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# Black magnetic spherules from the glacial and sea ice of Fletcher's Ice Island (T-3)

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BLACK MAGNETIC SPHERULES FROM THE GLACIAL AND SEA ICE OF FLETCHER'S ICE ISLAND (T-3)

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Calculated sedimentation rates for glacial ice spherules, extrapolated for the entire earth's surface, range from $1.1 \times 10^4$ to $1.1 \times 10^5$ metric tons per year. Calculated sedimentation rates for sea ice spherules range from $5.0 \times 10^3$ to $1.6 \times 10^5$ metric tons per year. Vertical variations in cumulative mass for closely spaced glacial ice cores indicate a similarity of depositional pattern.

This study represents the first known occurrence of spherules in Arctic sea ice but, does not explain the mechanism by which such particles are included. Any acceptable interpretation requires an explanation of the presence of spherules at depth in the sea ice.

# BLACK MAGNETIC SPHERULES FROM THE GLACIAL AND SEA ICE OF FLETCHER'S ICE ISLAND (T-3)

by

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1972

This thesis submitted by Richard Scattolini in partial fulfillment of the requirements for the Degree of Master of Science from the University of North Dakota is hereby approved by the Faculty Advisory Committee under whom the work has been done.

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Department Geology

Degree Master of Science

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ABSTRACT

Black magnetic spherules are particles which can be derived by ablationary processes from cosmic sources. Spherules from both the glacial ice and sea ice of Fletcher's Ice Island (T-3) were studied to determine their size distribution, sedimentation rates, and other parameters. The results were examined and shown to be similar to those of other researchers' work elsewhere.

Calculated sedimentation rates for glacial ice spherules, extrapolated for the entire earth's surface, range from $1.1 \times 10^4$ to $1.1 \times 10^5$ metric tons per year. Calculated sedimentation rates for sea ice spherules range from $5.0 \times 10^3$ to $1.6 \times 10^5$ metric tons per year. Vertical variations in cumulative mass for closely spaced glacial ice cores indicate a similarity of depositional pattern.

This study represents the first known occurrence of spherules in Arctic sea ice but, does not explain the mechanism by which such particles are included. Any acceptable interpretation requires an explanation of the presence of spherules at depth in the sea ice.

# INTRODUCTION

Fletcher's Ice Island (T-3) is a 30 $km^2$ drift station in the Arctic Ocean used by the Naval Arctic Research Laboratory (N.A.R.L.) for research ranging from so-far acoustics to weather observations. Such an installation is of significant value as a stable platform from which research may be conducted (Neal and others, 1969).

Although the source for T-3 is generally accepted as Ellesmere Island (Crary, 1960, Marshall, 1960, Stoiber and others, 1960), the precise location has not been clearly established. Crary (1960, p. 34) suggested Yelverton Bay as one possibility, but recent work by Hattersley-Smith (1967) has confirmed that the Ellesmere ice shelf farther northeast is as likely to have been the source area. But whatever the source, the Ice Island has been adrift in the Beaufort Gyre of the Canada Basin at least since 1947 when it was first discovered by Colonel Joseph Fletcher (Koenig and others, 1952). Since that time numerous research projects have been undertaken on T-3 (see Bushnell, 1960, and Monson and Sater, 1969). This report concerns one such project, although unsupported, initiated in 1968 to examine ice from T-3 for microparticulate matter, particularly the black magnetic spherules.

Black magnetic spherules are opaque spherical grains, some of which are unquestionably of extraterrestrial origin (Schmidt, 1963, Schmidt and Keil, 1966, Millard and Finkelman, 1970). Interest in these objects is due to several facts:

1. Few sediments are devoid of such particles (Crozier, 1960).
2. The origin of these particles is not clear (Carr, 1970, Wright and Hodge, 1968, and Crozier, 1966).
3. Such particles may be of value in determining sedimentation rates (Mutch and Garrison, 1967).
4. The earth's magnetic field may influence the deposition of these particles (Schmidt and Cohen, 1964, Brownlow and others, 1965).

Black magnetic spherules have been studied from Jurassic cherts and Permian salts (Mutch and Garrison, 1967), Antarctic and Arctic ice (Schmidt, 1963, Langway, 1967, Stoiber and others, 1960), Pleistocene and Recent beach sands (Marvin and Einaudi, 1967), the atmosphere (Crozier, 1966, Hamilton, 1968, Kumai, 1969, Carr, 1970, and Vittori, 1970), oceanic sediments (Millard and Finkelman, 1970, Schmidt and Keil, 1966, and Laevastu and Mellis, 1955), and manganese nodules (Finkelman, 1970).

Experimental studies on the formation of such particles have also been undertaken (Langway and Marvin, 1964, Yudin, 1971, Blanchard, 1972). Several researchers have made chemical analyses by X-ray diffraction, electron microprobe and radioactivation techniques (Smalles and others, 1958, Castaing and Fredriksson, 1958, Schmidt, 1963, El Goresy, 1967, Wright, Hodge and Langway, 1969, Manecki and Skrowronski, 1970 and Finkelman, 1970). Specific bibliographic information has also been compiled for literature up to 1965 (Schmidt, 1965) (see also Hoffleit, 1952).

## ORIGIN OF SPHERULES

Black magnetic spherules are opaque particles which represent approximately ten percent of the total amount of extraterrestrial dust fallout onto the surface of the earth (Schmidt and Cohen, 1964). Because these particles show evidence of remelting and are easily separated from other materials, they have been extensively studied. Although most spherules are presumably extraterrestrial, numerous hypotheses have been proposed for their origin. These origins include:

1. Industrial contamination (Handy and Davidson, 1955)
2. Micrometeorites of cometary and asteroidal origin (Cosby and Lyle, 1965),
3. Ablation droplets and strippings from small meteorites (Krinov, 1960),
4. Ablation droplets from large ($>1m^3$) meteoroids during atmospheric entry and breakup (Wright and Hodge, 1968, Carr, 1970).

Another proposed origin is volcanic (Fredriksson and Martin, 1963) which was subsequently disproven (Wright and Hodge, 1968, Wright and others, 1966).

Industrial contamination is the greatest problem encountered in studies of these particles. Therefore, the ideal is a high latitude, pre-industrial revolution sample (Hodge and Wildt, 1958).

Careful laboratory work is also necessary. These facts have long been recognized by many researchers. Finkelman (1970) used a clean room, Schmidt (1963) and Langway (1967) used clean boxes. Work by Langway and Marvin (1964) has shown that arc-weld spherules may have compositions similar to meteoritic spherules. This has been a concern in spacecraft collections of these particles (Blanchard and Farlow, 1966).

Earlier work indicated the local nature of the contamination problem. For example, Thomsen (1953) calculated a sedimentation rate of $2 \times 10^6$ metric tons per year for the entire earth's surface for black spheres. This report led to a controversy over this rate of accumulation.

Handy and Davidson (1953) subsequently pointed out that industrial fly ash produced in quantity in the midwestern U. S. has essentially the same composition as the "meteoritic" dust reported by Thomsen, making it doubtful that his calculation was accurate. In his studies of precipitation nuclei, Kumai (1969) photographed non-reflective spherules which he also believed to be fly ash.

In a study of all types of particulate materials, Hamilton (1968) noted that contamination from man-made sources (stoves in the Antarctic) causes particulate numbers to fluctuate one to two orders of magnitude higher than comparable non-contamination periods. With this knowledge, the necessity for some form of contamination control is obvious.

Micrometeoroids measured by deep space probes have shown an influx considerably less than that predicted from counts of spherules in earth based collections. These micrometeoroids are of cometary and asteroidal origin (Cosby and Lyle, 1965). In addition, recent

satellite measurements (Hemenway and Hallgren, 1968) have shown a lower micrometeoroid influx than previously (Whipple, 1961). This indicates that the micrometeoroid influx rate is insufficient to account for all of the black magnetic spherules found on the surface of the earth (Wright and Hodge, 1968). Therefore, alternative explanations are necessary.

Certainly, spherules are produced during some meteorite interactions with the earth. After the fall of the Sikhote-Alin meteorites (Krinov, 1964), the soil was found to contain metallic spherules and the fusion crusts of the meteorites showed striations which often ended in spherical globules (Krinov, 1960). These metallic spherules, however, do not make up the bulk of most spherule collections (Wright and Hodge, 1968).

Another possible origin is related to a significant discovery by McCrosky (1968). In essence, McCrosky's work shows that the number of large meteoroids in space is two orders of magnitude greater than in the $10^2$ to $10^{10}$ gram range than was previously thought. Ablation of bodies of this size could produce sufficient extraterrestrial material in the atmosphere with great numbers of spherules. These bodies may even be some type of carbonaceous chondrite or comet (Wright and Hodge, 1968). A possible example of this type of occurrence may be the Revelstoke meteorite, although only one gram of the meteorite, a type 1 carbonaceous chondrite, was recovered (Folinsbee and others, 1967). Particulate materials found in the atmosphere three days later included large numbers of black magnetic spherules (Carr, 1970). Thus, there is a strong indication that most, if not

all similar particles are derived from an extraterrestrial source similar to that involved in the Revelstoke event.

