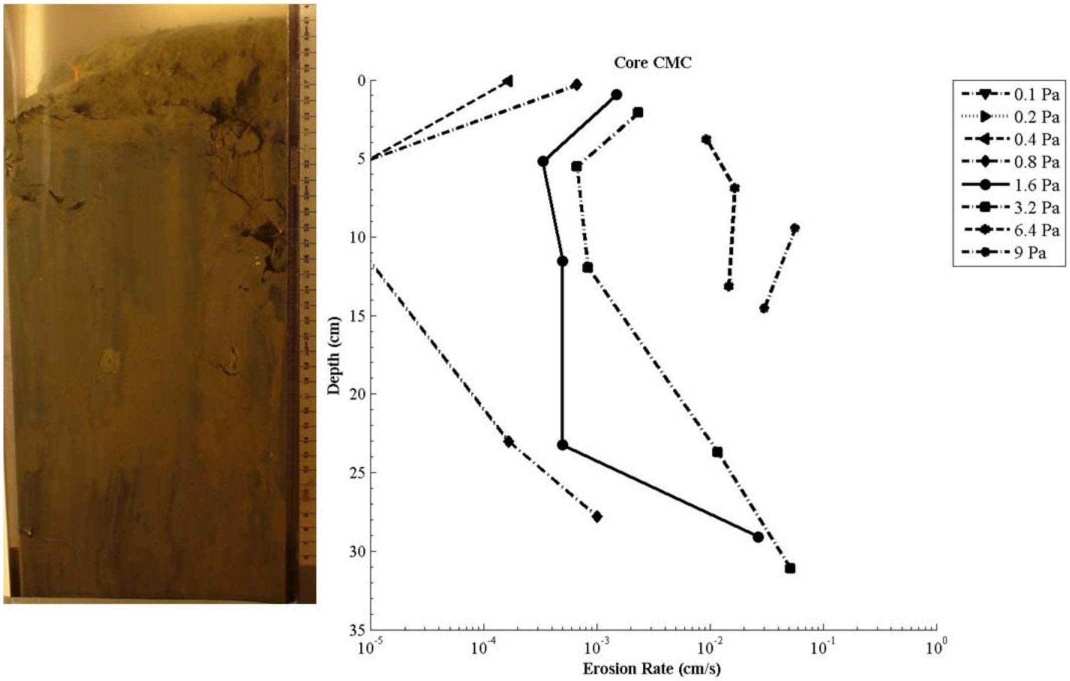

Figure 30. Picture of core CMC aligned with Sedflume erosion rate data.

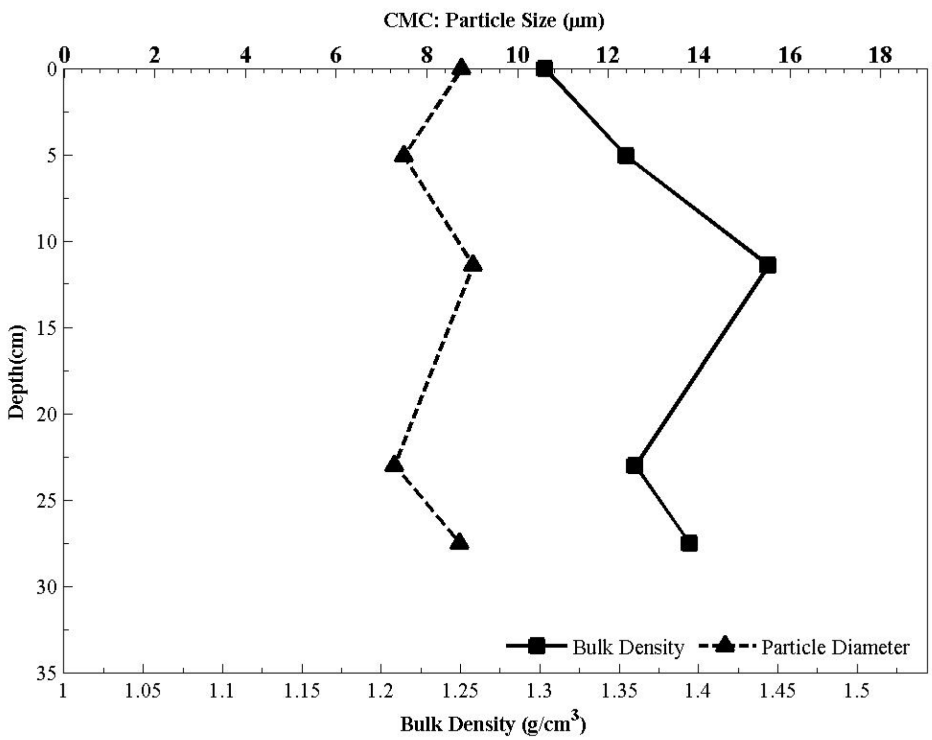

Figure 31. Bulk density and median particle size (d_{50}) with depth for core CMC.

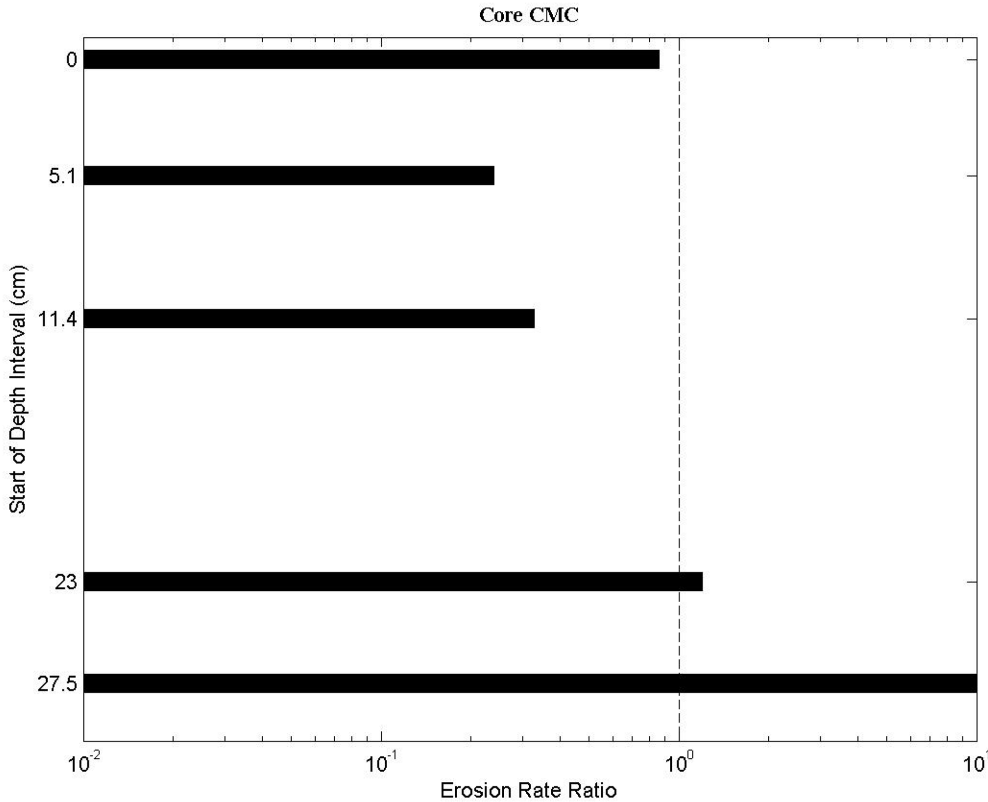

Figure 32. Intra-core erosion rate ratios for core CMC.

Table 21. Power law best-fit variables for specified depth intervals in core CMC.

Interval	Depth Start (cm)	Depth Finish (cm)	A	n	r^2
1	0.00	3.80	0.00069	1.34	0.97
2	5.10	9.45	0.00005	3.12	0.93
3	11.40	14.55	0.00010	2.56	0.92
4	23.00	23.70	0.00023	3.07	0.93
5	27.50	31.10	0.00292	2.84	0.87

Table 22. Bulk density, median particle size and critical shear stress with depth for core CMC.

Depth (cm)	d_{50} (μm)	ρ_b (g/cm^3)	Power Law τ_{cr} (Pa)	Linear Interpolation τ_{cr} (Pa)
0.00	8.76	1.30	0.24	0.32
5.10	7.48	1.35	1.29	1.04
11.40	9.02	1.44	1.01	0.96
23.00	7.28	1.36	0.76	0.64
27.50	8.71	1.39	0.30	0.44
Mean	**8.25**	**1.37**	**0.72**	**0.68**

Summary

Sea Engineering, Inc. conducted a Sedflume analysis on ten cores obtained from offshore of Corte Madera, CA. These cores were collected offshore in areas during times when the on-site water levels ranged to 20 ft.water depth. The primary goal of this work was to characterize the erosion rates and physical properties of the sediments within the region. The Sedflume analysis determined sediment erosion rates, critical shear stress, particle size and wet bulk density at depth intervals down the length of each core.

Due to the large number of worms, organic materials and other benthic organism, it is likely that erosion rates both on the surface and down-core were affected, though the magnitude of the impact is difficult to quantify. Surface organisms did not appear to affect initial, fine particulate erosion, which mobilized fairly readily (top 1-2 cm). Beneath the surface layer, at depths between 1-5 cm, erosion appeared to slow as the worms and other organic material anchored the sediment in place, preventing rapid erosion. This persisted until the shear stress was large enough to erode the organisms along with the sediment. At deeper depths, the affect of worms, clams and other organism appeared to have the opposite effect. When shear stresses were large enough, erosion tended to occur in large clumps, a result of existing holes and tubes created by the organisms. Erosion likely occurred more rapidly at these depths than if the holes did not exist because the voids allowed the sediment structure to fracture and erode more easily. These are results that are frequently encountered in Sedflume Analyses.

The images below present an additional method of visualizing the relative erodibility of each of the cores. Figure 33 is a ratio plot of each *core* mean erosion rate (vertically averaged erosion rate) to the *site-wide* mean erosion rate (average of the core mean erosion rates). The dashed line denotes the site-wide average erosion rate ratio of 1.0. Ratios above this line denote core locations that are more susceptible to erosion than those below the line. By quick inspection, cores CJ3c, ML-2, S2 and S3 are, in general, more susceptible to rapid erosion than the other cores, relative to the core average erosion rates. Cores ML-1 and S1 are least susceptible to rapid erosion, relative to the core average erosion rates. The least erodible core (ML1) is located in the nearshore, while the most erodible core (S3) is located at the furthest extent of the measured flat. Comparison with other measurements at the site may yield correlations for the trends observed here.

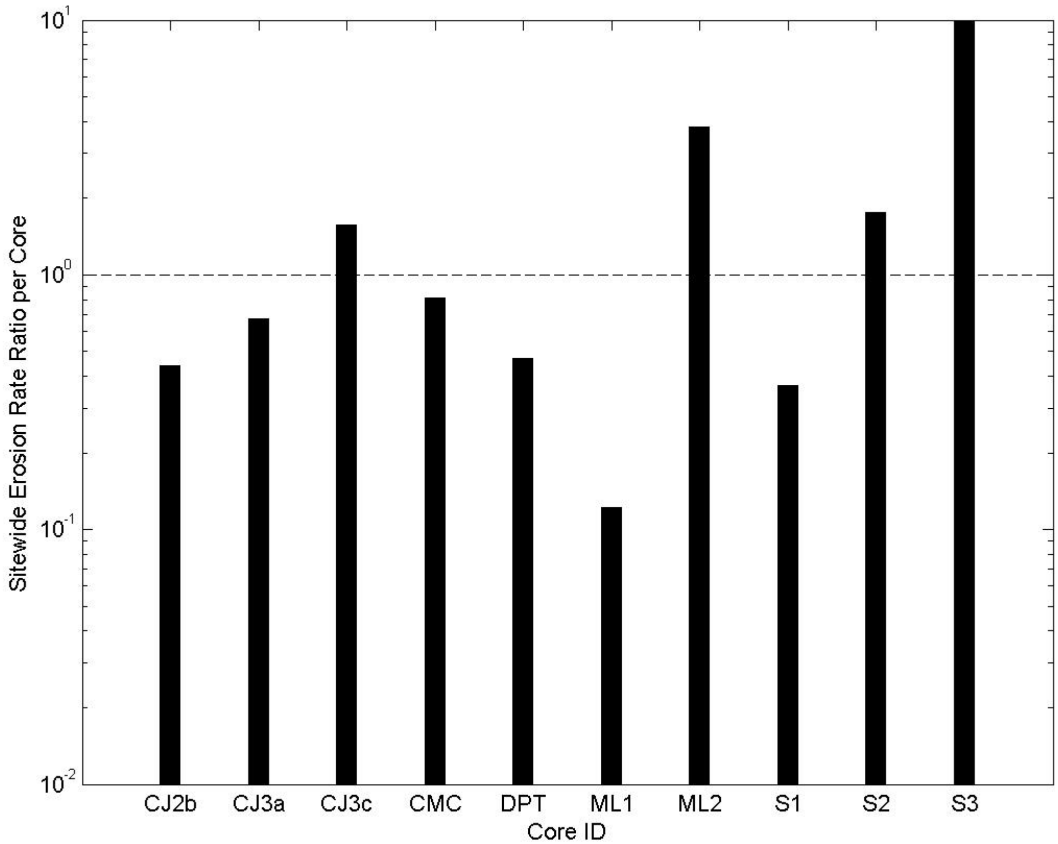

Figure 33. Inter-core erosion rate ratios. Depth-averaged core erosion rates compared to the site-wide average erosion rate.

In addition, Figure 34 is a ratio plot of the erosion rate of each core *interval* to the *site-wide* average erosion rate. This plot indicates individual core intervals which are more (or less) susceptible to erosion than others. By quick inspection, most of the intervals in cores CJ3c, ML-2 and S3 are more susceptible to erosion than other core intervals. Furthermore, the deepest interval in core CMC (coarse material) is more susceptible to rapid erosion than other core intervals. Several intervals in core Ml-1 are less susceptible to rapid erosion, compared to the other core intervals.

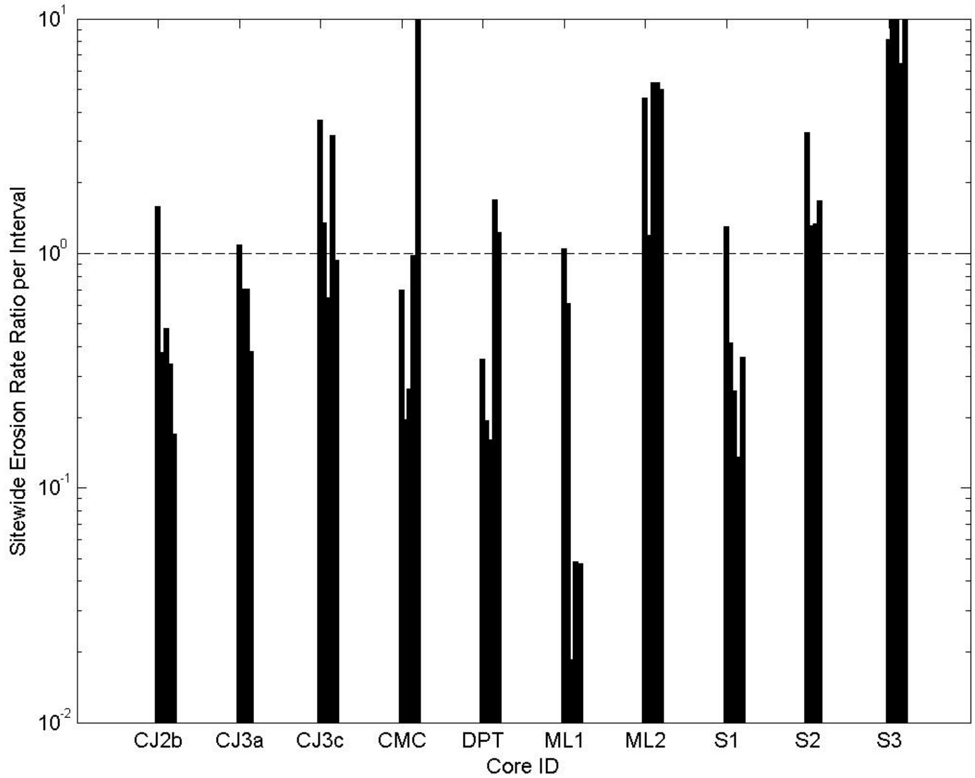

Figure 34. Inter-core erosion rate ratios, by core interval. Interval core erosion rates compared to the site-wide average erosion rate.

References

Hakanson, L., and M. Jansson, 2002, Principles of Lake Sedimentology. Blackburn Press, Caldwell, New Jersey, USA.

Jepsen, R., J. Roberts, and W. Lick, 1997, Effects of bulk density on sediment erosion rates, Water, Air and Soil Pollution, 99:21-31.

McNeil, J., C. Taylor, and W. Lick, 1996, Measurements of erosion of undisturbed bottom sediments with depth, J. Hydr. Engr., 122(6):316-324.

Roberts, J., R. Jepsen, D. Gotthard, and W. Lick, 1998, Effects of particle size and bulk density on erosion of quartz particles, J. Hydr. Engrg., 124(12):1261 1267.

Appendix A – Particle Size Distributions

Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ2b_1_112.$av
CJ2b_1_112.$av
File ID: CJ2b
Sample ID: 1
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/11/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
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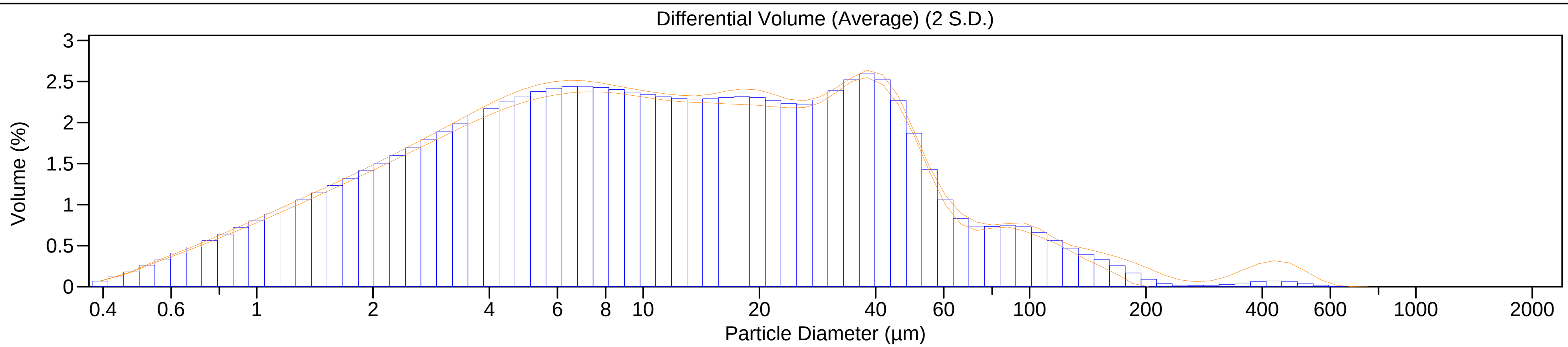
C:\LS13320\Projects\CorteMadera\CJ2b_1_111.$ls
C:\LS13320\Projects\CorteMadera\CJ2b_1_112.$ls

Volume Statistics (Arithmetic) CJ2b_1_112.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	22.70 µm	S.D.:	37.53 µm
Median:	10.32 µm	Variance:	1408 µm^2
Mean/Median ratio:	2.199	C.V.:	165%
Mode:	37.97 µm	Skewness:	6.033 Right skewed
		Kurtosis:	58.72 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.684 µm	3.839 µm	10.32 µm	28.64 µm	51.66 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ2b_2_115.$av
	CJ2b_2_115.$av
File ID:	CJ2b
Sample ID:	2
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/11/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	66
Fluid:	water

Average of 3 files:
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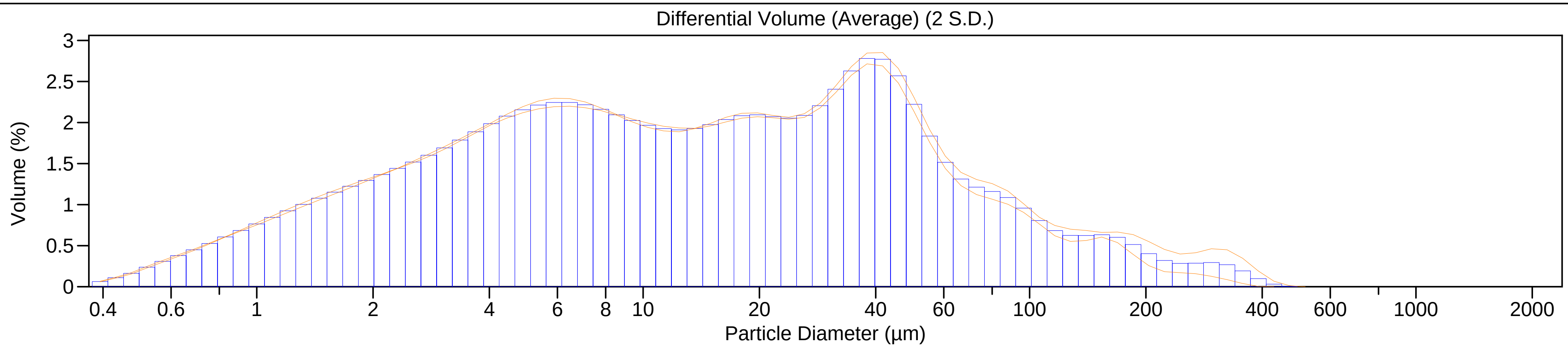
C:\LS13320\Projects\CorteMadera\CJ2b_2_114.$ls
C:\LS13320\Projects\CorteMadera\CJ2b_2_115.$ls

Volume Statistics (Arithmetic) CJ2b_2_115.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	31.19 µm	S.D.:	49.74 µm
Median:	12.79 µm	Variance:	2474 µm^2
Mean/Median ratio:	2.440	C.V.:	159%
Mode:	37.97 µm	Skewness:	3.521 Right skewed
		Kurtosis:	15.64 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.762 µm	4.222 µm	12.79 µm	37.63 µm	75.72 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ2b_3_118.$av
CJ2b_3_118.$av
File ID: CJ2b
Sample ID: 3
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/11/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
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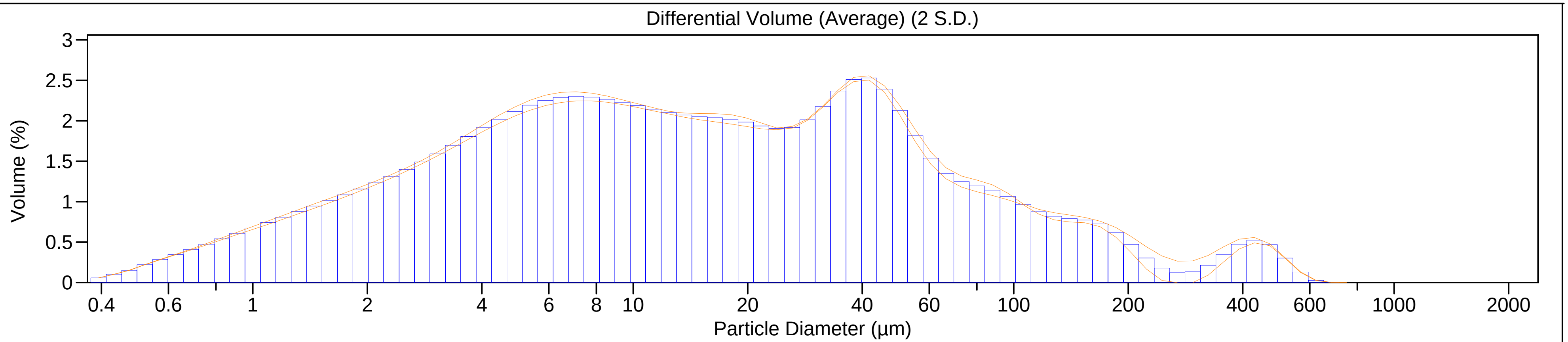
C:\LS13320\Projects\CorteMadera\CJ2b_3_117.$ls
C:\LS13320\Projects\CorteMadera\CJ2b_3_118.$ls

Volume Statistics (Arithmetic) CJ2b_3_118.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	39.90 µm	S.D.:	75.88 µm
Median:	13.40 µm	Variance:	5758 µm^2
Mean/Median ratio:	2.978	C.V.:	190%
Mode:	41.68 µm	Skewness:	4.048 Right skewed
		Kurtosis:	18.83 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.933 µm	4.663 µm	13.40 µm	40.82 µm	94.96 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

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CJ2b_4_121.$av
File ID: CJ2b
Sample ID: 4
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/11/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
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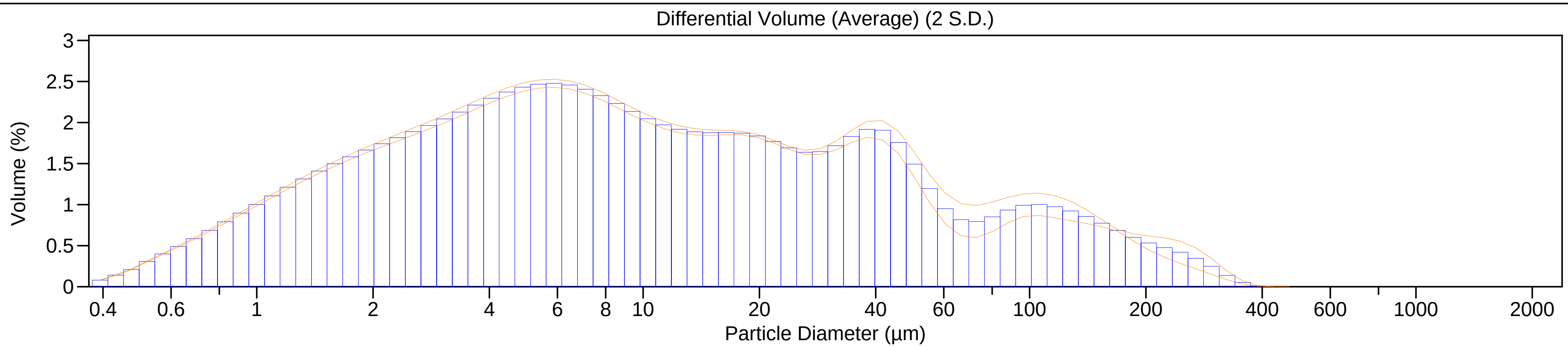
C:\LS13320\Projects\CorteMadera\CJ2b_4_120.$ls
C:\LS13320\Projects\CorteMadera\CJ2b_4_121.$ls

Volume Statistics (Arithmetic) CJ2b_4_121.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	28.62 µm	S.D.:	48.66 µm
Median:	8.718 µm	Variance:	2368 µm^2
Mean/Median ratio:	3.282	C.V.:	170%
Mode:	5.878 µm	Skewness:	3.038 Right skewed
		Kurtosis:	10.52 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.460 µm	3.231 µm	8.718 µm	30.42 µm	83.64 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

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CJ2b_5_124.$av
File ID: CJ2b
Sample ID: 5
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/11/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
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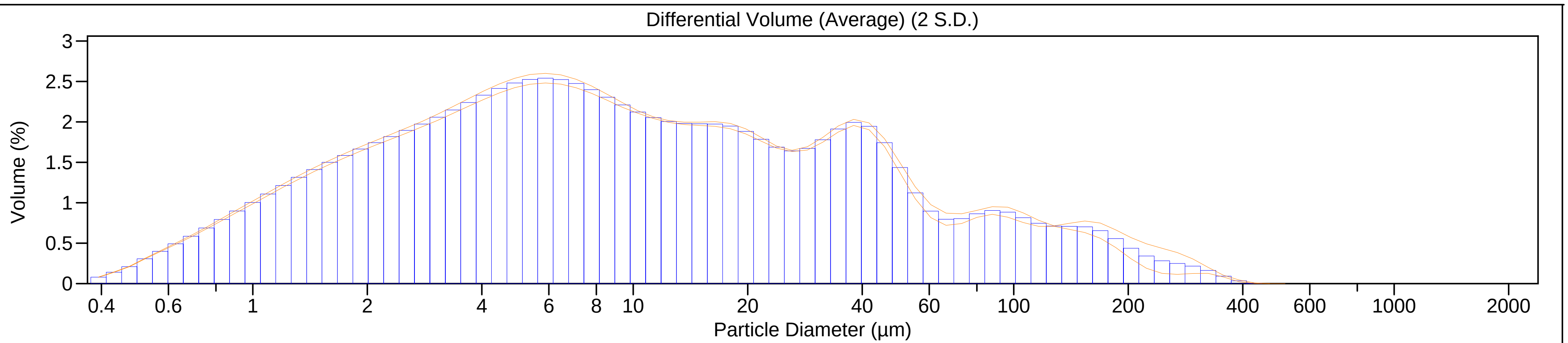
C:\LS13320\Projects\CorteMadera\CJ2b_5_123.$ls
C:\LS13320\Projects\CorteMadera\CJ2b_5_124.$ls

Volume Statistics (Arithmetic) CJ2b_5_124.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	26.59 µm	S.D.:	46.35 µm
Median:	8.507 µm	Variance:	2148 µm^2
Mean/Median ratio:	3.125	C.V.:	174%
Mode:	5.878 µm	Skewness:	3.411 Right skewed
		Kurtosis:	14.10 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.458 µm	3.223 µm	8.507 µm	28.14 µm	71.09 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

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Sample ID:	1
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/11/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module

Run length: 60 seconds

Pump speed:	66
Fluid:	water

Average of 3 files:
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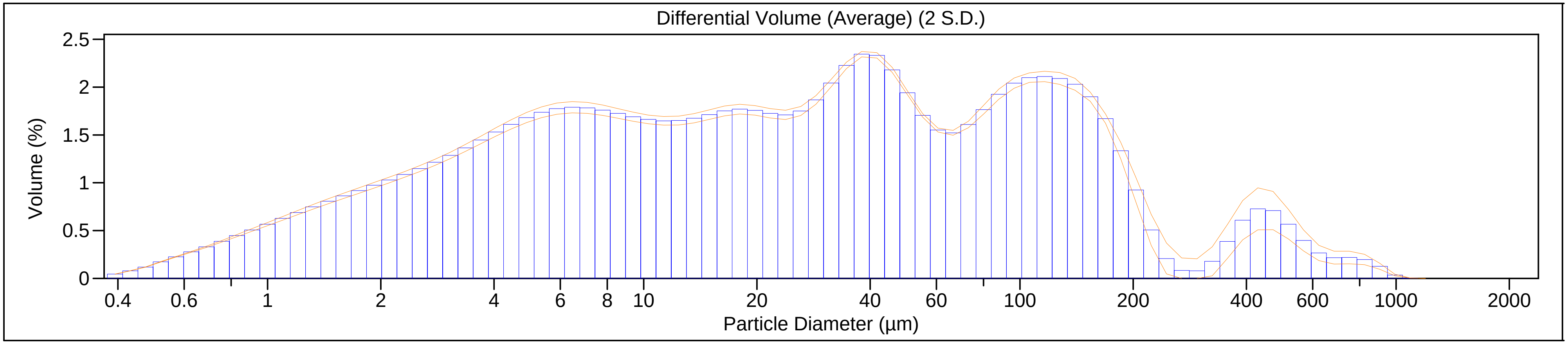
Volume Statistics (Arithmetic) CJ3a_1_127.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	65.97 µm	S.D.:	116.6 µm
Median:	22.98 µm	Variance:	13586 µm^2
Mean/Median ratio:	2.870	C.V.:	177%
Mode:	37.97 µm	Skewness:	3.682 Right skewed
		Kurtosis:	16.40 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.243 µm	5.941 µm	22.98 µm	78.17 µm	157.0 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

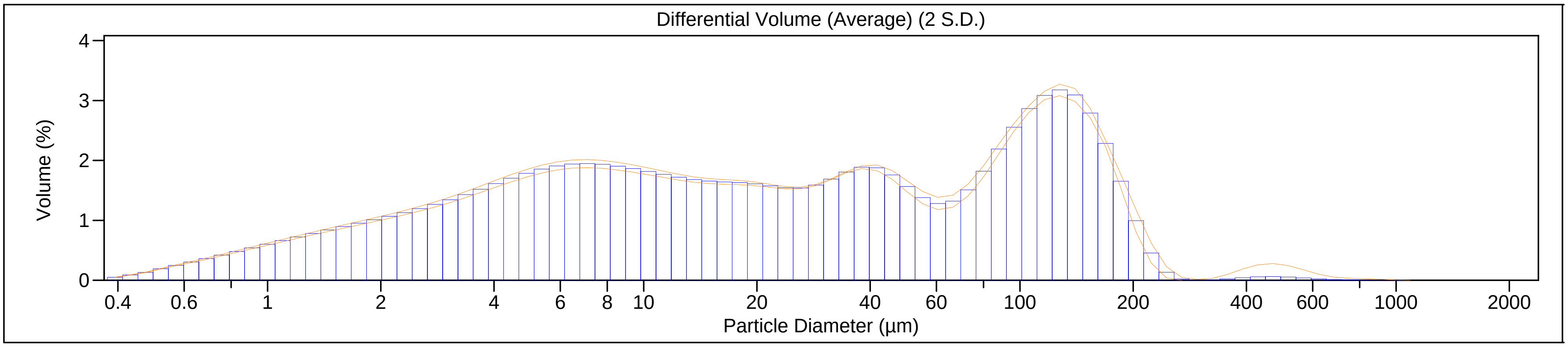
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ3a_2_130.$av
CJ3a_2_130.$av
File ID: CJ3a
Sample ID: 2
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/11/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CJ3a_2_128.$ls
C:\LS13320\Projects\CorteMadera\CJ3a_2_129.$ls
C:\LS13320\Projects\CorteMadera\CJ3a_2_130.$ls

Volume Statistics (Arithmetic) CJ3a_2_130.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	50.06 µm	S.D.:	62.22 µm
Median:	20.46 µm	Variance:	3872 $µm^2$
Mean/Median ratio:	2.447	C.V.:	124%
Mode:	127.7 µm	Skewness:	2.374 Right skewed
		Kurtosis:	13.12 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.141 µm	5.556 µm	20.46 µm	86.30 µm	141.2 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ3a_3_133.$av
	CJ3a_3_133.$av
File ID:	CJ3a
Sample ID:	3
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/11/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	66
Fluid:	water

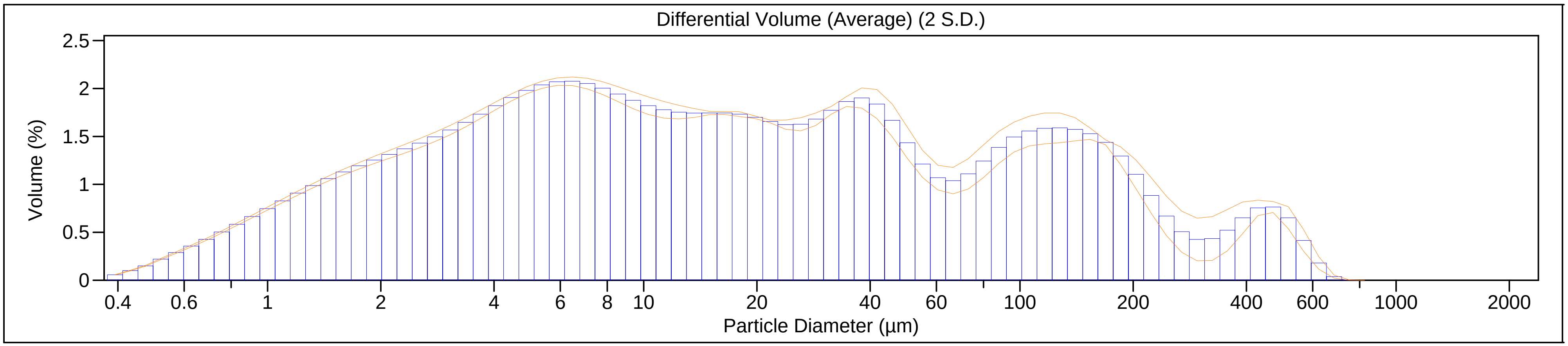
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CJ3a_3_131.$ls
C:\LS13320\Projects\CorteMadera\CJ3a_3_132.$ls
C:\LS13320\Projects\CorteMadera\CJ3a_3_133.$ls