Some spherules display surface flow markings produced during the ablationary process. But, many do not show such features. For these spherules microchemical analysis may be useful. Two generally accepted chemical criteria for proof of an extraterrestrial origin are:

1. A high nickel content with other elemental compositional similarities to known meteoritic material (Wright and others, 1963). While this criterion is acceptable, it is not necessarily unique to extraterrestrial material (Langway and Marvin, 1964).
2. Presence of the mineral wüstite ($Fe_{1-X}0$) (Marvin and Einaudi, 1967, Finkleman, 1970).

## PREVIOUS T-3 WORK

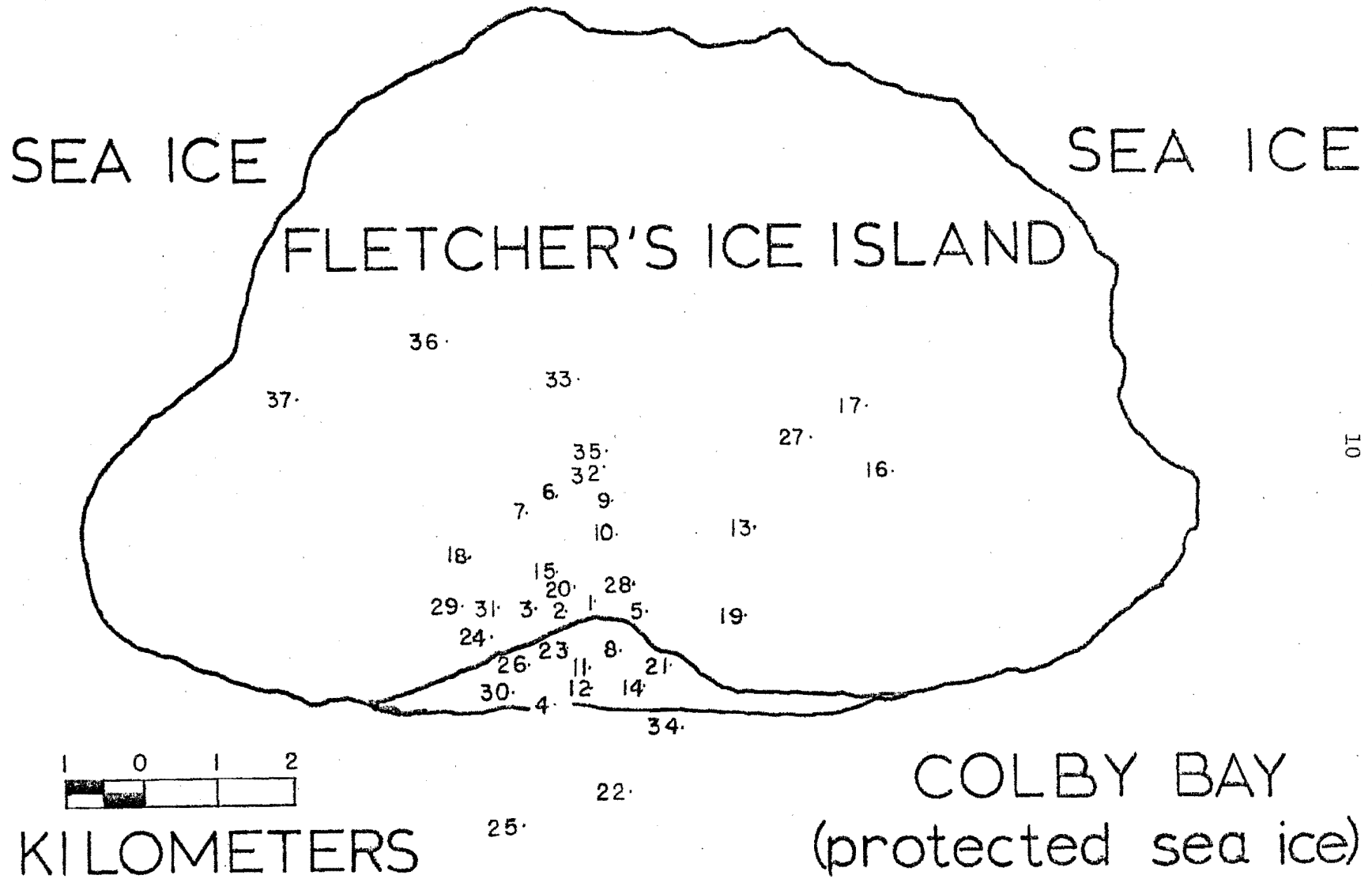
The presence of spherules in the glacial ice of T-3 has been known since 1960, when Stoiber and others published a description of black magnetic spherules from T-3 showing flow markings. Because of the separation process employed to concentrate these particles (a hand magnet) the quantitative information obtained was admittedly poor (Stoiber and others, 1960, p. 69). Because the recovery of small spherules was incomplete, the calculated sedimentation rates are misleading. As far as can be determined, this is the only study relating directly to spherules on T-3.

## FIELD COLLECTION

Twenty-eight ice cores, from 1 to 8 meters long, were collected from T-3 during the summers of 1968 and 1970. Figure 1 is a sketch map of T-3 showing locations of these cores. The source of this map is unknown but, it is probably a photographic enlargement of a radar screen sweep. Coring was completed with a standard S.I.P.R.E. (Snow, Ice, and Permafrost Research Establishment) corer which cuts a 7.5 cm diameter core. Only those sites which were dry and devoid of surface dirt were selected. Each core was placed in a clean plastic bag and later allowed to melt in a large contamination-free plastic container. All equipment used in this process was washed with distilled and particle-free water.

Core samples were permitted at least 48 hours of undisturbed settling time, after which water above 10 cm was siphoned off and discarded. The remaining water with particulate material was transferred to a small plastic container, which was then sealed for shipment to the laboratory.

Fig. 1.--Sketch map of T-3 showing core locations.


SEA ICE
SEA ICE
FLETCHER'S ICE ISLAND
36
33
37
17
27
35
32
16
6
9
7
10
13
18
15
20
28
29
31
3
2
1
5
19
24
23
8
26
11
21
30
12
14
4
34
22
25
1 0 1 2
KILOMETERS
COLBY BAY
(protected sea ice)

## SPHERULE SEPARATION

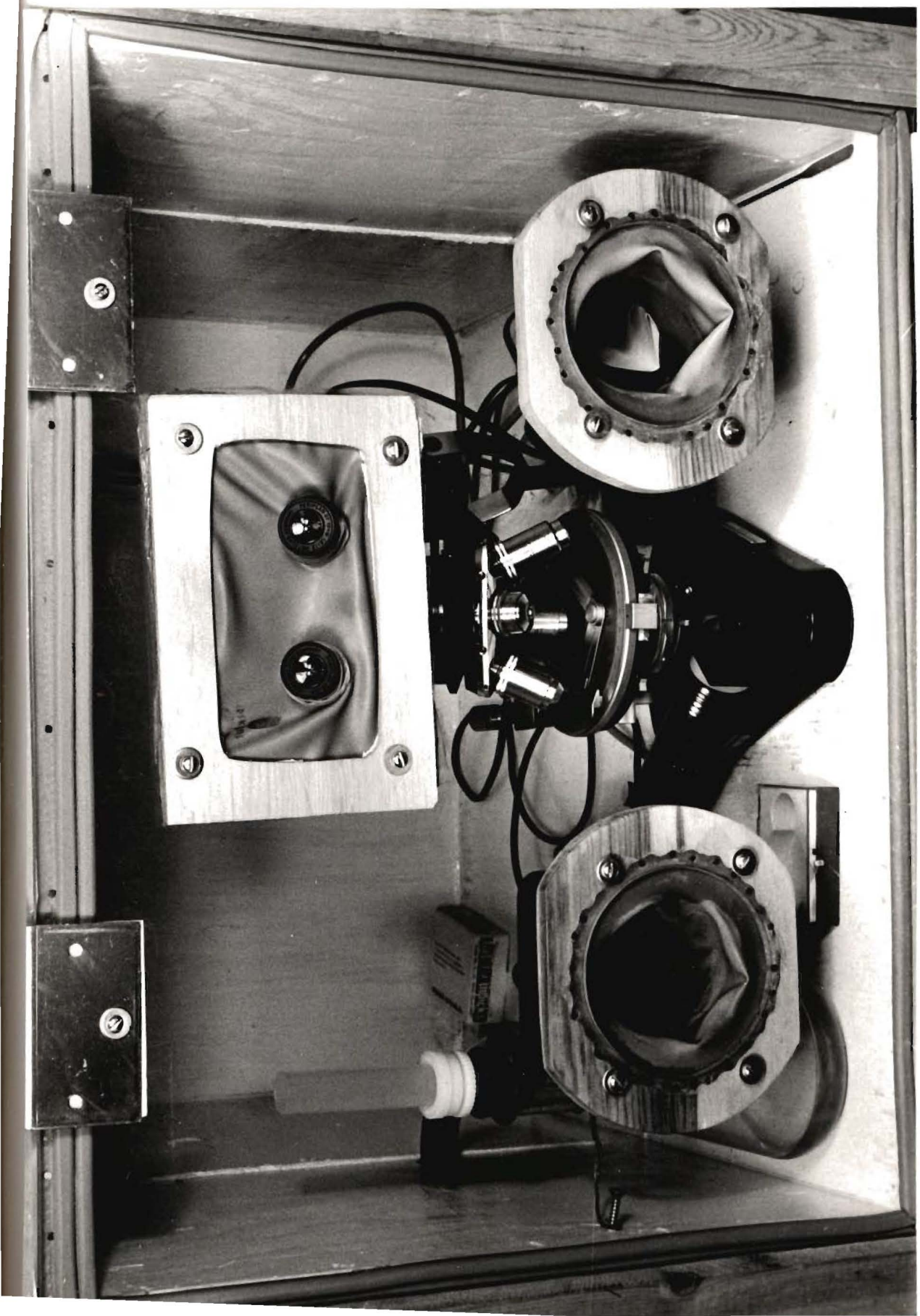
In the laboratory, samples were treated with filtered solutions to prevent contamination by particulate material >2 microns in diameter. A 5% sodium hexametaphosphate solution was used to deflocculate clay minerals and a 3% solution of hydrogen peroxide was also added to prevent bacterial growth.

A Frantz isodynamic separator was operated at 0.2 amps and a standing water gravity settling technique was used similar to that of Mutch and Garrison (1967, p. 1143). The technique was modified slightly in that the separatory funnel was plugged with cotton after the sample was introduced to prevent laboratory contamination. The particulate material from each sample settled a minimum of four hours through this closed system.

During the process of transfer, all rinsing of containers was done with distilled and filtered (>2 microns) water. After processing in this manner, the separator amperage was increased to 1.2 amps and the sample water in the separatory funnel was drawn off slowly. The separatory funnel was rinsed to assure that no material was lost. The resulting magnetic fraction was placed in a pre-cleaned 6 dram vial.

The remainder of the work on these particles was completed in a specially constructed clean box (Figure 2). Laboratory air was filtered through a plug of cotton and a filtration apparatus was used inside the clean box.

Fig. 2.--Photograph of the clean box enclosure.



A vacuum pump was operated to draw air for 10 to 15 minutes through a clean filter which was subsequently mounted on a slide and examined microscopically before any T-3 sample was filtered. The 10 to 15 minute period was the time necessary to evacuate twice the volume of air in the clean box. The contamination control slides were immediately examined microscopically and although some opaque material was observed no spherules were found.

Spherules were observed only on filters on which T-3 samples were mounted. These filters were mounted in glycerol on a petrographic slide with cover slip. Then immediately placed on the Leitz S. M. pol binocular microscope stage which was also located inside the clean box; the microscope was fitted with a mechanical stage for systematic scanning. Reflected light was obtained from two Bausch and Lomb light sources located at 120° from each other.

## SPHERULE IDENTIFICATION

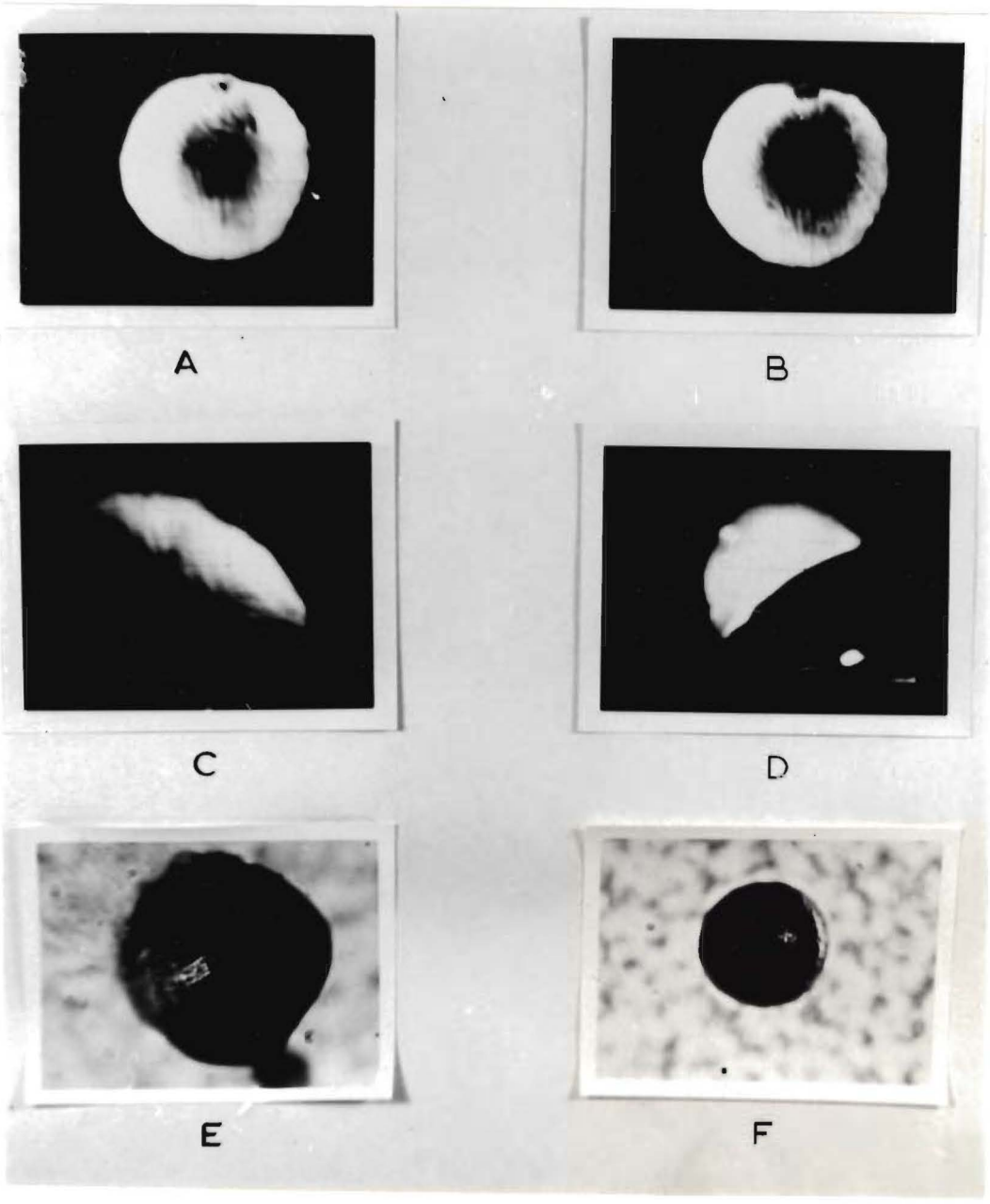
Three characteristics were used to identify these particles. They had to be spherical, they had to be opaque and highly reflective and they had to be highly magnetic. Sphericity is probably the earliest criterion to be used and is indicative of remelting (Murray and Renard, 1884). In the T-3 study, a visual estimate of sphericity may have resulted in measurement of a few ovoid shapes, but teardrop, pear-shaped and dumbell-type particles were excluded. For this reason, computed values based on these spherule measurements may be considered a lower approximation.

The second criterion requires that spherules included in this study be black, opaque, and highly reflective; reddish and dull black spherules were excluded. The spherules which were included had the appearance of the type "A" spherule, as described by Millard and Finkelman (1970).

The third criterion is that spherules be magnetic and therefore separable by the Frantz separator (Mutch and Garrison, 1967). Examples of such particles are shown in Figures 3 and 4.