Volume Statistics (Arithmetic) CJ3a_3_133.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	59.24 µm	S.D.:	103.2 µm
Median:	15.15 µm	Variance:	10647 μm^2
Mean/Median ratio:	3.910	C.V.:	174%
Mode:	6.453 µm	Skewness:	2.894 Right skewed
		Kurtosis:	9.078 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.803 µm	4.493 µm	15.15 µm	62.61 µm	169.3 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ3a_4_136.$av
	CJ3a_4_136.$av
File ID:	CJ3a
Sample ID:	4
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/11/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	66
Fluid:	water

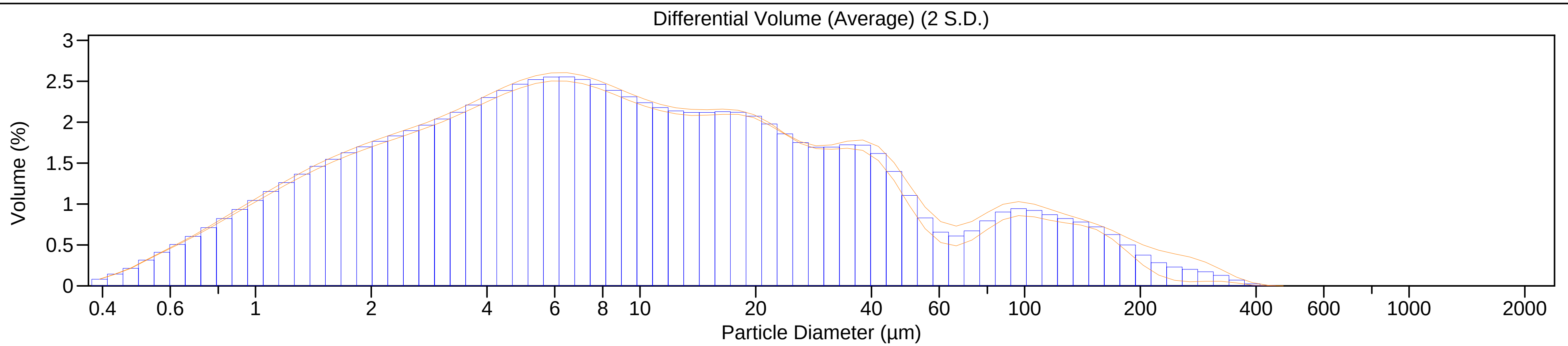
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CJ3a_4_134.$ls
C:\LS13320\Projects\CorteMadera\CJ3a_4_135.$ls
C:\LS13320\Projects\CorteMadera\CJ3a_4_136.$ls

Volume Statistics (Arithmetic) CJ3a_4_136.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	25.24 µm	S.D.:	44.30 µm
Median:	8.316 µm	Variance:	1963 µm^2
Mean/Median ratio:	3.035	C.V.:	176%
Mode:	6.453 µm	Skewness:	3.415 Right skewed
		Kurtosis:	14.24 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.425 µm	3.150 µm	8.316 µm	24.78 µm	70.13 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

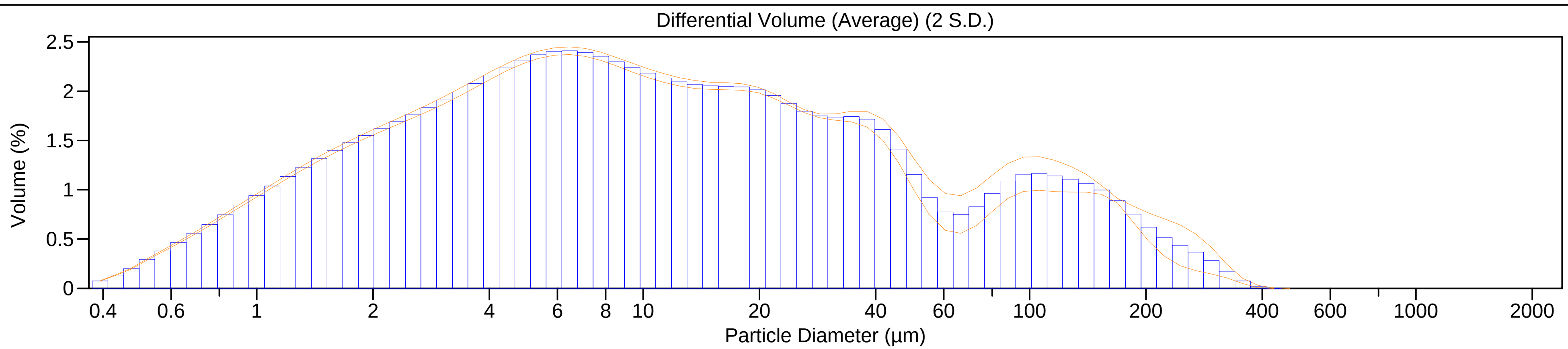
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ3a_5_139.$av
CJ3a_5_139.$av
File ID: CJ3a
Sample ID: 5
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/11/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Pump speed: 66
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CJ3a_5_137.$ls
C:\LS13320\Projects\CorteMadera\CJ3a_5_138.$ls
C:\LS13320\Projects\CorteMadera\CJ3a_5_139.$ls

Volume Statistics (Arithmetic) CJ3a_5_139.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	31.04 µm	S.D.:	51.88 µm
Median:	9.620 µm	Variance:	2692 µm^2
Mean/Median ratio:	3.227	C.V.:	167%
Mode:	6.453 µm	Skewness:	2.828 Right skewed
		Kurtosis:	8.897 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.519 µm	3.481 µm	9.620 µm	30.87 µm	98.08 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ3c_1_142.$av
	CJ3c_1_142.$av
File ID:	CJ3c
Sample ID:	1
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/11/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
Run length:	60 seconds
Pump speed:	66
Fluid:	water

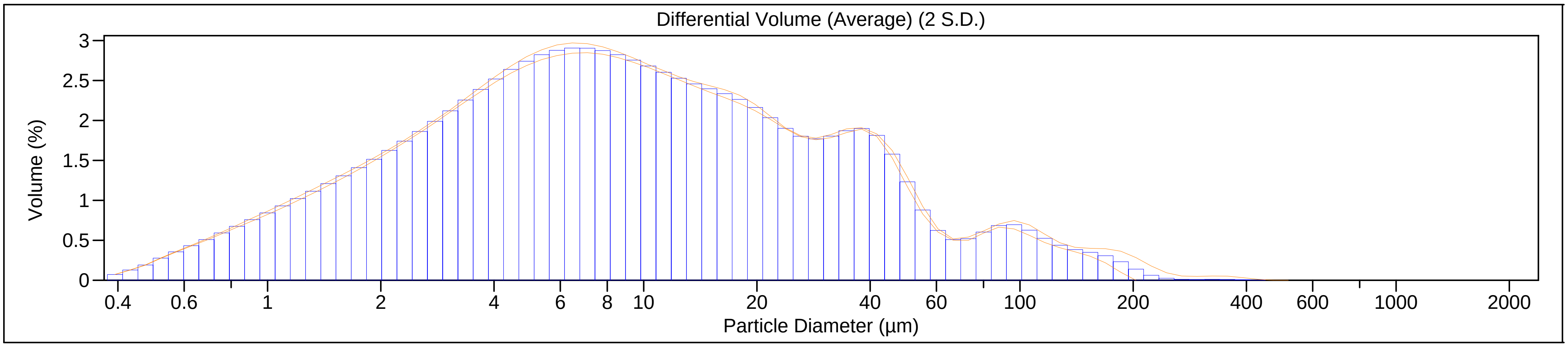
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CJ3c_1_140.$ls
C:\LS13320\Projects\CorteMadera\CJ3c_1_141.$ls
C:\LS13320\Projects\CorteMadera\CJ3c_1_142.$ls

Volume Statistics (Arithmetic) CJ3c_1_142.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	18.94 µm	S.D.:	29.50 µm
Median:	8.256 µm	Variance:	870.0 µm^2
Mean/Median ratio:	2.294	C.V.:	156%
Mode:	6.453 µm	Skewness:	3.694 Right skewed
		Kurtosis:	19.31 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.621 µm	3.528 µm	8.256 µm	21.08 µm	44.96 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ3c_2_145.$av
	CJ3c_2_145.$av
File ID:	CJ3c
Sample ID:	2
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/11/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
Pump speed:	66
Fluid:	water

Average of 3 files:
C:\LS13320\Projects\CorteMadera\CJ3c_2_143.$ls
C:\LS13320\Projects\CorteMadera\CJ3c_2_144.$ls
C:\LS13320\Projects\CorteMadera\CJ3c_2_145.$ls

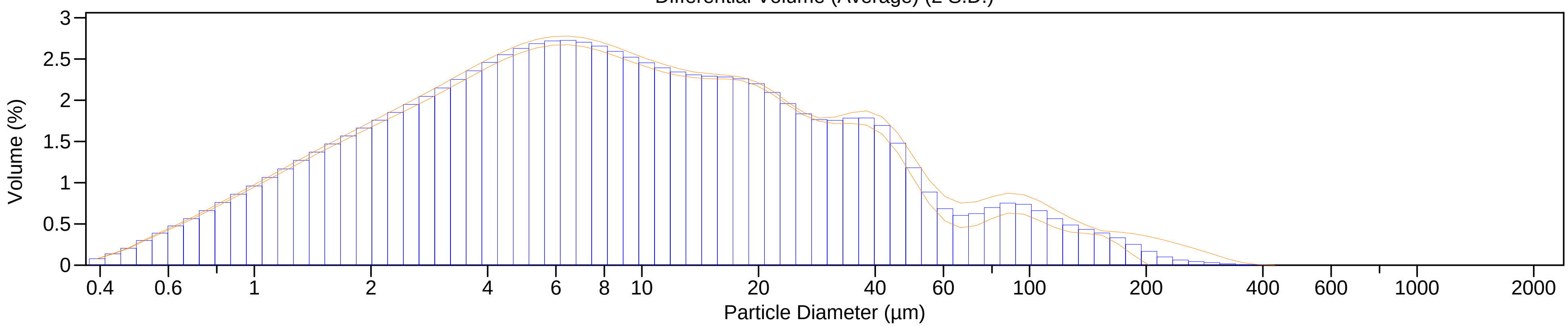
Volume Statistics (Arithmetic) CJ3c_2_145.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.62 µm	S.D.:	31.45 µm
Median:	8.019 µm	Variance:	989.4 µm^2
Mean/Median ratio:	2.447	C.V.:	160%
Mode:	6.453 µm	Skewness:	3.574 Right skewed
		Kurtosis:	16.78 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.493 µm	3.243 µm	8.019 µm	21.55 µm	47.14 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ3c_3_148.$av
	CJ3c_3_148.$av
File ID:	CJ3c
Sample ID:	3
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/11/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	66
Fluid:	water

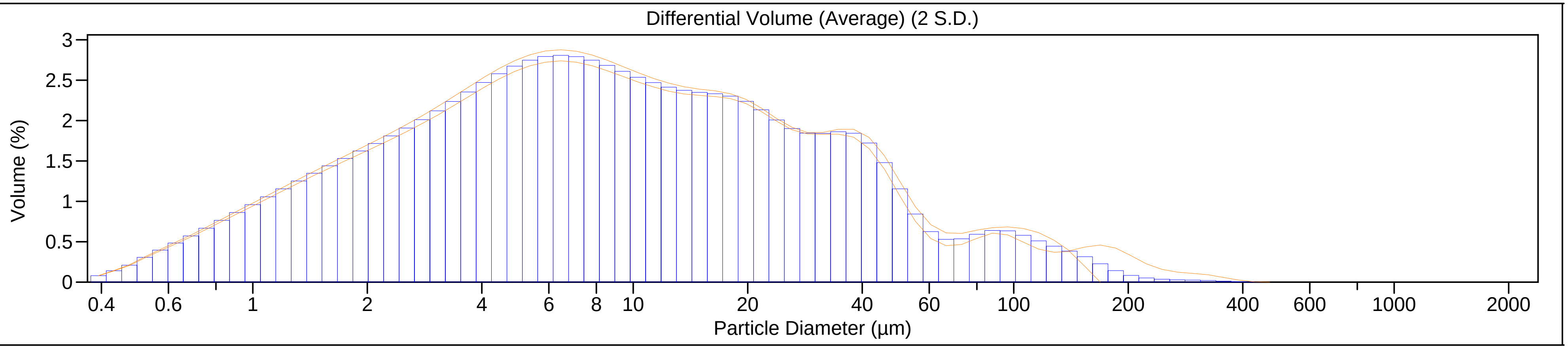
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CJ3c_3_146.$ls
C:\LS13320\Projects\CorteMadera\CJ3c_3_147.$ls
C:\LS13320\Projects\CorteMadera\CJ3c_3_148.$ls

Volume Statistics (Arithmetic) CJ3c_3_148.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	18.28 µm	S.D.:	28.57 µm
Median:	7.982 µm	Variance:	816.4 μm^2
Mean/Median ratio:	2.290	C.V.:	156%
Mode:	6.453 µm	Skewness:	3.862 Right skewed
		Kurtosis:	21.80 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.494 µm	3.287 µm	7.982 µm	20.77 µm	43.45 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ3c_4_151.$av
	CJ3c_4_151.$av
File ID:	CJ3c
Sample ID:	4
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/11/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module

Run length: 60 seconds

Pump speed:	66
Fluid:	water

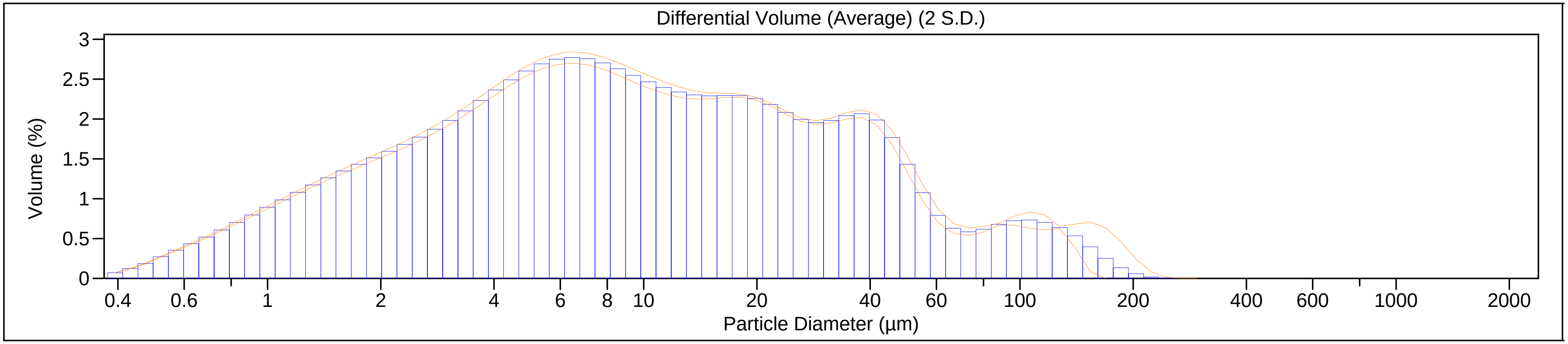
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CJ3c_4_149.$ls
C:\LS13320\Projects\CorteMadera\CJ3c_4_150.$ls
C:\LS13320\Projects\CorteMadera\CJ3c_4_151.$ls

Volume Statistics (Arithmetic) CJ3c_4_151.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	19.79 µm	S.D.:	28.46 µm
Median:	8.717 µm	Variance:	810.1 µm^2
Mean/Median ratio:	2.270	C.V.:	144%
Mode:	6.453 µm	Skewness:	2.872 Right skewed
		Kurtosis:	9.617 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.579 µm	3.556 µm	8.717 µm	23.67 µm	47.97 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CJ3c_5_154.$av
	CJ3c_5_154.$av
File ID:	CJ3c
Sample ID:	5
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/11/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	66
Fluid:	water

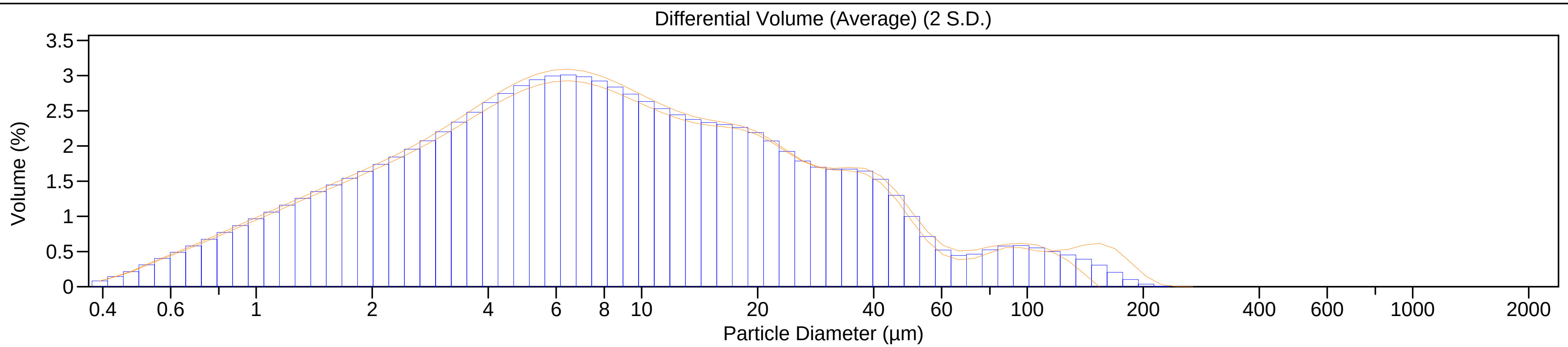
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CJ3c_5_152.$ls
C:\LS13320\Projects\CorteMadera\CJ3c_5_153.$ls
C:\LS13320\Projects\CorteMadera\CJ3c_5_154.$ls