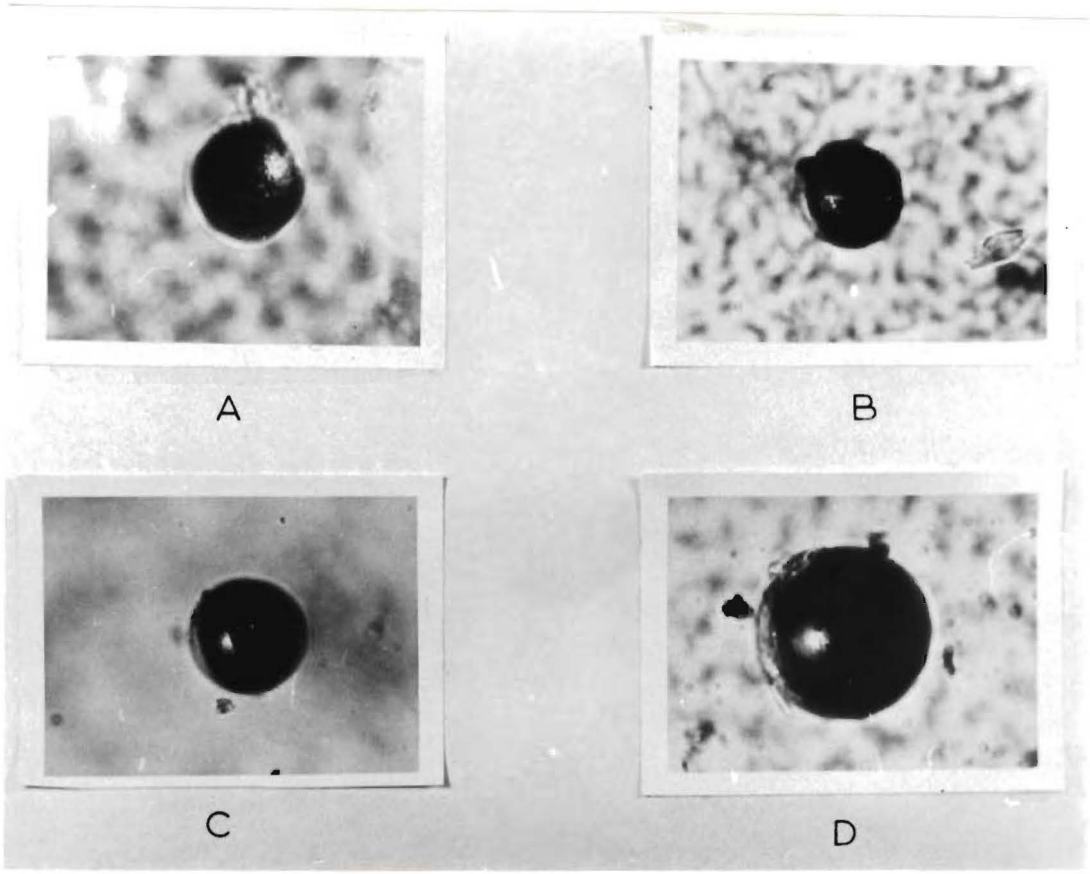
| | Sample-Spherule Number | Size Microns | Comments |
|---|---|---|---|
| A | 15-1 | 60 | Electron microprobe (EM) Sample current photograph Note the ridges on the top of the spherule. |
| B | 15-1 | 60 | EM sample current photograph Notice that these ridges are continuous away from the top of the spherule. Such ridges have been called flow marks (Stoiber and others, 1960). |
| C | 15-1 | 60 | EM backscatter photograph Backscatter dectector is at an angle hence, only part of the spherule is visible. Magnification is twice A and B. Notice that ridges are still present. |
| D | 15-4 | 30 | EM sample current photograph Spherule broken in half with small ( 5 micron) spherule attached. |
| E | 3-1 | 63 | Photomicrograph Notice ridge and furrow surface pattern. This feature is similar to that described by Schmidt and others (1963). |
| F | 3-2 | 25 | Photomicrograph Notice the pitted surface. This feature is similar to that described by Schmidt and others (1963). |

Fig. 3.--Photographs of black magnetic spherules showing surface features.


A
B
C
D
E
F

| | Sample-Spherule Number | Size Microns | Comments |
|---|---|---|---|
| A | 3-3 | 21 | Photomicrograph of glacial ice spherule. |
| B | 3-4 | 18 | Photomicrograph of glacial ice spherule. |
| C | 3-5 | 28 | Photomicrograph of glacial ice spherule similar to smooth type as described by Schmidt (1963). |
| D | 3-6 | 38 | Photomicrograph of a glacial ice spherule similar to the glassy type as described by Langway (1967). |

Fig. 4.--Photograph of typical black magnetic spherules.


A
B
C
D

## MEASUREMENTS

The diameter of all spherules which met the above three requirements were measured to ±1 micron with an eyepiece reticule calibrated with a stage micrometer. Calibration curves were drawn and reticle measurements were read from the graph. Measurements, all made in the clean enclosure, were generally made at 400x magnification.

## COMPUTED PARAMETERS AND ASSUMPTIONS

Among the computed parameters used in this study were: the cumulative percentage of numbers of particles (equation 1.2, Appendix A), the cumulative mass (equation 1.6, Appendix A), the average spherule diameter (equation 1.7, Appendix A), the average mass of spherules (equation 1.8, Appendix A), average mass diameter of spherules (equation 1.8, Appendix A), average mass diameter of spherules (equation 1.9, Appendix A) and the sedimentation rate (equation 2.0, Appendix A).

The usefulness of the cumulative mass calculation is that it represents the total amount of spherules, in grams, for the interval of time or length of core under consideration. The computation requires measurement of three spherule parameters: diameter, number within diameter interval (grouped in 5 micron intervals), and density. In this study, spherule density was not measured but was assumed to be that of other Arctic spherules, 4.54 $gm/cm^3$ (Franklin and others, 1967). The effect of density in this computation is that of multiplying the numerically integrated volume term by a constant. This computation was made for each sample (see Appendix B).

The average diameter and the average mass diameter were computed for each sample, in microns. The average mass for each sample was computed in grams (see Appendix B).

The computed sedimentation rate, in metric tons per year, reflects the amount of black magnetic spherules reaching the entire earth's surface in one year. The computation requires that the age

or an independently determinable sedimentation rate for the ice be known.

These ages and/or rates for T-3, however, are not known and can be estimated only from the work of Crary (1960) who determined the ice-accumulation rate for the Ellesmere ice shelf, the presumed source for T-3. The determination of the rate of accretion for the adjacent sea ice is more difficult. The theoretical work of Untersteiner (1964) presents the general case for the growth of sea ice. The protected sea ice of Colby Bay, however, poses a special problem; because large quantities of fresh meltwater runoff from T-3 during the melt season and because fresh water freezes more rapidly than sea water, the rate of growth of the Colby Bay sea ice is likely to be higher than that of most sea ice. The sea ice of Colby Bay was found to be about 4 meters thick while farther from T-3 the sea ice was penetrated at 2.5 and 2.9 meters. The rates of ice accretion assumed for this study are shown in Table 1. Ages in years for specific lengths of core were computed from these ice accumulation rates.

TABLE 1

ASSUMED ICE ACCUMULATION RATES FOR T-3 ICE CORES

| Type of Ice | Accumulation Rate | Source |
|---|---|---|
| Glacial Ice | 12.4 cm/yr | Crary (1960) |
| Sea Ice (Pack) | 30.0 cm/yr | Untersteiner (1964) |
| Colby Bay Sea Ice | 36.3 cm/yr | Modified after Untersteiner (1964) |

Since ice accretion rates are assumed to be constants, part of the variation in the computed sedimentation rates may be due to this assumption. It is unlikely that the glacial ice-accretion rate was constant. Sea-ice accumulation rates may also vary but differences between the assumed and the actual rate for sea ice are probably small relative to those for glacial ice.

## GLACIAL ICE RESULTS

The diameter of the spherules from T-3 glacial ice ranges from less than 5 microns to 160 microns. Of 1862 spherules measured from the T-3 glacial ice, most are 15 to 30 microns in diameter. Statistical parameters computed for each glacial-ice sample are presented in Table 2. The relationship of cumulative percentage to spherule diameter, in microns, is shown in Figure 5.

Calculated sedimentation rates for these particles, extrapolated for the entire earth's surface, range from $1.1 \times 10^4$ to $1.1 \times 10^5$ metric tons per year.

The suggestion of a possible spherule stratigraphy was proposed by Marshall (1959), and distinct vertical variations in numbers of black magnetic spherules were subsequently observed by Langway (1967), further suggesting the possibility that the meteoritic phenomena producing these particles are cyclic. T-3 ice was, therefore, examined for such vertical variations.

Three short cores 6 to 8 meters long were examined over 1 meter intervals and a variation was, in fact, observed. It is probable, however, that the sampling interval was too large to clearly observe such a cyclic pattern. By plotting the cumulative mass of spherules against increasing depth (Figure 6), some interesting results are observed. Samples 32 and 35 suggest a similar pattern of spherule variation. Both of these samples are from the

TABLE 2

STATISTICAL PARAMETERS FOR SPHERULES FROM GLACIAL ICE CORES

| Sample Number | Summer Cored | Length (Meters) | Cumulative Number of Spherules | Cumulative Number/ $m^2$/sec x $10^{-4}$ | Cumulative Mass (Grams) x $10^{-8}$ | Average Diameter (Microns) | Entire Earth Influx (Metric Tons/Year) x $10^4$ |
|---|---|---|---|---|---|---|---|
| 2 | 1968 | 1.0 | 173 | 14.9 | 4.5 | 16.2 | 6.3 |
| 3 | 1968 | 1.0 | 123 | 10.6 | 5.9 | 20.7 | 8.1 |
| 5 | 1968 | 3.0 | 161 | 4.7 | 12.9 | 17.6 | 6.0 |
| 7 | 1968 | 3.0 | 137 | 4.0 | 5.7 | 22.3 | 2.6 |
| 9 | 1968 | 3.0 | 149 | 4.3 | 9.2 | 22.6 | 4.3 |
| 15 | 1968 | 3.0 | 72 | 2.1 | 5.5 | 24.7 | 2.5 |
| 17 | 1968 | 3.0 | 53 | 1.5 | 2.3 | 19.1 | 1.1 |
| 18 | 1968 | 3.0 | 73 | 2.1 | 6.2 | 21.4 | 2.9 |
| 19 | 1968 | 3.0 | 66 | 2.0 | 9.8 | 23.3 | 4.5 |
| 20 | 1968 | 3.0 | 66 | 2.0 | 3.2 | 20.8 | 1.5 |
| 24 | 1968 | 2.0 | 72 | 3.1 | 15.5 | 30.9 | 10.8 |
| 27 | 1968 | 3.0 | 41 | 1.2 | 2.4 | 22.8 | 1.1 |
| 29 | 1970 | 1.0 | 39 | 3.4 | 1.3 | 16.4 | 1.8 |
| 32 | 1970 | 6.0* | 240 | 3.5 | 17.6 | 19.8 | 4.1 |
| 33 | 1970 | 1.0 | 24 | 2.1 | 2.2 | 20.6 | 3.0 |
| 35 | 1970 | 8.0* | 200 | 2.2 | 6.5 | 16.8 | 1.1 |
| 37 | 1970 | 8.0* | 173 | 1.9 | 15.9 | 23.8 | 2.8 |
| Composite | | | 1862 | 2.9 | 126.6 | 20.6 | 3.2 |

*Sample was collected in 1 meter sections. Results are for composite cores.

Fig. 5.--Cumulative percentage of numbers of spherules for the T-3 glacial ice plotted against spherule diameter. Sample numbers correspond to locations in Figure 1.

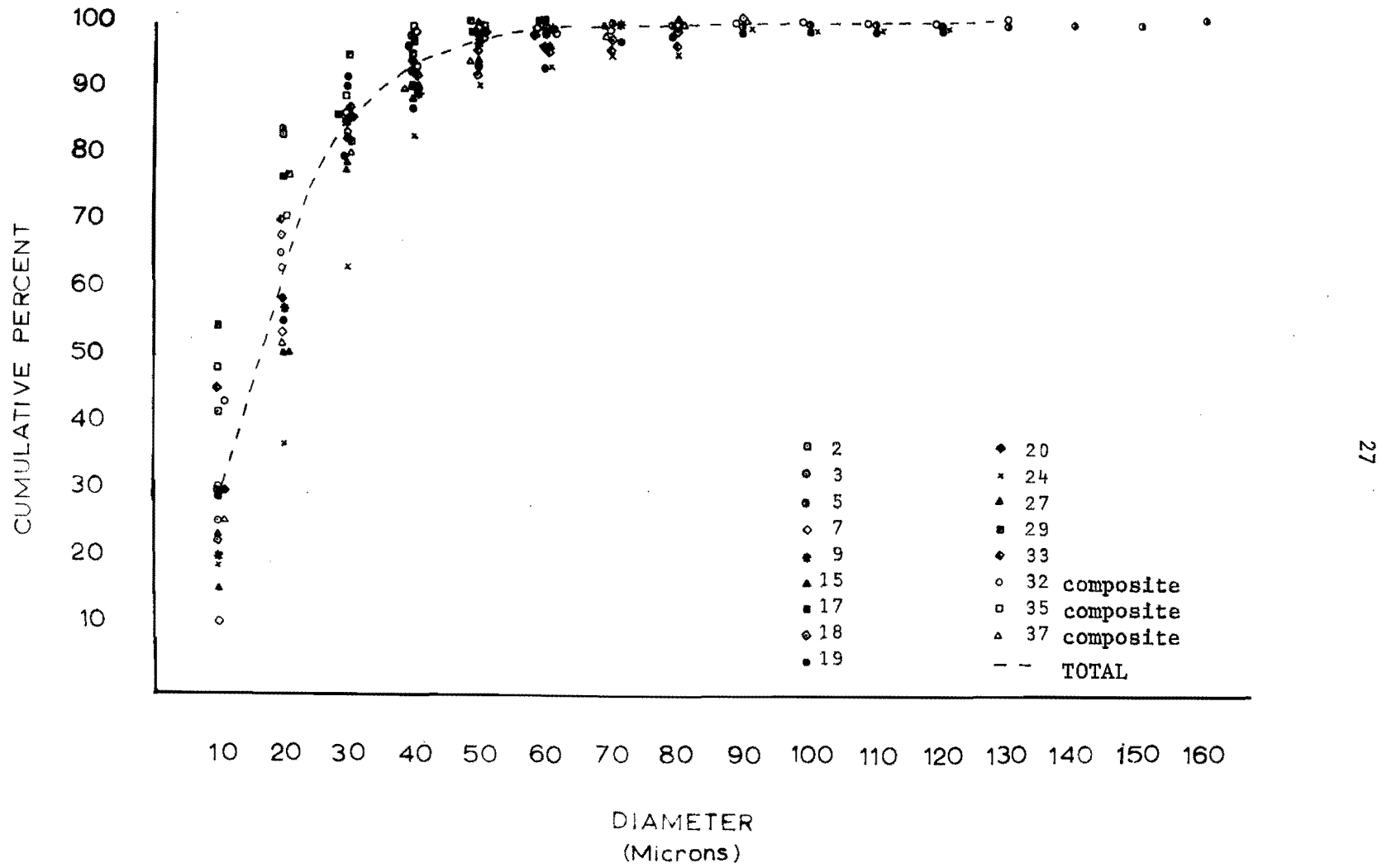
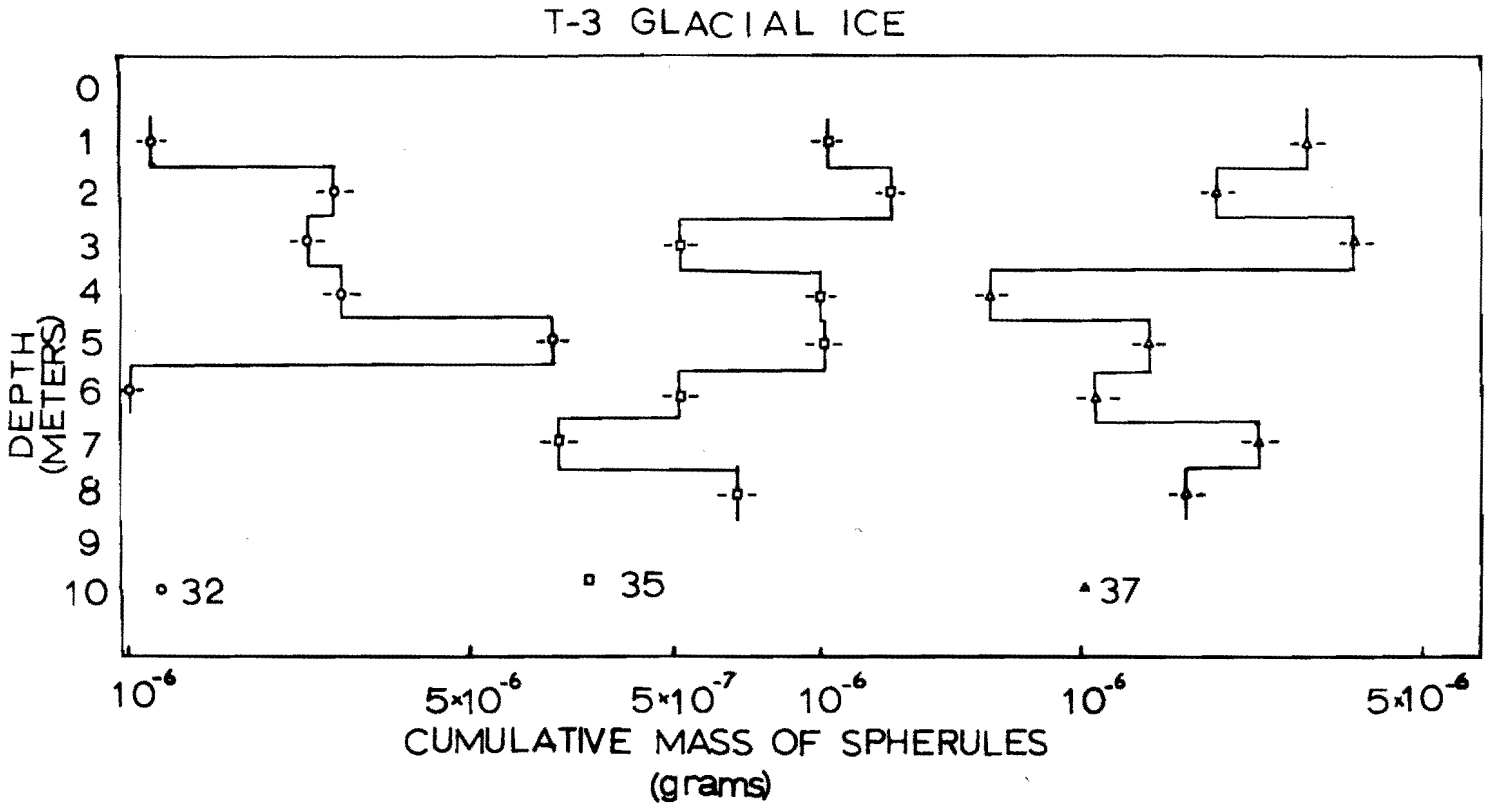

CUMULATIVE PERCENT
100
90
80
70
60
50
40
30
20
10
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160
DIAMETER
(Microns)
2
3
5
7
9
15
17
18
19
20
24
27
29
33
32 composite
35 composite
37 composite
TOTAL

Fig. 6.--Variations of Spherule Cumulative Mass Plotted Against Depth for 3 Short Glacial Ice Cores. Numbers 32, 35, and 37 correspond to core locations in Figure 1.