Volume Statistics (Arithmetic) CJ3c_5_154.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	16.74 µm	S.D.:	25.39 µm
Median:	7.485 µm	Variance:	644.5 µm^2
Mean/Median ratio:	2.237	C.V.:	152%
Mode:	6.453 µm	Skewness:	3.304 Right skewed
		Kurtosis:	13.04 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.486 µm	3.236 µm	7.485 µm	18.76 µm	40.32 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CMC_1_160.$av
	CMC_1_160.$av
File ID:	CMC
Sample ID:	1
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/12/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	66
Fluid:	water

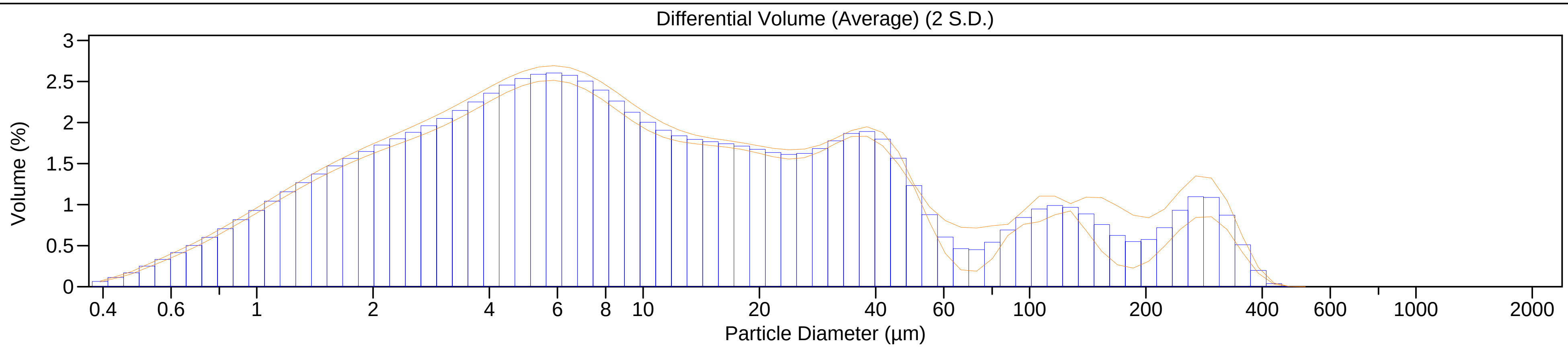
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CMC_1_158.$ls
C:\LS13320\Projects\CorteMadera\CMC_1_159.$ls
C:\LS13320\Projects\CorteMadera\CMC_1_160.$ls

Volume Statistics (Arithmetic) CMC_1_160.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	37.91 µm	S.D.:	70.97 µm
Median:	8.760 µm	Variance:	5037 µm^2
Mean/Median ratio:	4.327	C.V.:	187%
Mode:	5.878 µm	Skewness:	2.818 Right skewed
		Kurtosis:	7.652 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.546 µm	3.374 µm	8.760 µm	32.32 µm	119.9 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CMC_2_163.$av
	CMC_2_163.$av
File ID:	CMC
Sample ID:	2
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/12/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	66
Fluid:	water

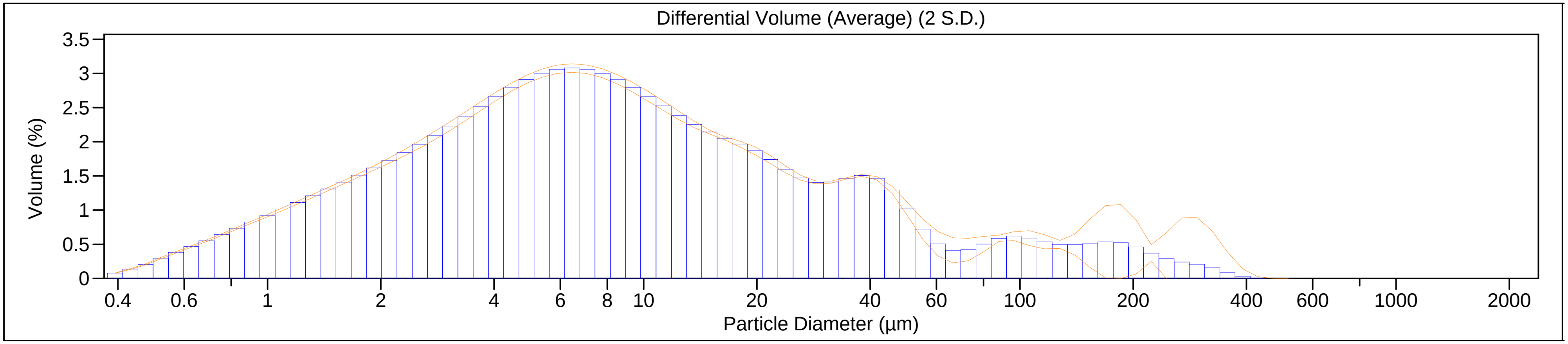
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CMC_2_161.$ls
C:\LS13320\Projects\CorteMadera\CMC_2_162.$ls
C:\LS13320\Projects\CorteMadera\CMC_2_163.$ls

Volume Statistics (Arithmetic) CMC_2_163.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	22.54 µm	S.D.:	44.02 µm
Median:	7.483 µm	Variance:	1938 µm^2
Mean/Median ratio:	3.013	C.V.:	195%
Mode:	6.453 µm	Skewness:	3.959 Right skewed
		Kurtosis:	18.29 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.532 µm	3.301 µm	7.483 µm	19.41 µm	49.45 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CMC_3_166.$av
	CMC_3_166.$av
File ID:	CMC
Sample ID:	3
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/12/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module

Run length: 60 seconds

Pump speed:	66
Fluid:	water

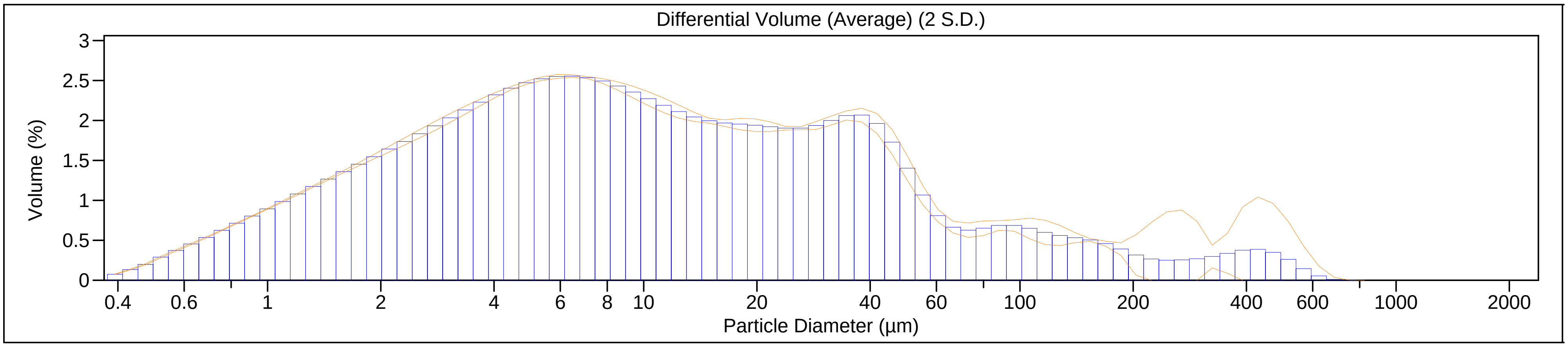
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CMC_3_164.$ls
C:\LS13320\Projects\CorteMadera\CMC_3_165.$ls
C:\LS13320\Projects\CorteMadera\CMC_3_166.$ls

Volume Statistics (Arithmetic) CMC_3_166.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	32.67 µm	S.D.:	72.87 µm
Median:	9.019 µm	Variance:	5311 μm^2
Mean/Median ratio:	3.622	C.V.:	223%
Mode:	6.453 µm	Skewness:	4.522 Right skewed
		Kurtosis:	23.16 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.563 µm	3.478 µm	9.019 µm	28.27 µm	68.99 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CMC_4_169.$av
	CMC_4_169.$av
File ID:	CMC
Sample ID:	4
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/12/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	66
Fluid:	water

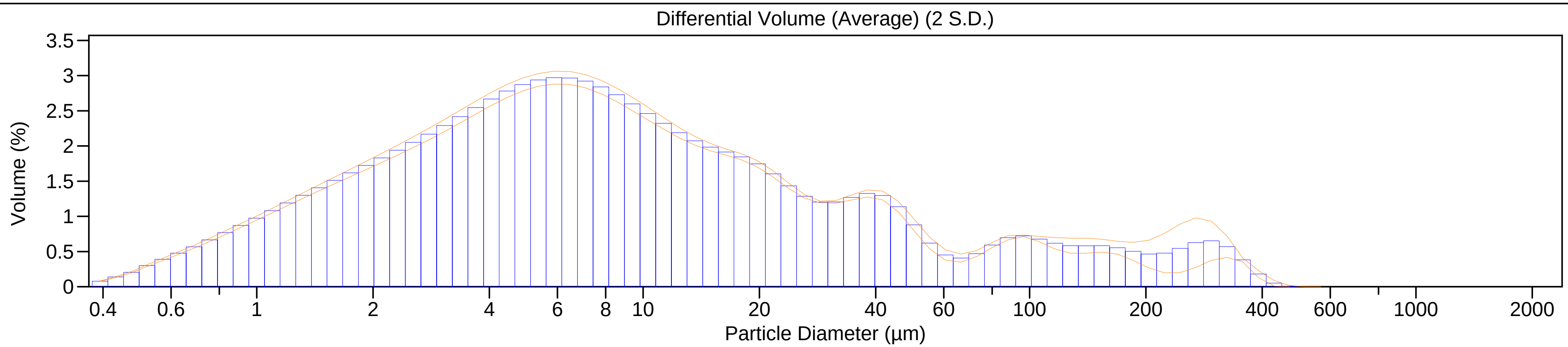
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CMC_4_167.$ls
C:\LS13320\Projects\CorteMadera\CMC_4_168.$ls
C:\LS13320\Projects\CorteMadera\CMC_4_169.$ls

Volume Statistics (Arithmetic) CMC_4_169.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	28.89 µm	S.D.:	60.75 µm
Median:	7.278 µm	Variance:	3691 µm^2
Mean/Median ratio:	3.970	C.V.:	210%
Mode:	5.878 µm	Skewness:	3.539 Right skewed
		Kurtosis:	13.17 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.481 µm	3.137 µm	7.278 µm	20.35 µm	77.30 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\CMC_5_172.$av
	CMC_5_172.$av
File ID:	CMC
Sample ID:	5
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/12/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module

Run length: 60 seconds

Pump speed:	66
Fluid:	water

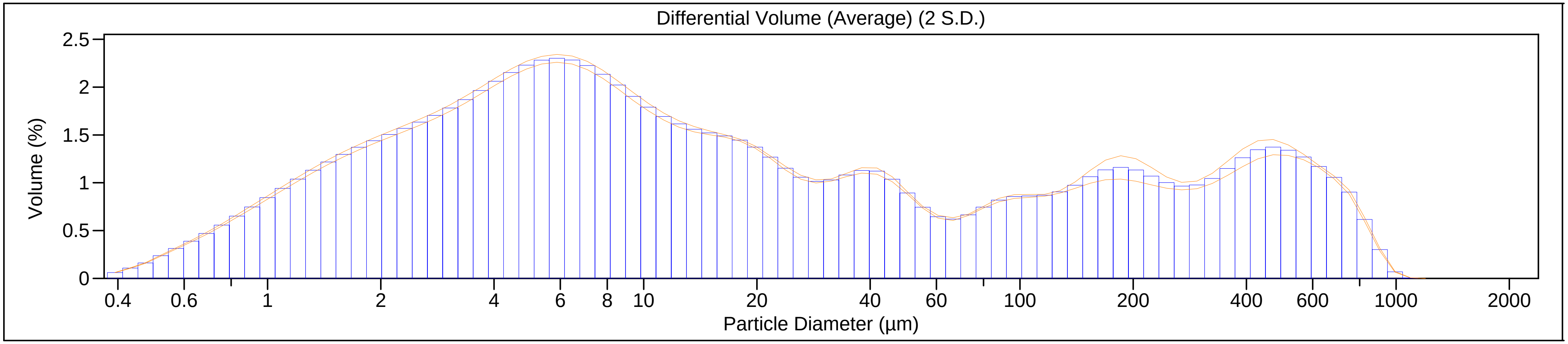
Average of 3 files:
C:\LS13320\Projects\CorteMadera\CMC_5_170.$ls
C:\LS13320\Projects\CorteMadera\CMC_5_171.$ls
C:\LS13320\Projects\CorteMadera\CMC_5_172.$ls

Volume Statistics (Arithmetic) CMC_5_172.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	102.6 µm	S.D.:	185.3 µm
Median:	11.78 µm	Variance:	34333 µm^2
Mean/Median ratio:	8.713	C.V.:	181%
Mode:	5.878 µm	Skewness:	2.238 Right skewed
		Kurtosis:	4.413 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.649 µm	3.862 µm	11.78 µm	101.4 µm	393.8 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

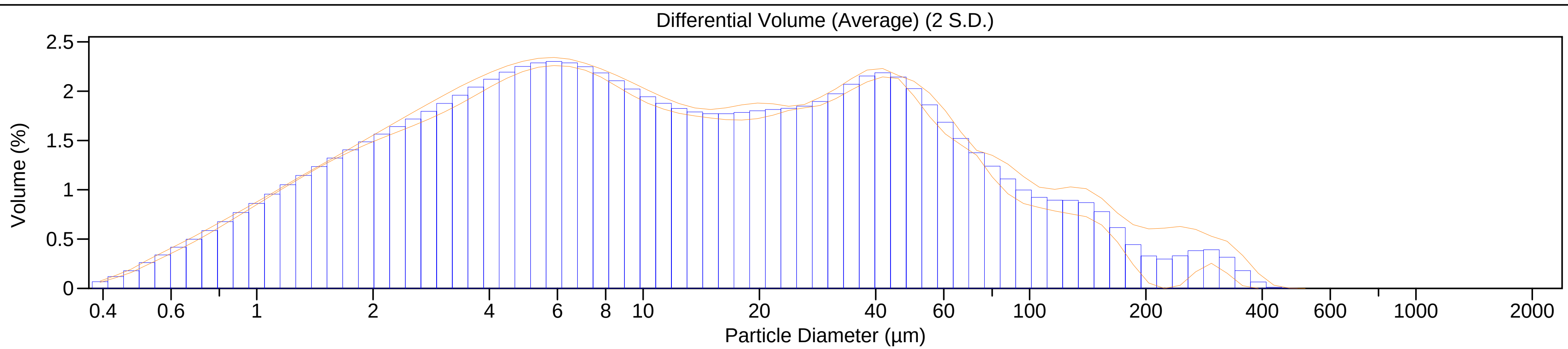
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\Dpt_1_06.$av
Dpt_1_06.$av
File ID: DPT
Sample ID: 1
Operator: JM
Comment 1: Corte Madera
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 63
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\DPT_1_04.$ls
C:\LS13320\Projects\CorteMadera\DPT_1_05.$ls
C:\LS13320\Projects\CorteMadera\DPT_1_06.$ls

Volume Statistics (Arithmetic) Dpt_1_06.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	31.71 µm	S.D.:	51.52 µm
Median:	10.82 µm	Variance:	2654 µm^2
Mean/Median ratio:	2.930	C.V.:	162%
Mode:	5.878 µm	Skewness:	3.250 Right skewed
		Kurtosis:	12.93 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.613 µm	3.699 µm	10.82 µm	37.93 µm	82.90 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\Dpt_2_09.$av
Dpt_2_09.$av
File ID: DPT
Sample ID: 2
Operator: JM
Comment 1: Corte Madera
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 63
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\DPT_2_07.$ls
C:\LS13320\Projects\CorteMadera\DPT_2_08.$ls
C:\LS13320\Projects\CorteMadera\DPT_2_09.$ls