T-3 GLACIAL ICE
DEPTH (METERS)
0
1
2
3
4
5
6
7
8
9
10
○ 32
□ 35
▲ 37
10⁻⁶
5×10⁻⁶
5×10⁻⁷
10⁻⁶
10⁻⁶
5×10⁻⁶
CUMULATIVE MASS OF SPHERULES
(grams)

central area of T-3, within 50 meters of each other. Sample 37, however, appears to have a reversed pattern; the reason for this is not clear but it may be related to the associated oriented air bubbles in the core, suggesting the possibility that shearing has distorted the normal sequence. The morainal debris on one end of T-3, may be the surface expression of this shear or "dumping" (Smith, 1960).

## SEA ICE RESULTS

The size distribution of spherules found in the sea ice is similar to that of the glacial ice of T-3. In addition, the external morphology of these particles is similar to the morphology of the glacial ice spherules. For these reasons, the sea ice spherules probably have a similar origin. The size distribution of spherules from the sea ice ranges from less than 5 microns to 145 microns in diameter. Of the 718 spherules measured, most are between 15 and 30 microns in diameter. Statistical parameters computed for sea ice cores are shown in Table 3. The cumulative percentage of spherule diameters is shown in Figure 7.

Calculated sedimentation rates for these particles, extrapolated for the entire earth's surface, range from $5.0 \times 10^3$ to $1.6 \times 10^5$ metric tons per year.

Figure 8 unexpectedly shows that spherules are present throughout the sea ice. Some satisfactory explanation must be advanced for the presence of spherules at depth in the sea ice, because the sea ice is known to accrete from the bottom upward (Untersteiner, 1964).

TABLE 3

STATISTICAL PARAMETERS FOR SPHERULES FROM SEA ICE CORES

| Sample Number | Summer Cored | Length (Meters) | Cumulative Number of Spherules | Cumulative Number/ $m^2$/sec x $10^{-4}$ | Cumulative Mass (Grams) x $10^{-8}$ | Average Diameter (Microns) | Entire Earth Influx (Metric Tons/Year) x $10^4$ |
|---|---|---|---|---|---|---|---|
| 4 | 1968 | 3.0 | 26 | 2.0 | 1.3 | 24.4 | 1.6 |
| 8 | 1968 | 3.0 | 208 | 16.1 | 5.6 | 19.8 | 6.9 |
| 11 | 1968 | 3.0 | 21 | 1.6 | .7 | 21.4 | .9 |
| 12 | 1968 | 3.0 | 32 | 2.5 | 3.6 | 26.4 | 4.5 |
| 14 | 1968 | 3.0 | 17 | 1.5 | .3 | 18.2 | .5 |
| 21 | 1968 | 3.0 | 52 | 4.0 | 3.1 | 24.4 | 3.9 |
| 23 | 1968 | 3.0 | 22 | 1.7 | 4.3 | 30.9 | 5.3 |
| 25 | 1968 | 3.0+ | 74 | 6.9 | 5.6 | 25.9 | 8.3 |
| 26 | 1968 | 2.0 | 62 | 7.2 | 4.0 | 23.3 | 7.5 |
| 30 | 1970 | 3.0* | 133 | 10.3 | 13.6 | 22.6 | 16.9 |
| 34 | 1970 | 3.0* | 97 | 6.8 | 5.4 | 21.6 | 6.0 |
| Composite | | | 744 | 3.8 | 47.4 | 22.6 | 3.8 |

+Pack ice sample. Other cores in Table 3 are from Colby Bay
*Sample was collected in 1 meter sections. Results are for composite cores.

Fig. 7.--Cumulative percentage of spherule numbers plotted against spherule diameter for T-3's Colby Bay Sea Ice. Sample numbers correspond to core locations in Figure 1.

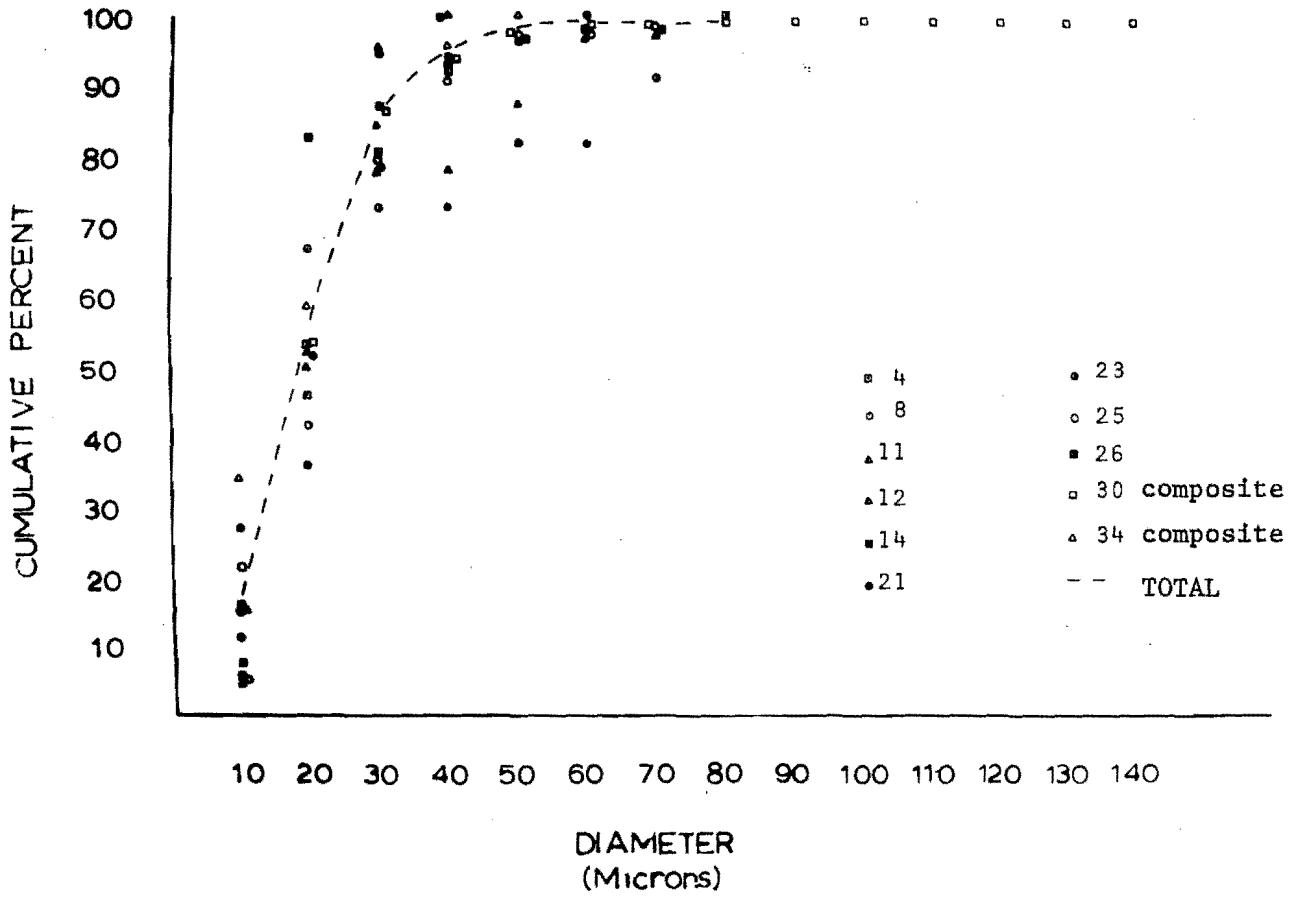
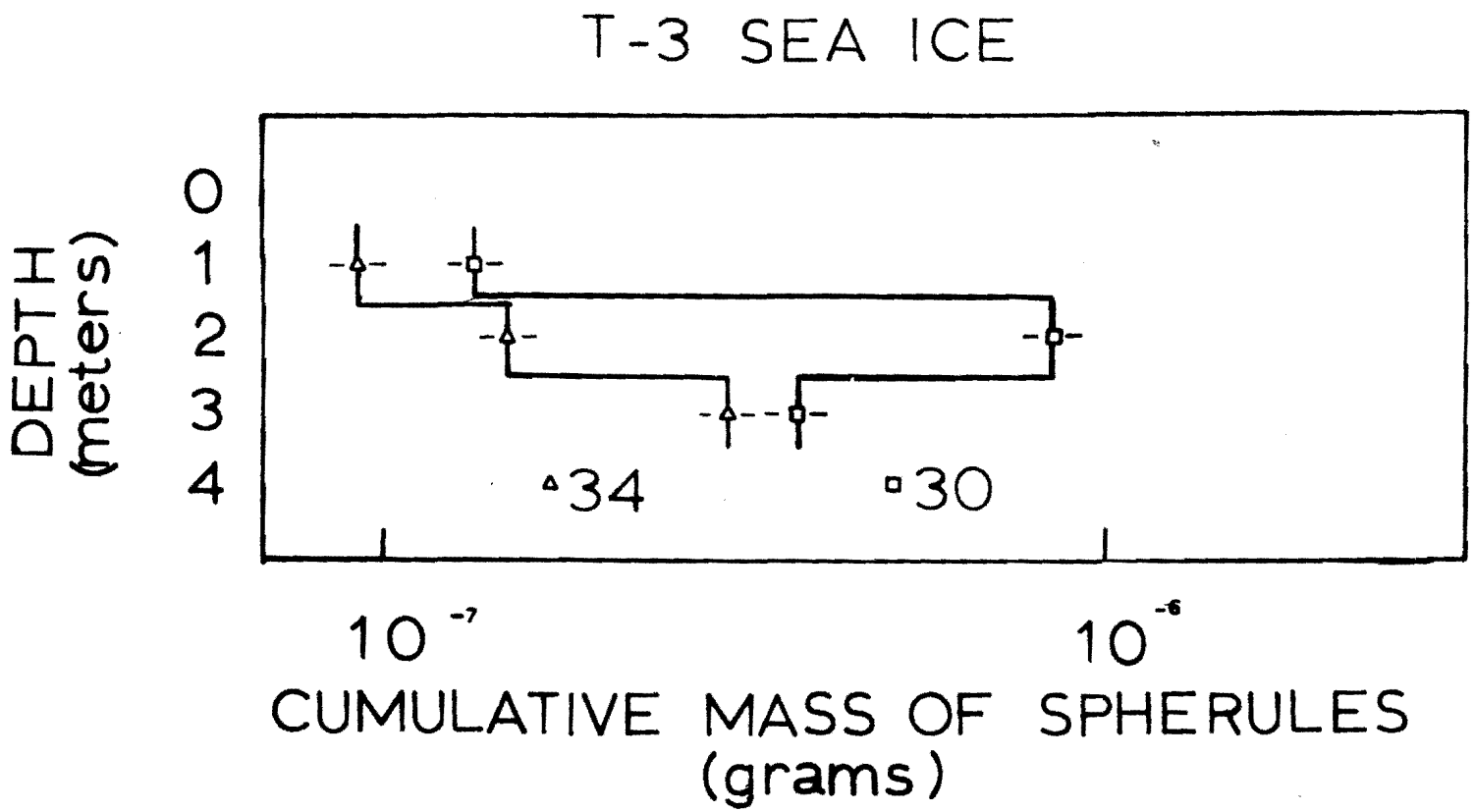