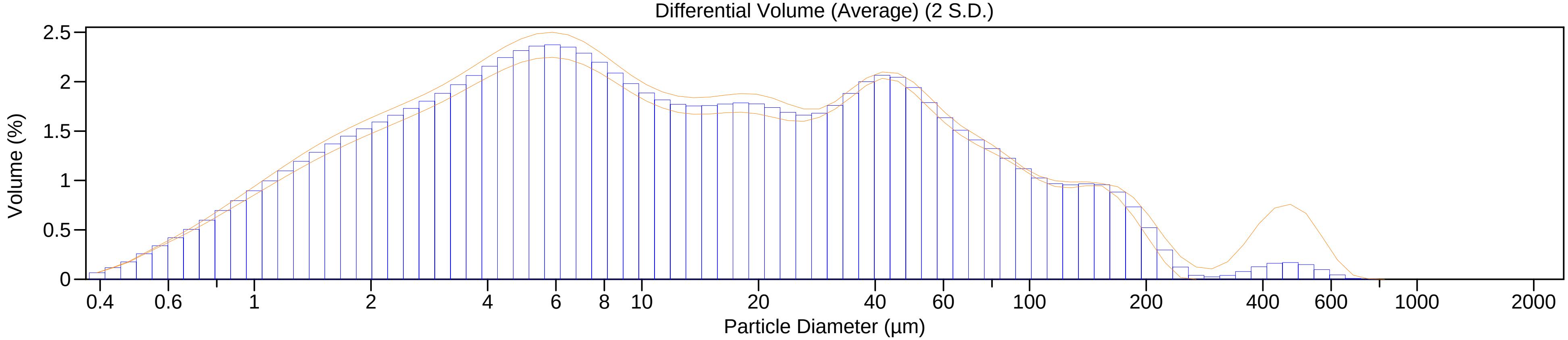
Volume Statistics (Arithmetic) Dpt_2_09.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	33.08 µm	S.D.:	59.01 µm
Median:	10.41 µm	Variance:	3482 μm^2
Mean/Median ratio:	3.177	C.V.:	178%
Mode:	5.878 µm	Skewness:	4.541 Right skewed
		Kurtosis:	29.56 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.580 µm	3.616 µm	10.41 µm	38.78 µm	88.70 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

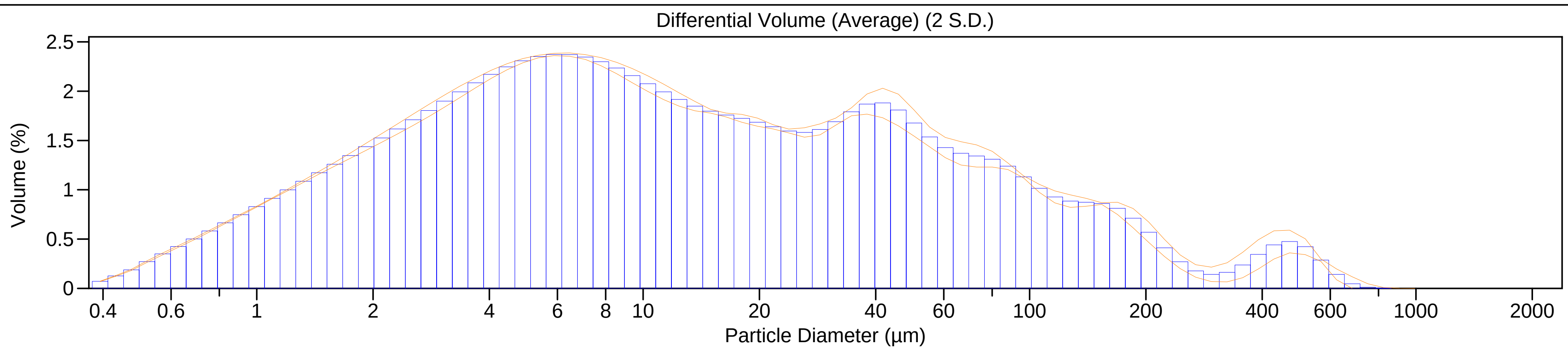
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\Dpt_3_12.$av
Dpt_3_12.$av
File ID: DPT
Sample ID: 3
Operator: JM
Comment 1: Corte Madera
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 63
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\DPT_3_10.$ls
C:\LS13320\Projects\CorteMadera\DPT_3_11.$ls
C:\LS13320\Projects\CorteMadera\DPT_3_12.$ls

Volume Statistics (Arithmetic) Dpt_3_12.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	41.03 µm	S.D.:	83.49 µm
Median:	10.53 µm	Variance:	6970 µm^2
Mean/Median ratio:	3.897	C.V.:	203%
Mode:	5.878 µm	Skewness:	4.122 Right skewed
		Kurtosis:	19.74 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.647 µm	3.764 µm	10.53 µm	39.70 µm	103.4 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\Dpt_4_15.$av
	Dpt_4_15.$av
File ID:	DPT
Sample ID:	4
Operator:	JM
Comment 1:	Corte Madera
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	63
Fluid:	water

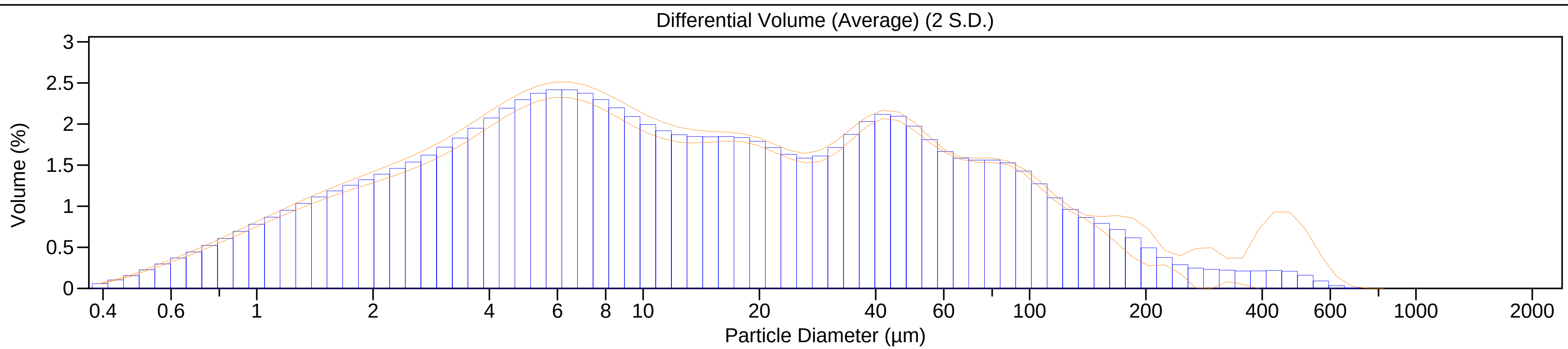
Average of 3 files:
C:\LS13320\Projects\CorteMadera\DPT_4_13.$ls
C:\LS13320\Projects\CorteMadera\DPT_4_14.$ls
C:\LS13320\Projects\CorteMadera\DPT_4_15.$ls

Volume Statistics (Arithmetic) Dpt_4_15.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	37.07 µm	S.D.:	65.40 µm
Median:	11.75 µm	Variance:	4277 µm^2
Mean/Median ratio:	3.155	C.V.:	176%
Mode:	6.453 µm	Skewness:	4.022 Right skewed
		Kurtosis:	21.34 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.745 µm	4.135 µm	11.75 µm	42.82 µm	96.86 µm



Beckman Coulter LS Particle Size Analyzer

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Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\Dpt_5_18.$av
	Dpt_5_18.$av
File ID:	DPT
Sample ID:	5
Operator:	JM
Comment 1:	Corte Madera
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
Pump speed:	63
Fluid:	water

Average of 3 files:
C:\LS13320\Projects\CorteMadera\DPT_5_16.$ls
C:\LS13320\Projects\CorteMadera\DPT_5_17.$ls
C:\LS13320\Projects\CorteMadera\DPT_5_18.$ls

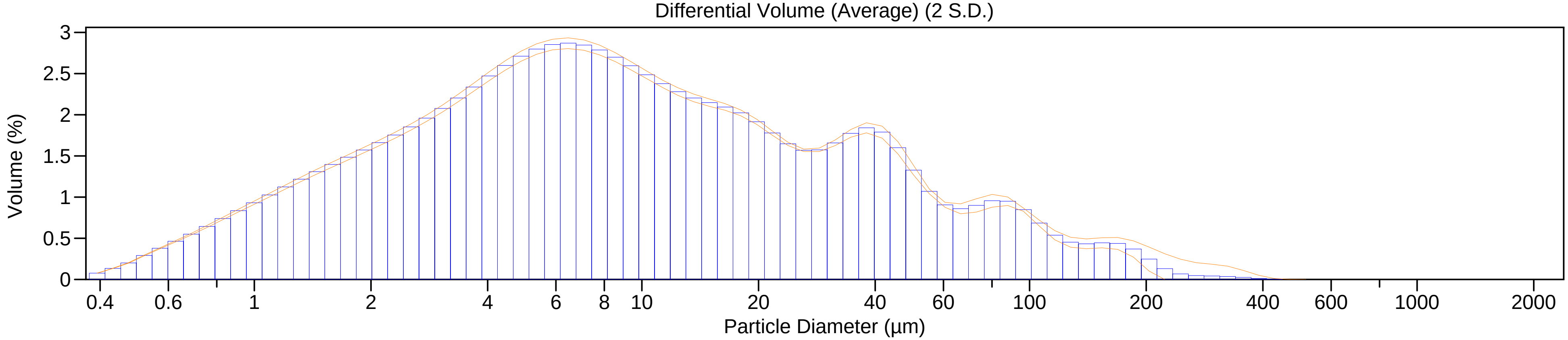
Volume Statistics (Arithmetic)   Dpt_5_18.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	21.36 µm	S.D.:	34.64 µm
Median:	8.106 µm	Variance:	1200 µm^2
Mean/Median ratio:	2.635	C.V.:	162%
Mode:	6.453 µm	Skewness:	3.541 Right skewed
		Kurtosis:	17.05 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.528 µm	3.393 µm	8.106 µm	23.05 µm	54.82 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\ML-1_1_94.$av
	ML-1_1_94.$av
File ID:	ML-1
Sample ID:	1
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
Run length:	60 seconds
Pump speed:	66
Fluid:	water

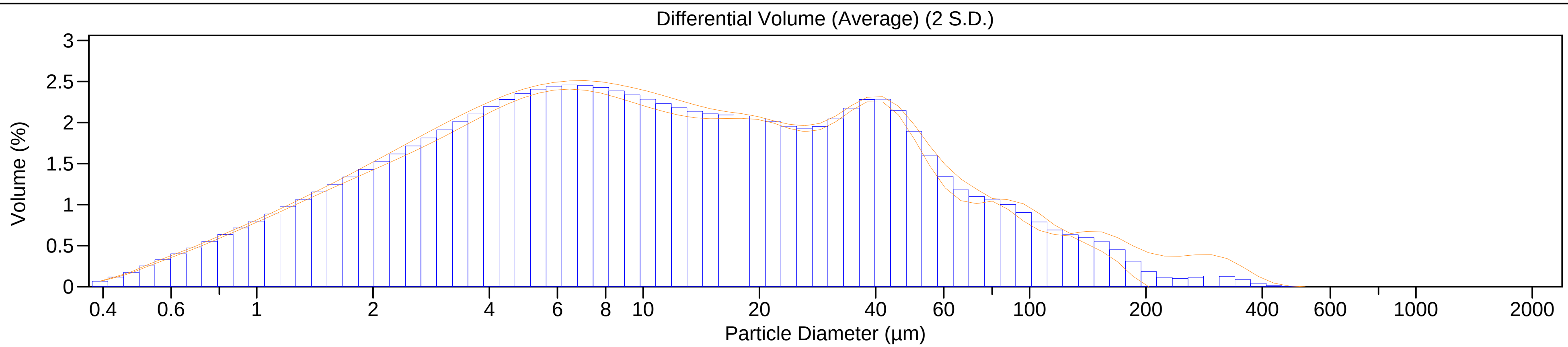
Average of 3 files:
C:\LS13320\Projects\CorteMadera\ML-1_1_92.$ls
C:\LS13320\Projects\CorteMadera\ML-1_1_93.$ls
C:\LS13320\Projects\CorteMadera\ML-1_1_94.$ls

Volume Statistics (Arithmetic) ML-1_1_94.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	25.52 µm	S.D.:	39.91 µm
Median:	10.22 µm	Variance:	1593 µm^2
Mean/Median ratio:	2.497	C.V.:	156%
Mode:	6.453 µm	Skewness:	3.724 Right skewed
		Kurtosis:	19.82 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.688 µm	3.814 µm	10.22 µm	31.43 µm	64.39 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\ML-1_2_97.$av
	ML-1_2_97.$av
File ID:	ML-1
Sample ID:	2
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
Run length:	60 seconds
Pump speed:	66
Fluid:	water

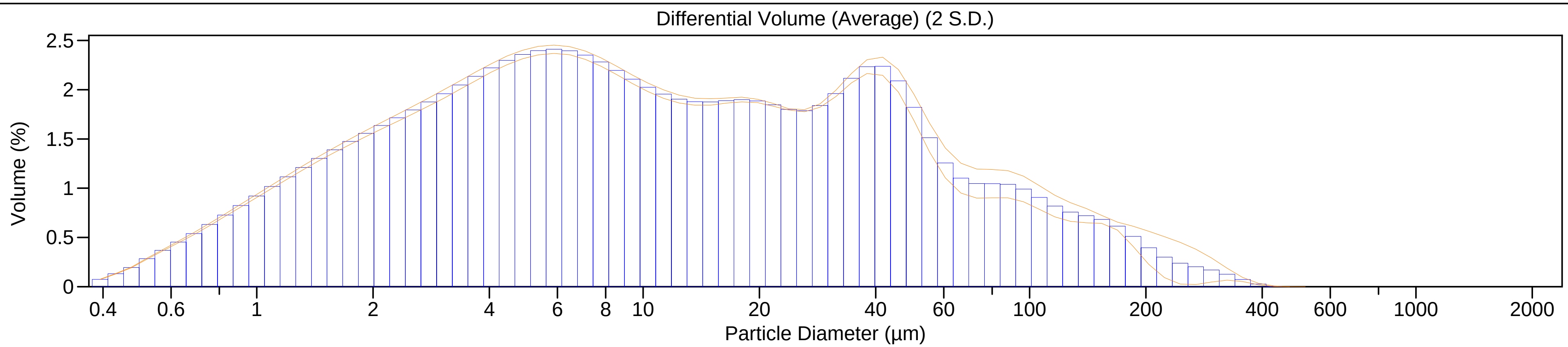
Average of 3 files:
C:\LS13320\Projects\CorteMadera\ML-1_2_95.$ls
C:\LS13320\Projects\CorteMadera\ML-1_2_96.$ls
C:\LS13320\Projects\CorteMadera\ML-1_2_97.$ls

Volume Statistics (Arithmetic) ML-1_2_97.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	27.71 µm	S.D.:	44.57 µm
Median:	9.653 µm	Variance:	1987 µm^2
Mean/Median ratio:	2.871	C.V.:	161%
Mode:	5.878 µm	Skewness:	3.240 Right skewed
		Kurtosis:	13.35 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.542 µm	3.481 µm	9.653 µm	33.09 µm	74.04 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\ML-1_3_100.$av
ML-1_3_100.$av
File ID: ML-1
Sample ID: 3
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/10/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\ML-1_3_98.$ls
C:\LS13320\Projects\CorteMadera\ML-1_3_99.$ls
C:\LS13320\Projects\CorteMadera\ML-1_3_100.$ls

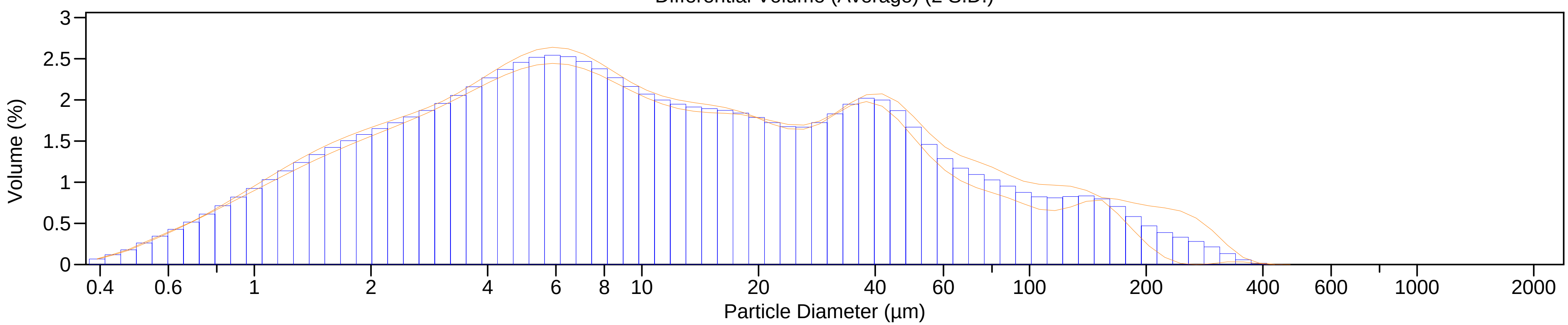
Volume Statistics (Arithmetic) ML-1_3_100.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	28.48 µm	S.D.:	46.86 µm
Median:	9.251 µm	Variance:	2196 $µm^2$
Mean/Median ratio:	3.078	C.V.:	165%
Mode:	5.878 µm	Skewness:	3.095 Right skewed
		Kurtosis:	11.41 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.548 µm	3.475 µm	9.251 µm	32.44 µm	77.36 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\ML-1_4_103.$av
	ML-1_4_103.$av
File ID:	ML-1
Sample ID:	4
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module

Run length: 60 seconds

Pump speed:	66
Fluid:	water

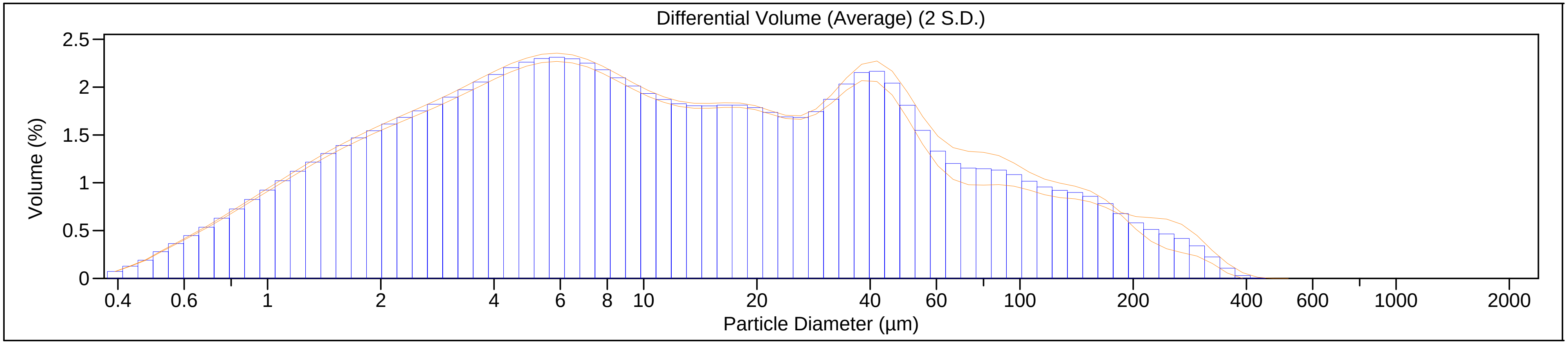
Average of 3 files:
C:\LS13320\Projects\CorteMadera\ML-1_4_101.$ls
C:\LS13320\Projects\CorteMadera\ML-1_4_102.$ls
C:\LS13320\Projects\CorteMadera\ML-1_4_103.$ls

Volume Statistics (Arithmetic)   ML-1_4_103.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	32.28 µm	S.D.:	52.44 µm
Median:	10.30 µm	Variance:	2750 µm^2
Mean/Median ratio:	3.133	C.V.:	162%
Mode:	5.878 µm	Skewness:	2.921 Right skewed
		Kurtosis:	9.836 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.543 µm	3.531 µm	10.30 µm	37.17 µm	91.23 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

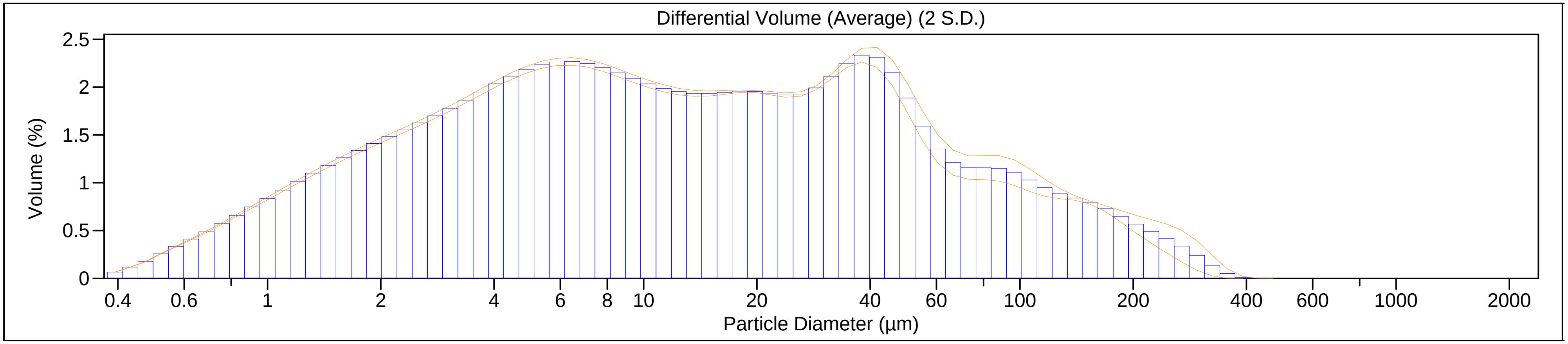
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\ML-1_5_106.$av
ML-1_5_106.$av
File ID: ML-1
Sample ID: 5
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/10/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\ML-1_5_104.$ls
C:\LS13320\Projects\CorteMadera\ML-1_5_105.$ls
C:\LS13320\Projects\CorteMadera\ML-1_5_106.$ls

Volume Statistics (Arithmetic) ML-1_5_106.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	31.42 µm	S.D.:	48.79 µm
Median:	11.48 µm	Variance:	2380 µm^2
Mean/Median ratio:	2.736	C.V.:	155%
Mode:	37.97 µm	Skewness:	2.875 Right skewed
		Kurtosis:	9.646 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.652 µm	3.892 µm	11.48 µm	37.05 µm	86.61 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\ML-2_1_79.$av
	ML-2_1_79.$av
File ID:	ML-2
Sample ID:	1
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
Run length:	60 seconds
Pump speed:	66
Fluid:	water

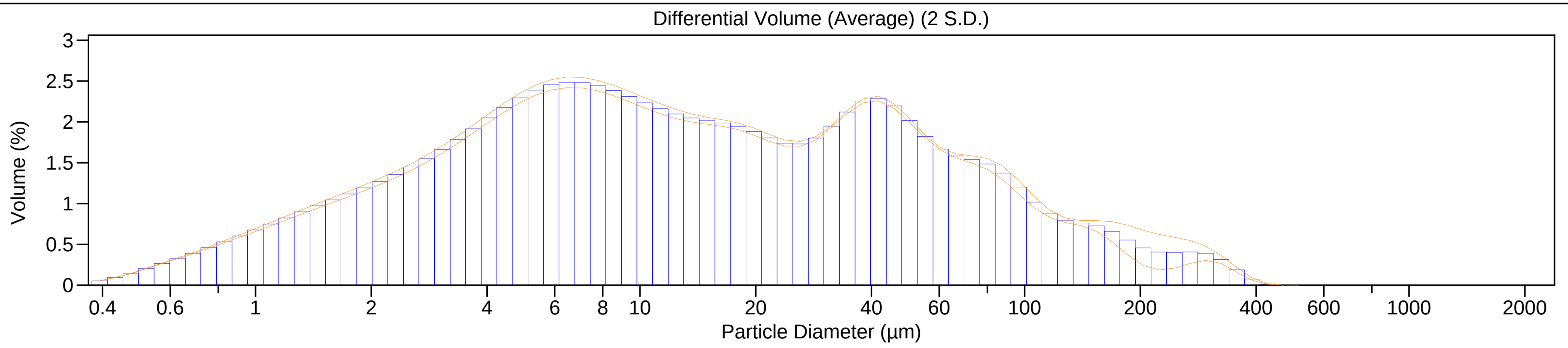
Average of 3 files:
C:\LS13320\Projects\CorteMadera\ML-2_1_77.$ls
C:\LS13320\Projects\CorteMadera\ML-2_1_78.$ls
C:\LS13320\Projects\CorteMadera\ML-2_1_79.$ls

Volume Statistics (Arithmetic) ML-2_1_79.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	33.58 µm	S.D.:	52.99 µm
Median:	12.16 µm	Variance:	2808 µm^2
Mean/Median ratio:	2.762	C.V.:	158%
Mode:	6.453 µm	Skewness:	3.135 Right skewed
		Kurtosis:	11.87 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.927 µm	4.508 µm	12.16 µm	40.15 µm	87.59 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\ML-2_2_82.$av
	ML-2_2_82.$av
File ID:	ML-2
Sample ID:	2
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
Pump speed:	66
Fluid:	water

Average of 3 files:
C:\LS13320\Projects\CorteMadera\ML-2_2_80.$ls
C:\LS13320\Projects\CorteMadera\ML-2_2_81.$ls
C:\LS13320\Projects\CorteMadera\ML-2_2_82.$ls

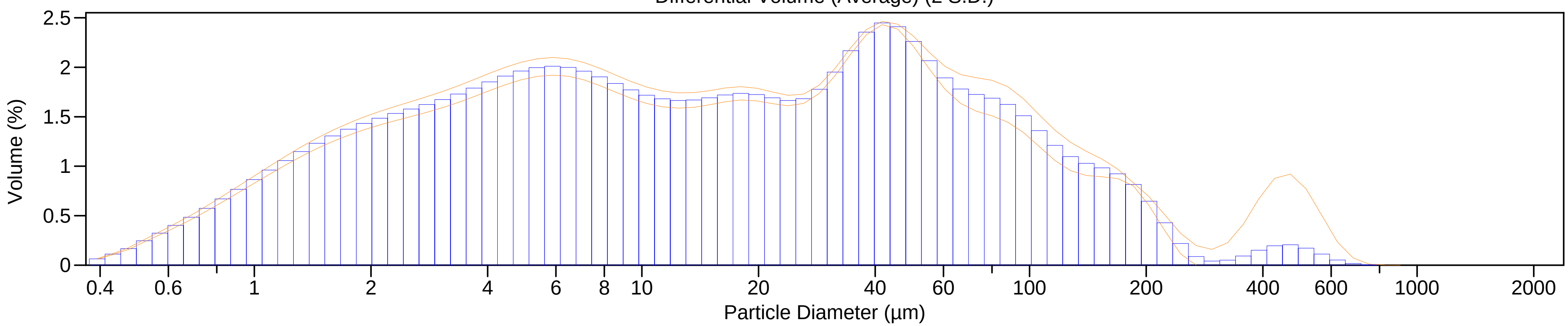
Volume Statistics (Arithmetic) ML-2_2_82.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	38.23 µm	S.D.:	63.69 µm
Median:	13.85 µm	Variance:	4057 μm^2
Mean/Median ratio:	2.760	C.V.:	167%
Mode:	41.68 µm	Skewness:	4.182 Right skewed
		Kurtosis:	25.02 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.625 µm	3.944 µm	13.85 µm	46.96 µm	100.5 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\ML-2_3_85.$av
ML-2_3_85.$av
File ID: ML-2
Sample ID: 3
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/10/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\ML-2_3_83.$ls
C:\LS13320\Projects\CorteMadera\ML-2_3_84.$ls
C:\LS13320\Projects\CorteMadera\ML-2_3_85.$ls

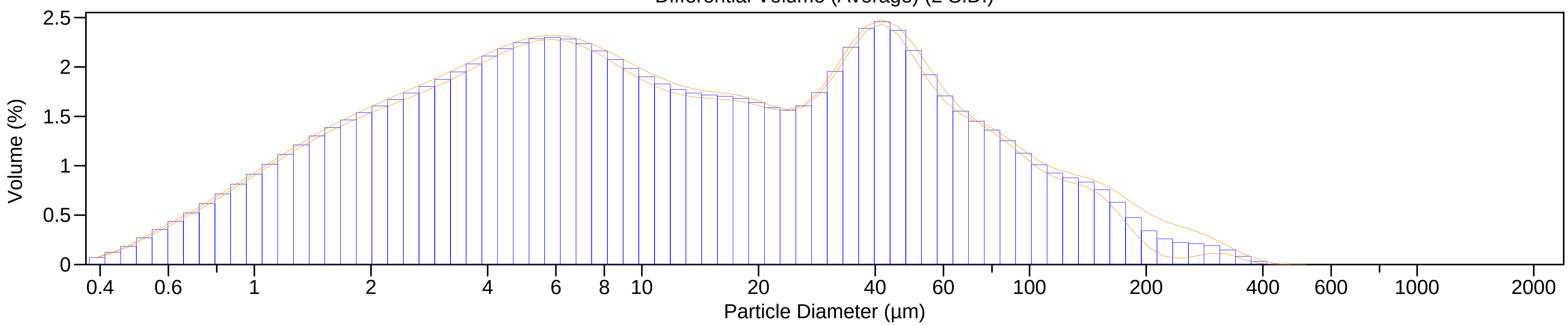
Volume Statistics (Arithmetic) ML-2_3_85.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	29.96 µm	S.D.:	45.64 µm
Median:	10.53 µm	Variance:	2083 μm^2
Mean/Median ratio:	2.846	C.V.:	152%
Mode:	41.68 µm	Skewness:	3.040 Right skewed
		Kurtosis:	12.19 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.556 µm	3.572 µm	10.53 µm	38.86 µm	80.55 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\ML-2_4_88.$av
	ML-2_4_88.$av
File ID:	ML-2
Sample ID:	4
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
Run length:	60 seconds
Pump speed:	66
Fluid:	water

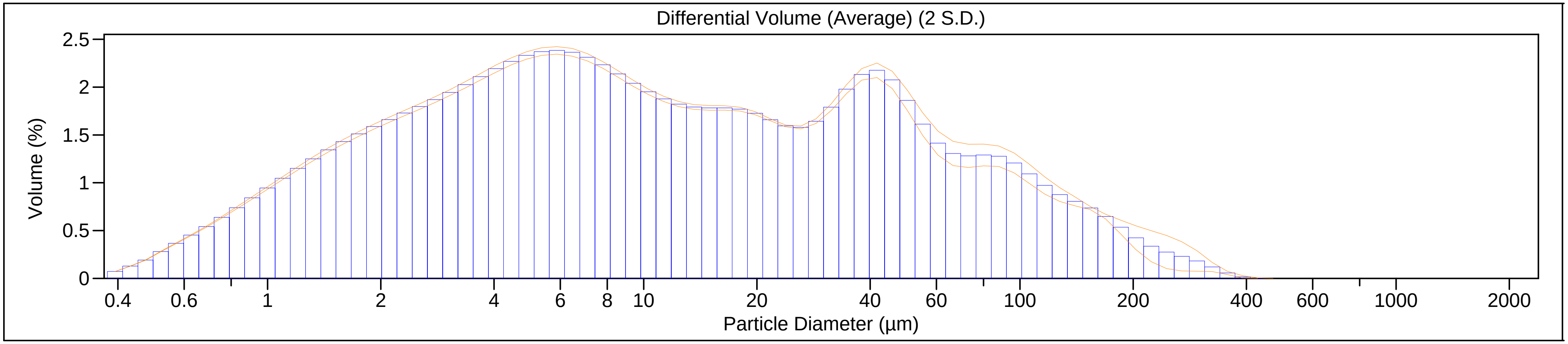
Average of 3 files:
C:\LS13320\Projects\CorteMadera\ML-2_4_86.$ls
C:\LS13320\Projects\CorteMadera\ML-2_4_87.$ls
C:\LS13320\Projects\CorteMadera\ML-2_4_88.$ls

Volume Statistics (Arithmetic) ML-2_4_88.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	29.32 µm	S.D.:	45.94 µm
Median:	9.692 µm	Variance:	2110 $µm^2$
Mean/Median ratio:	3.025	C.V.:	157%
Mode:	5.878 µm	Skewness:	2.952 Right skewed
		Kurtosis:	10.89 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.521 µm	3.434 µm	9.692 µm	36.16 µm	82.74 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\ML-2_5_91.$av
	ML-2_5_91.$av
File ID:	ML-2
Sample ID:	5
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module

Run length: 60 seconds

Pump speed:	66
Fluid:	water

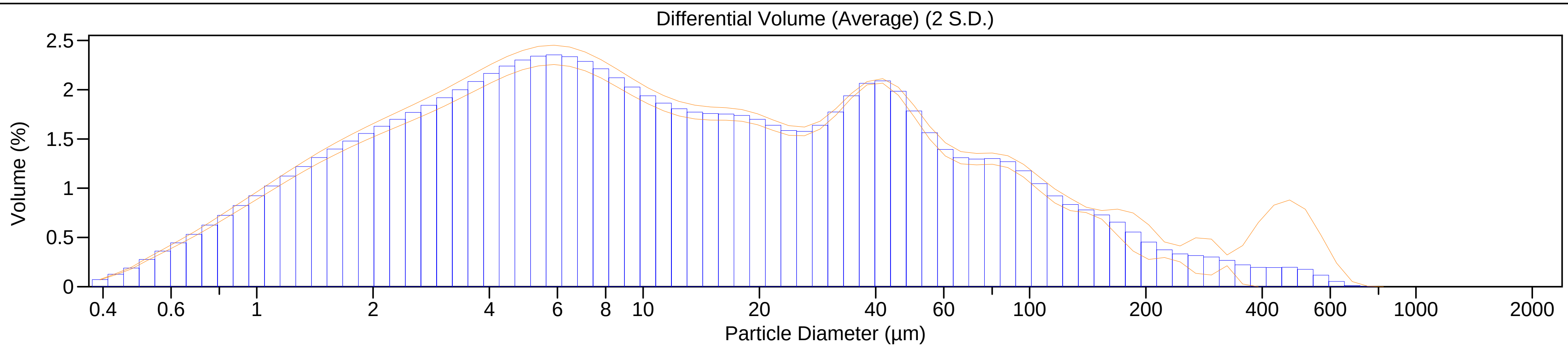
Average of 3 files:
C:\LS13320\Projects\CorteMadera\ML-2_5_89.$ls
C:\LS13320\Projects\CorteMadera\ML-2_5_90.$ls
C:\LS13320\Projects\CorteMadera\ML-2_5_91.$ls

Volume Statistics (Arithmetic) ML-2_5_91.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	35.27 µm	S.D.:	66.93 µm
Median:	10.05 µm	Variance:	4479 µm^2
Mean/Median ratio:	3.511	C.V.:	190%
Mode:	5.878 µm	Skewness:	4.207 Right skewed
		Kurtosis:	22.76 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.543 µm	3.508 µm	10.05 µm	37.91 µm	91.56 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

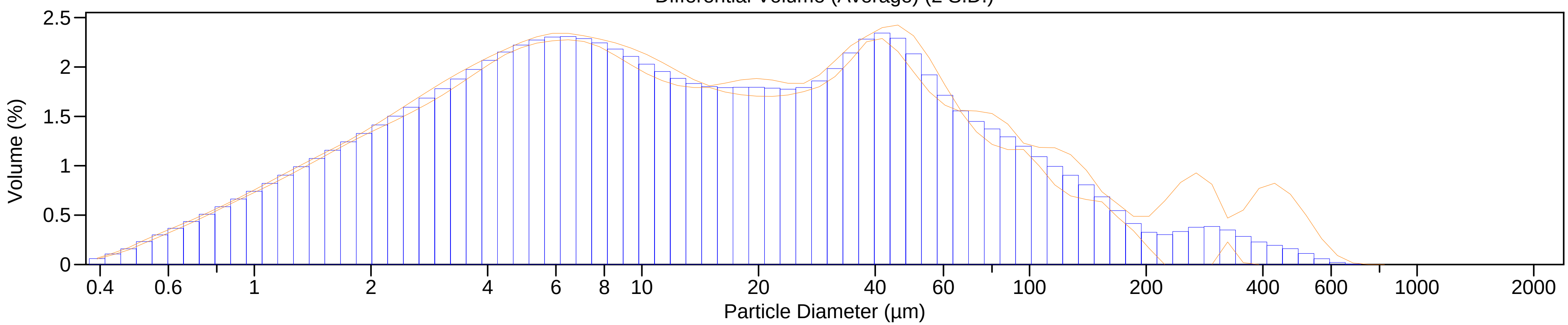
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-1_1_64.$av
S-1_1_64.$av
File ID: S-1
Sample ID: 1
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/10/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-1_1_62.$ls
C:\LS13320\Projects\CorteMadera\S-1_1_63.$ls
C:\LS13320\Projects\CorteMadera\S-1_1_64.$ls