CUMULATIVE PERCENT
100
90
80
70
60
50
40
30
20
10
10 20 30 40 50 60 70 80 90 100 110 120 130 140
DIAMETER
(Microns)
4
8
11
12
14
21
23
25
26
30 composite
34 composite
TOTAL

Fig. 8.--Variations of cumulative mass plotted against depth for two sea ice cores. Notice that for the first two meters the pattern is similar. The last meter appears to be convergent. Sample numbers correspond to core locations in Figure 1.


T-3 SEA ICE
DEPTH (meters)
0
1
2
3
4
▵34
▫30
10 -7
10 -6
CUMULATIVE MASS OF SPHERULES (grams)

## DISCUSSION

Because industrial contamination is an important consideration, two details must be considered. First, the site of formation of T-3, presumably from the Ellesmere ice shelf approximately 83°N. 73°W. is sufficiently remote from present and past industrial activities to make original contamination of these samples highly unlikely.

Secondly, neither the exact site of origin nor the time of formation of T-3 as an ice island is well established. Polunin (1955), using dendrochronological methods, tentatively placed T-3's separation from land no later than 1935. T-3's original thickness was about 60 meters (Crary and others, 1955). But T-3 is believed to be thinning at a rate of approximately 0.6 meters per year (Dr. Ken Hunkins at the pre-trial jurisdictional hearing of U. S. vs. Escamilla. See Lewis, 1971). On the assumption that this rate is a good average approximation, since 1935, twenty-one meters, have been ablated from the upper surface of T-3, leaving 39 meters, approximately T-3's present thickness. If Crary's ice accumulation rate for the Ellesmere ice shelf is accurate for T-3, the 1970 surface should represent ice approximately 170 years old. Therefore, all subsurface ice on T-3 should be older than the industrial revolution and hence free of such contamination.

The age argument that applies to the T-3 glacial ice cannot apply to the sea ice samples. The time represented by these samples is from 1959 to 1970. Thus, the possibility that sea ice samples

may be contaminated is real. It should be emphasized, however that this sea ice is relatively remote from all industrial activities except for those associated with T-3 camp activities.

Apparently, this study is the first reported occurrence of such particles in Arctic sea ice. More importantly, however, the study of the sea ice was undertaken because sea ice may occur at depth in T-3. Crary and others (1955) suggested the possibility of accretion of sea ice to the base of T-3. Therefore, the nearby sea ice was examined for spherules. Because of the sea-ice accretion process, an explanation is required for the distribution of spherules throughout the sea ice rather than at the upper part of a floe. Several alternative explanations are possible:

1. Since the location of these samples is close enough to T-3, the spherules in some samples may be a result of meltwater run-off from T-3. This is a strong possibility but does not explain why spherules are found at depth. This process may explain the large number of spherules in sample number 8.

2. Another possibility requires the operation of two processes known to occur in polar regions. The first is that of cryoconite formation where a small dark particle absorbs more solar radiation than the ice around it and thereby melts into the ice. These cryoconite holes often have large amounts of material and extend approximately 0.4 to 0.6 meters below the surface (Gerdel and Drouet, 1958). But, this process alone would concentrate material only to this depth and would not satisfactorily explain the presence of spherules at greater depth. It is also known that the brine content of sea ice increases

with depth (Mellor, 1964). If exsolution operates to concentrate the salt along crystal boundaries, it is possible that this process could also transfer the particulate material to greater depth. This combination of processes could explain spherules being found at depth in sea ice.

3. The third possibility is related to the characteristics of the spherules themselves. In an attempt to remove particles from two sea ice samples with a magnetized needle, it was found that spherules in the sea ice tended to be hollow and much more fragile than those from the glacial ice. The hollow spherules may retain air and float which would allow them to become included in near surface freezing. Because the sea ice does undergo considerable fracturing and pressure ridging (Koenig and others, 1952), perhaps inclusion of these particles at depth is a result of this process.

At this time, it is uncertain which of the possible alternatives satisfactorily explains the distribution of such particles in the sea ice.

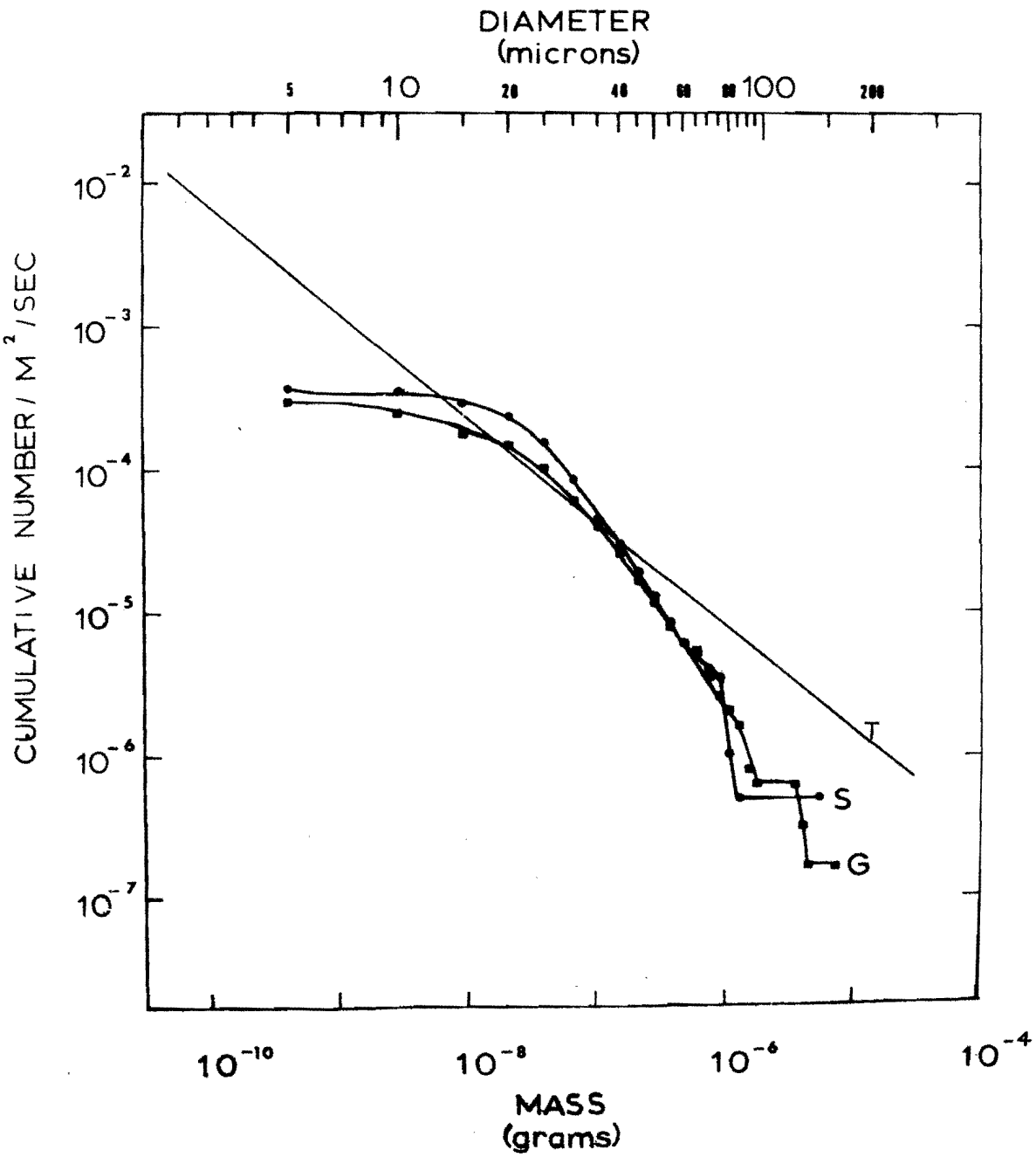
Comparison of both sea ice and glacial ice composite samples (Figure 9) indicates that the same type of process produced the spherules for both cases. The theoretical distribution (Laevastu and Mellis, 1961) also agrees well with both sets of composite samples. There is a noticeable reduction in particles at 5 to 10 microns diameter, which may be a result of this size particle being difficult to see or that there are actually fewer of them.