Volume Statistics (Arithmetic) S-1_1_64.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	36.13 µm	S.D.:	63.80 µm
Median:	12.06 µm	Variance:	4071 µm^2
Mean/Median ratio:	2.996	C.V.:	177%
Mode:	41.68 µm	Skewness:	3.957 Right skewed
		Kurtosis:	20.03 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.786 µm	4.137 µm	12.06 µm	41.20 µm	90.71 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-1_2_67.$av
	S-1_2_67.$av
File ID:	S-1
Sample ID:	2
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module

Run length: 60 seconds

Pump speed:	66
Fluid:	water

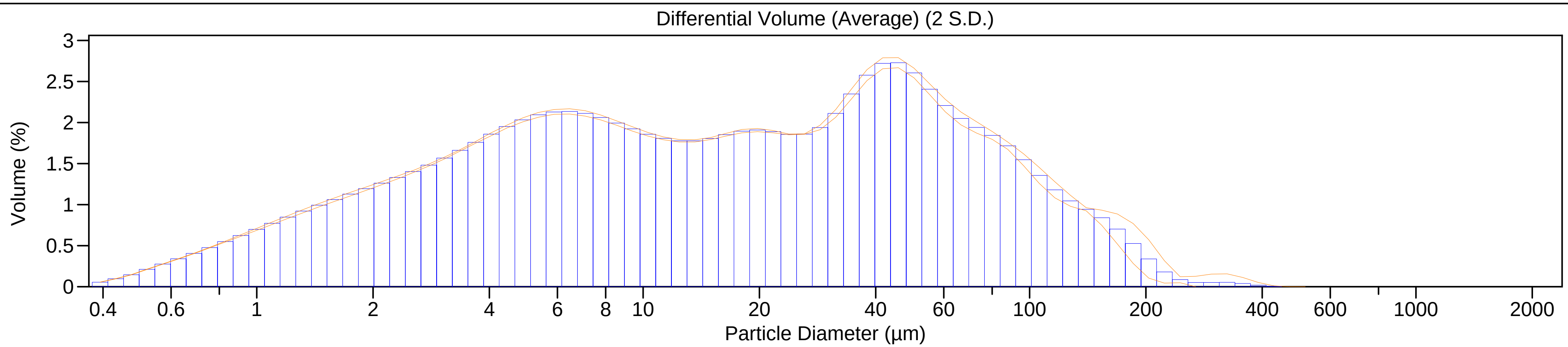
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-1_2_65.$ls
C:\LS13320\Projects\CorteMadera\S-1_2_66.$ls
C:\LS13320\Projects\CorteMadera\S-1_2_67.$ls

Volume Statistics (Arithmetic) S-1_2_67.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	32.76 µm	S.D.:	42.07 µm
Median:	15.20 µm	Variance:	1770 µm^2
Mean/Median ratio:	2.155	C.V.:	128%
Mode:	45.76 µm	Skewness:	2.368 Right skewed
		Kurtosis:	7.973 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.891 µm	4.639 µm	15.20 µm	45.95 µm	87.15 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-1_3_70.$av
	S-1_3_70.$av
File ID:	S-1
Sample ID:	3
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module

Run length: 60 seconds

Pump speed:	66
Fluid:	water

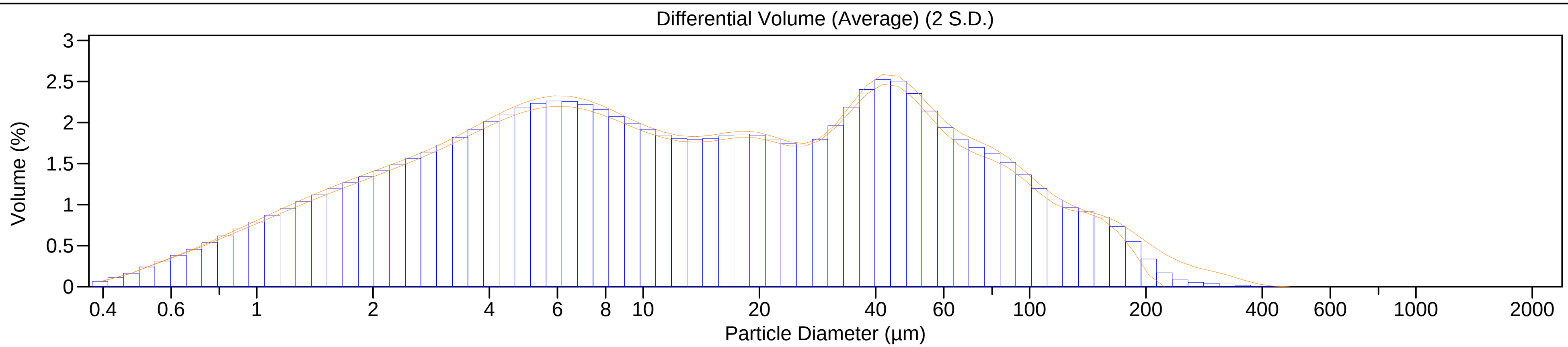
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-1_3_68.$ls
C:\LS13320\Projects\CorteMadera\S-1_3_69.$ls
C:\LS13320\Projects\CorteMadera\S-1_3_70.$ls

Volume Statistics (Arithmetic) S-1_3_70.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	30.48 µm	S.D.:	41.03 µm
Median:	12.49 µm	Variance:	1683 µm^2
Mean/Median ratio:	2.441	C.V.:	135%
Mode:	41.68 µm	Skewness:	2.370 Right skewed
		Kurtosis:	7.244 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.726 µm	4.103 µm	12.49 µm	42.02 µm	83.38 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-1_4_73.$av
S-1_4_73.$av
File ID: S-1
Sample ID: 4
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/10/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-1_4_71.$ls
C:\LS13320\Projects\CorteMadera\S-1_4_72.$ls
C:\LS13320\Projects\CorteMadera\S-1_4_73.$ls

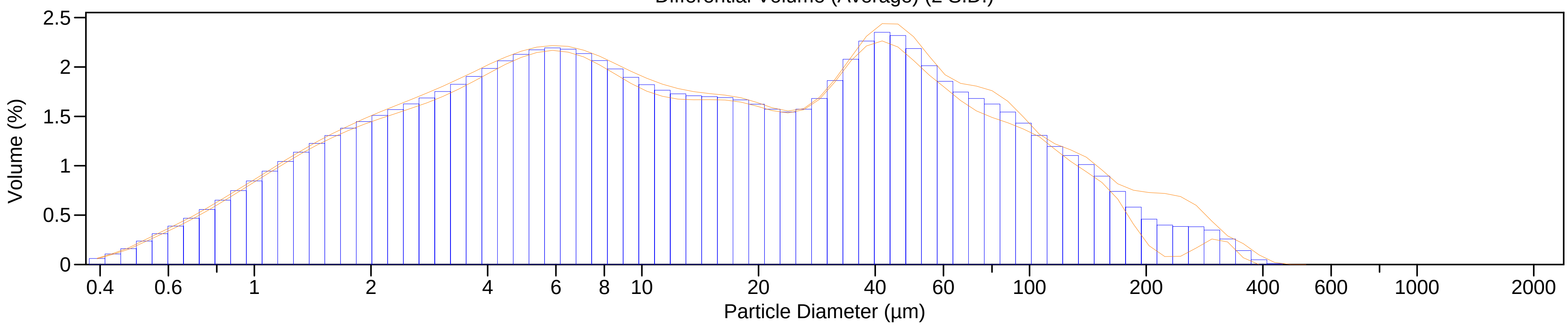
Volume Statistics (Arithmetic) S-1_4_73.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	35.09 µm	S.D.:	52.72 µm
Median:	12.31 µm	Variance:	2779 $µm^2$
Mean/Median ratio:	2.851	C.V.:	150%
Mode:	41.68 µm	Skewness:	2.798 Right skewed
		Kurtosis:	9.681 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.646 µm	3.882 µm	12.31 µm	44.91 µm	96.51 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-1_5_76.$av
	S-1_5_76.$av
File ID:	S-1
Sample ID:	5
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	66
Fluid:	water

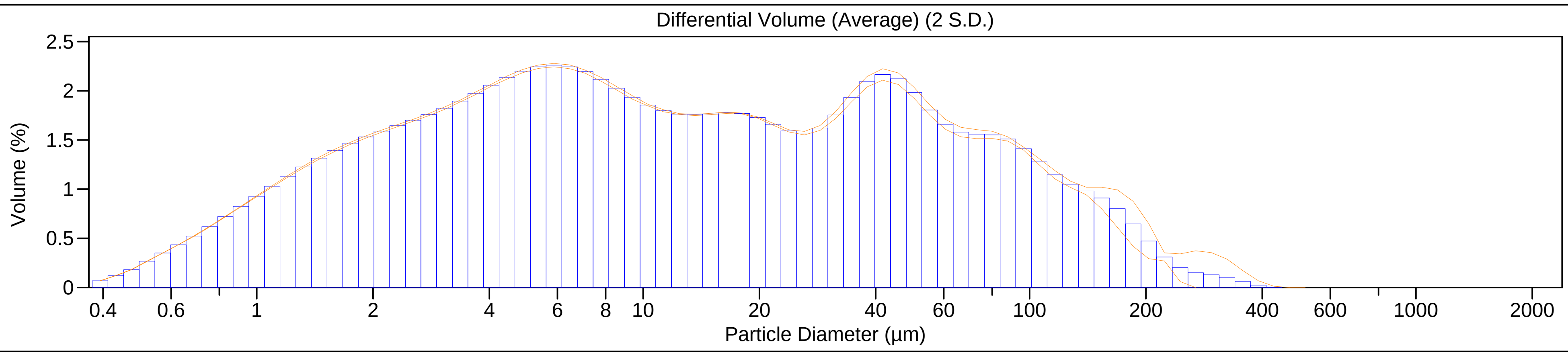
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-1_5_74.$ls
C:\LS13320\Projects\CorteMadera\S-1_5_75.$ls
C:\LS13320\Projects\CorteMadera\S-1_5_76.$ls

Volume Statistics (Arithmetic) S-1_5_76.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	31.57 µm	S.D.:	46.57 µm
Median:	10.90 µm	Variance:	2168 µm^2
Mean/Median ratio:	2.896	C.V.:	148%
Mode:	5.878 µm	Skewness:	2.650 Right skewed
		Kurtosis:	9.020 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.547 µm	3.598 µm	10.90 µm	40.91 µm	90.44 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

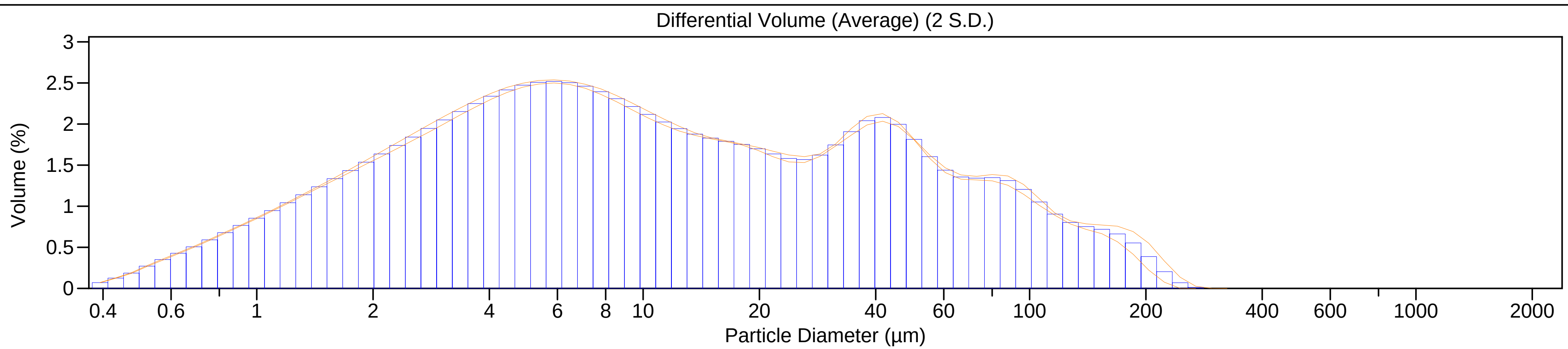
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-2_1_36.$av
S-2_1_36.$av
File ID: S-2
Sample ID: 1
Operator: JM
Comment 1: Corte Madera
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 63
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-2_1_34.$ls
C:\LS13320\Projects\CorteMadera\S-2_1_35.$ls
C:\LS13320\Projects\CorteMadera\S-2_1_36.$ls

Volume Statistics (Arithmetic) S-2_1_36.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	26.51 µm	S.D.:	38.59 µm
Median:	9.324 µm	Variance:	1489 µm^2
Mean/Median ratio:	2.843	C.V.:	146%
Mode:	5.878 µm	Skewness:	2.436 Right skewed
		Kurtosis:	6.470 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.610 µm	3.539 µm	9.324 µm	33.96 µm	76.33 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

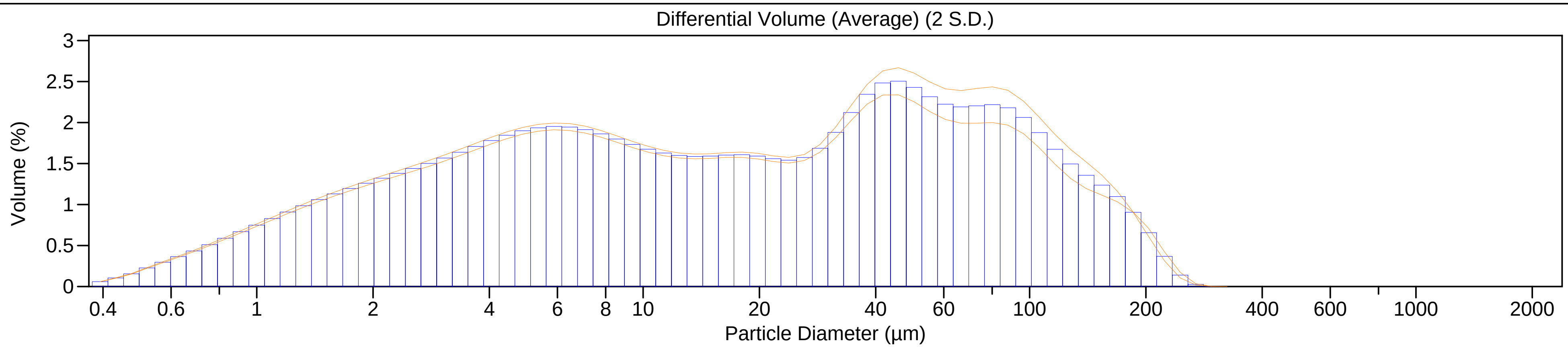
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-2_2_39.$av
S-2_2_39.$av
File ID: S-2
Sample ID: 2
Operator: JM
Comment 1: Corte Madera
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 63
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-2_2_37.$ls
C:\LS13320\Projects\CorteMadera\S-2_2_38.$ls
C:\LS13320\Projects\CorteMadera\S-2_2_39.$ls

Volume Statistics (Arithmetic) S-2_2_39.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	37.86 µm	S.D.:	46.62 µm
Median:	16.76 µm	Variance:	2173 µm^2
Mean/Median ratio:	2.259	C.V.:	123%
Mode:	45.76 µm	Skewness:	1.721 Right skewed
		Kurtosis:	2.737 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.795 µm	4.495 µm	16.76 µm	55.37 µm	105.5 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

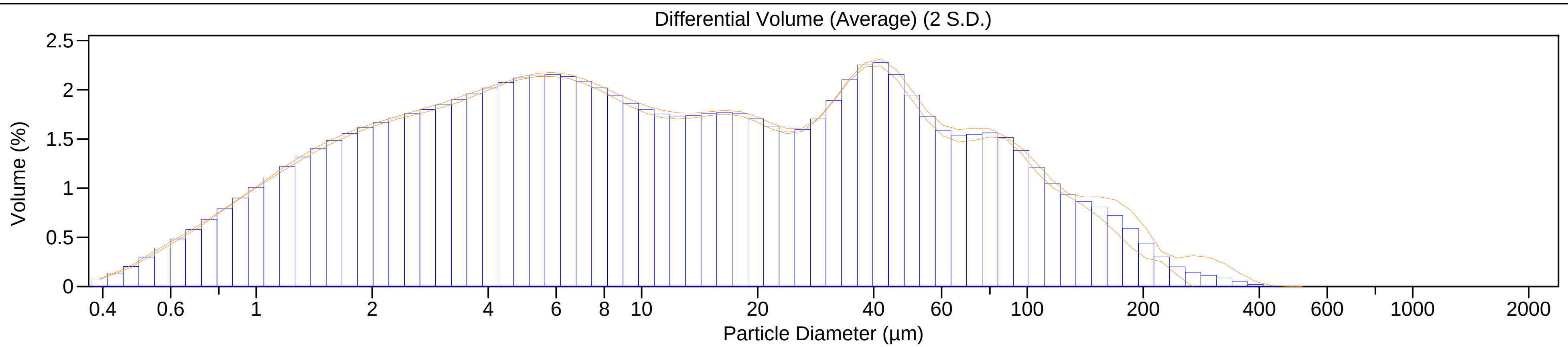
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-2_3c_48.$av
S-2_3c_48.$av
File ID: S-2
Sample ID: 3c
Operator: JM
Comment 1: Corte Madera
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 63
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-2_3c_46.$ls
C:\LS13320\Projects\CorteMadera\S-2_3c_47.$ls
C:\LS13320\Projects\CorteMadera\S-2_3c_48.$ls

Volume Statistics (Arithmetic) S-2_3c_48.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	30.39 µm	S.D.:	44.98 µm
Median:	10.64 µm	Variance:	2023 µm^2
Mean/Median ratio:	2.857	C.V.:	148%
Mode:	41.68 µm	Skewness:	2.701 Right skewed
		Kurtosis:	9.429 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.462 µm	3.363 µm	10.64 µm	39.41 µm	86.22 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

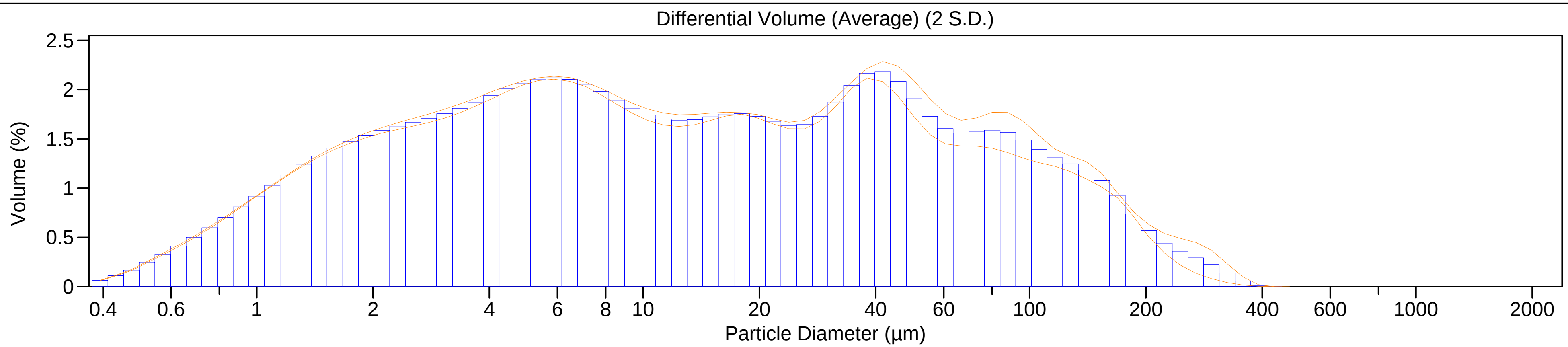
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-2_4d_58.$av
S-2_4d_58.$av
File ID: S-2
Sample ID: 4d
Operator: JM
Comment 1: Corte Madera
Comment 2: 12/10/2010
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 66
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-2_4d_56.$ls
C:\LS13320\Projects\CorteMadera\S-2_4d_57.$ls
C:\LS13320\Projects\CorteMadera\S-2_4d_58.$ls

Volume Statistics (Arithmetic) S-2_4d_58.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	34.67 µm	S.D.:	50.76 µm
Median:	12.10 µm	Variance:	2576 $µm^2$
Mean/Median ratio:	2.865	C.V.:	146%
Mode:	41.68 µm	Skewness:	2.479 Right skewed
		Kurtosis:	7.263 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.562 µm	3.668 µm	12.10 µm	43.84 µm	101.0 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-2_5_61.$av
	S-2_5_61.$av
File ID:	S-2
Sample ID:	5
Operator:	JM
Comment 1:	Corte Madera
Comment 2:	12/10/2010
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module

Run length: 60 seconds

Pump speed:	66
Fluid:	water

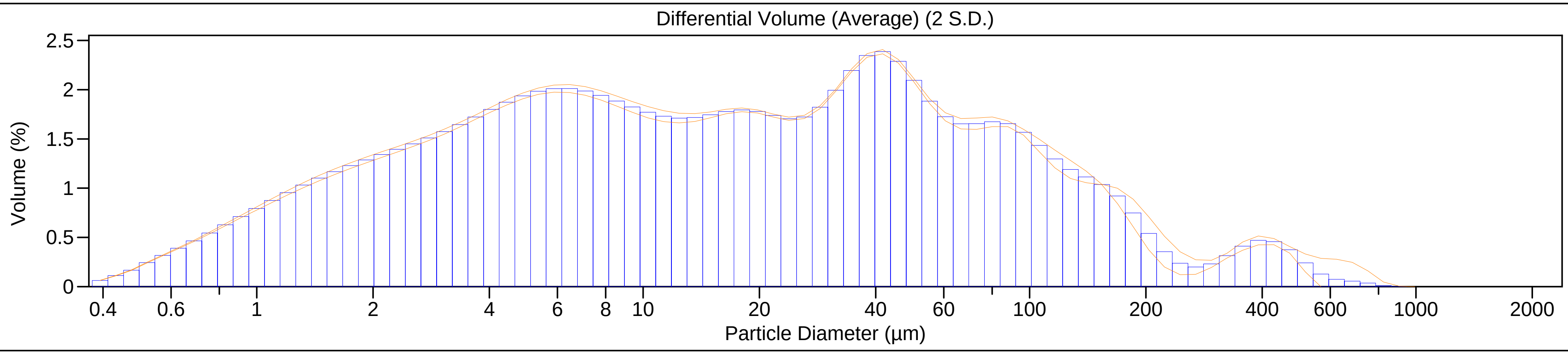
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-2_5_59.$ls
C:\LS13320\Projects\CorteMadera\S-2_5_60.$ls
C:\LS13320\Projects\CorteMadera\S-2_5_61.$ls

Volume Statistics (Arithmetic) S-2_5_61.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	45.15 µm	S.D.:	80.49 µm
Median:	15.13 µm	Variance:	6479 µm^2
Mean/Median ratio:	2.984	C.V.:	178%
Mode:	41.68 µm	Skewness:	3.859 Right skewed
		Kurtosis:	18.68 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.726 µm	4.347 µm	15.13 µm	49.71 µm	114.8 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-3_1_21.$av
	S-3_1_21.$av
File ID:	S-3
Sample ID:	1
Operator:	JM
Comment 1:	Corte Madera
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
Run length:	60 seconds
Pump speed:	63
Fluid:	water

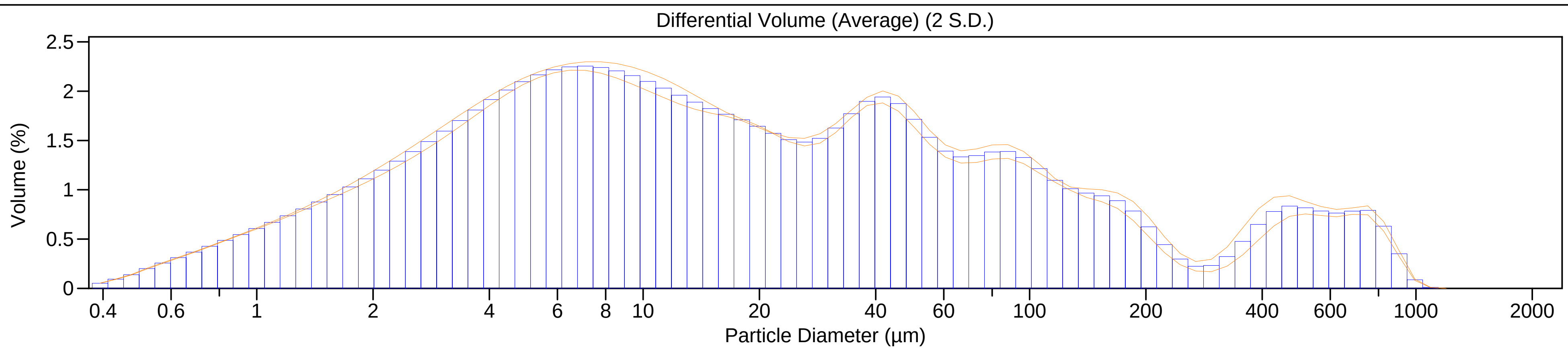
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-3_1_19.$ls
C:\LS13320\Projects\CorteMadera\S-3_1_20.$ls
C:\LS13320\Projects\CorteMadera\S-3_1_21.$ls

Volume Statistics (Arithmetic)   S-3_1_21.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	77.58 µm	S.D.:	162.5 µm
Median:	14.54 µm	Variance:	26394 µm^2
Mean/Median ratio:	5.336	C.V.:	209%
Mode:	7.084 µm	Skewness:	3.151 Right skewed
		Kurtosis:	9.794 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.064 µm	4.857 µm	14.54 µm	57.70 µm	192.2 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-3_2_24.$av
	S-3_2_24.$av
File ID:	S-3
Sample ID:	2
Operator:	JM
Comment 1:	Corte Madera
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
Run length:	60 seconds
Pump speed:	63
Fluid:	water

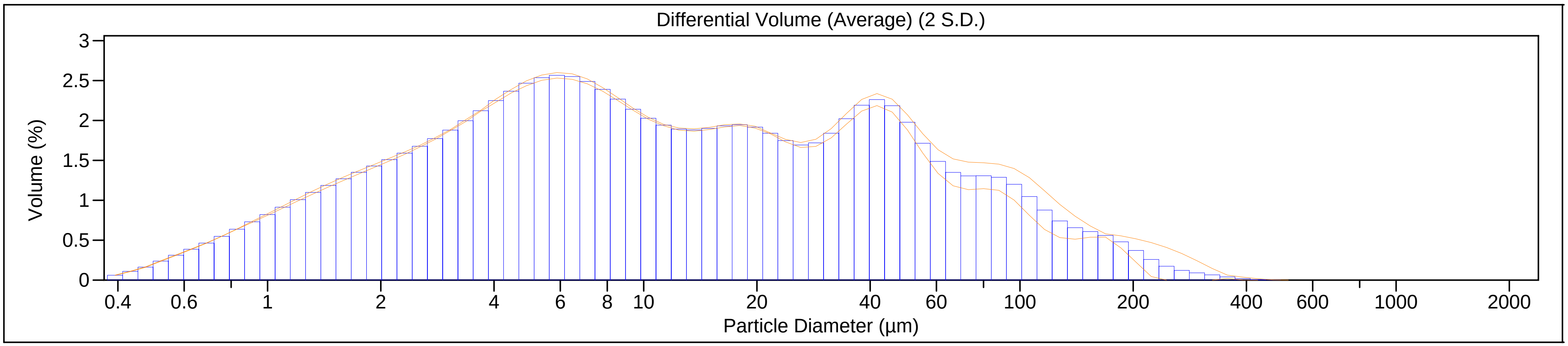
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-3_2_22.$ls
C:\LS13320\Projects\CorteMadera\S-3_2_23.$ls
C:\LS13320\Projects\CorteMadera\S-3_2_24.$ls

Volume Statistics (Arithmetic) S-3_2_24.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	27.72 µm	S.D.:	41.65 µm
Median:	10.15 µm	Variance:	1735 μm^2
Mean/Median ratio:	2.731	C.V.:	150%
Mode:	5.878 µm	Skewness:	3.004 Right skewed
		Kurtosis:	12.11 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.674 µm	3.818 µm	10.15 µm	35.27 µm	75.99 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

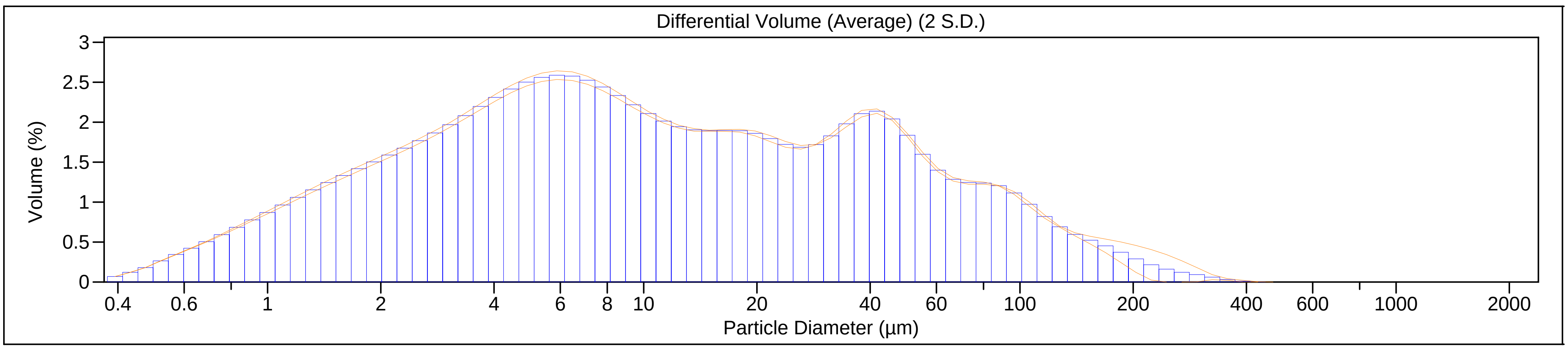
File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-3_3_27.$av
S-3_3_27.$av
File ID: S-3
Sample ID: 3
Operator: JM
Comment 1: Corte Madera
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 63
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-3_3_25.$ls
C:\LS13320\Projects\CorteMadera\S-3_3_26.$ls
C:\LS13320\Projects\CorteMadera\S-3_3_27.$ls

Volume Statistics (Arithmetic) S-3_3_27.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	25.91 µm	S.D.:	39.59 µm
Median:	9.374 µm	Variance:	1567 $µm^2$
Mean/Median ratio:	2.764	C.V.:	153%
Mode:	5.878 µm	Skewness:	3.117 Right skewed
		Kurtosis:	13.09 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.603 µm	3.604 µm	9.374 µm	32.38 µm	70.83 µm



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name:	C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-3_4_30.$av
	S-3_4_30.$av
File ID:	S-3
Sample ID:	4
Operator:	JM
Comment 1:	Corte Madera
Optical model:	Fraunhofer.rf780z
LS 13 320 SW	Aqueous Liquid Module
	Run length: 60 seconds
Pump speed:	63
Fluid:	water

Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-3_4_28.$ls
C:\LS13320\Projects\CorteMadera\S-3_4_29.$ls
C:\LS13320\Projects\CorteMadera\S-3_4_30.$ls

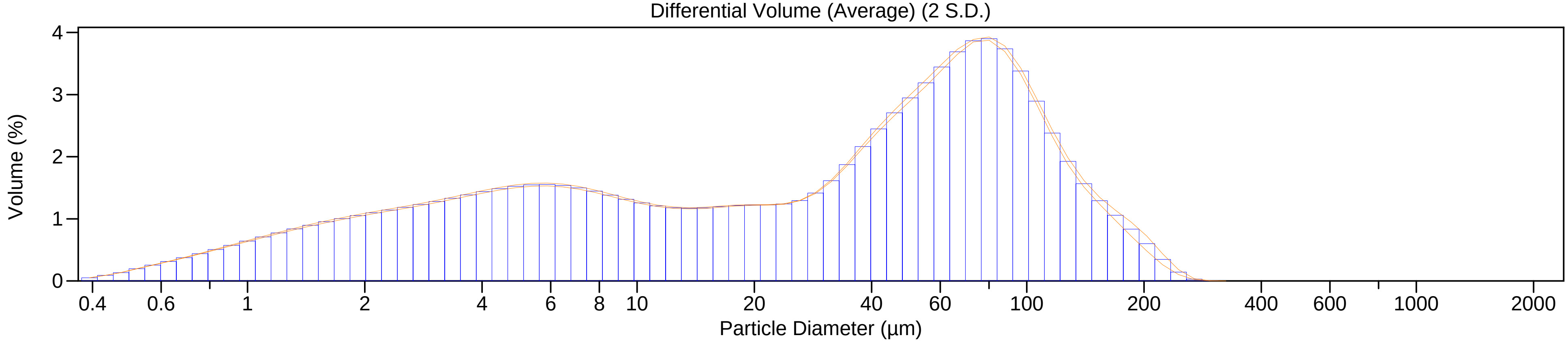
Volume Statistics (Arithmetic)   S-3_4_30.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	46.75 µm	S.D.:	47.51 µm
Median:	33.72 µm	Variance:	2258 µm^2
Mean/Median ratio:	1.386	C.V.:	102%
Mode:	80.07 µm	Skewness:	1.215 Right skewed
		Kurtosis:	1.263 Leptokurtic

<10%	<25%	<50%	<75%	<90%
2.047 µm	5.806 µm	33.72 µm	74.82 µm	111.8 µm

Differential Volume (Average) (2 S.D.)



Beckman Coulter LS Particle Size Analyzer

17 Dec 2010

Corte Madera Sedflume

File name: C:\Documents and Settings\Administrator\My Documents\Projects\Corte Madera\Sedflume PSD Data\S-3_5_33.$av
S-3_5_33.$av
File ID: S-3
Sample ID: 5
Operator: JM
Comment 1: Corte Madera
Optical model: Fraunhofer.rf780z
LS 13 320 SW Aqueous Liquid Module
Run length: 60 seconds
Pump speed: 63
Fluid: water
Average of 3 files:
C:\LS13320\Projects\CorteMadera\S-3_5_31.$ls
C:\LS13320\Projects\CorteMadera\S-3_5_32.$ls
C:\LS13320\Projects\CorteMadera\S-3_5_33.$ls

Volume Statistics (Arithmetic) S-3_5_33.$av

Calculations from 0.375 µm to 2000 µm

Volume:	100%		
Mean:	32.01 µm	S.D.:	45.82 µm
Median:	11.76 µm	Variance:	2099 µm^2
Mean/Median ratio:	2.723	C.V.:	143%
Mode:	5.878 µm	Skewness:	2.572 Right skewed
		Kurtosis:	8.335 Leptokurtic

<10%	<25%	<50%	<75%	<90%
1.731 µm	4.101 µm	11.76 µm	41.93 µm	89.43 µm