The comparison in Figure 9 may be unjustified in that it eliminates a basic difference between the glacial ice and sea ice, namely, that of their different mode of deposition. The deposition

Fig. 9.--Comparison of composite samples with theoretical curve.

The line marked "T" is the theoretical size distribution (Laevastu and Mellis, 1961).

The line marked "S" is the T-3 Colby Bay sea ice.
The line marked "G" is the T-3 glacial ice.


DIAMETER
(microns)
5
10
20
40
60
80
100
200
CUMULATIVE NUMBER / M $^2$ / SEC
$10^{-2}$
$10^{-3}$
$10^{-4}$
$10^{-5}$
$10^{-6}$
$10^{-7}$
T
S
G
$10^{-10}$
$10^{-8}$
$10^{-6}$
$10^{-4}$
MASS
(grams)

of glacial ice is well known; the sea ice differs from glacial ice because the youngest ice is at the bottom of the floe.

Comparison of the size distribution of composite T-3 glacial ice cores and composite sea ice cores with the results of several other investigators is shown in Figure 10. These size distributions are in good agreement with the size distributions observed by several workers (Buddhue, 1950, Laevastu and Mellis, 1955, Hunter and Parkin, 1960, Theil and Schmidt, 1961, Langway, 1962). Table 4 compares the sedimentation rates found for the glacial ice and the sea ice with the rates found by several other investigators. These sedimentation rates are also in good agreement with those of other investigators.

Fig. 10.--Cumulative percentage of numbers of spherules plotted against spherule diameter comparing this T-3 work with previous studies elsewhere.

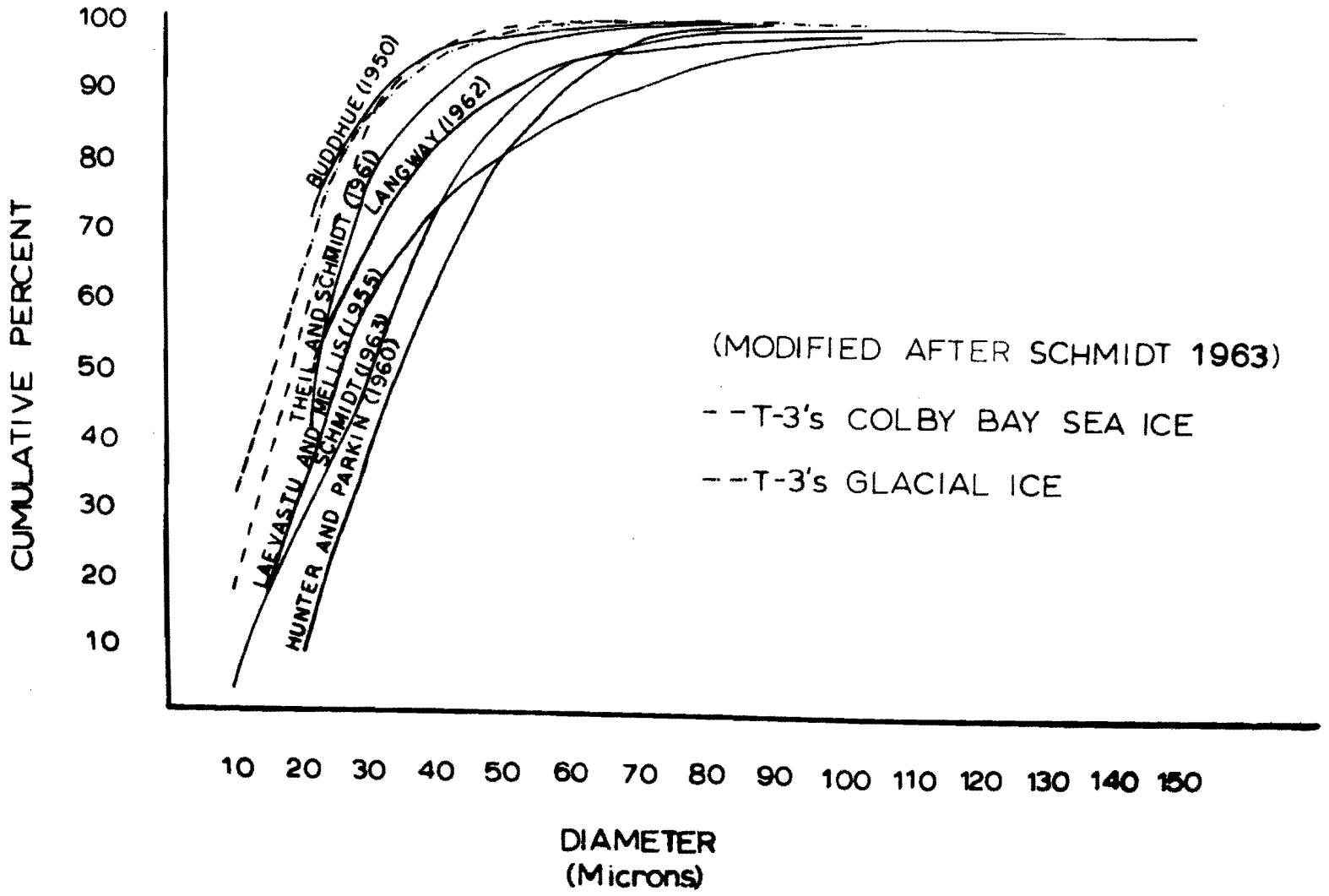

100
90
80
70
60
50
40
30
20
10
CUMULATIVE PERCENT
BUDDHUE (1950)
THEIL AND SCHMIDT (1961)
LANGWAY (1962)
LAEVASTU AND MELLIS (1955)
SCHMIDT (1963)
HUNTER AND PARKIN (1960)
(MODIFIED AFTER SCHMIDT 1963)
--T-3's COLBY BAY SEA ICE
--T-3's GLACIAL ICE
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150
DIAMETER
(Microns)

TABLE 4

COMPARISON WITH OTHER RESEARCHERS' SEDIMENTATION RATES

| Type of Spherule | Sedimentation Rate (Metric tons/year) | Source of Data |
|---|---|---|
| Atmosphere | 8 to 1.29 x $10^5$ | Buddhue, 1950 |
| Oceanic Sediments | 125 | Laevastu and Mellis, 1955 |
| Oceanic Sediments | 2.4 to 5.0 x $10^3$ | Pettersson and Fredriksson, 1958 |
| Atmosphere | 9 x $10^4$ | Crozier, 1961 |
| Antarctic Ice | 1.2 x $10^5$ | Schmidt, 1963 |
| Atmosphere | 1.6 x $10^5$ | Crozier, 1966 |
| Antarctic Ice | 1.8 x $10^5$ | Theil and Schmidt, 1961 |
| Upper Atmosphere | 2 x $10^5$ | Wright and Hodge, 1962 |
| Greenland Ice | 2 x $10^5$ | Wright, Hodge and Langway, 1963 |
| Arctic Atmosphere | 5 x $10^5$ | Hodge and Wildt, 1958 |
| Greenland Ice | 9 x $10^5$ | Langway, 1963 |
| Atmosphere | Approximately 2 x $10^3$ | Vittori, 1970 |
| Atmosphere and Paleozoic salts | 1 to 2 x $10^5$ | Ivanov and Florenskiy, 1970 |
| Atmosphere | 2 to 6 x $10^6$ | Baranov and Vilenski, 1966 In Ivanov and Florenskiy |
| T-3 Glacial Ice | 1.1 x $10^4$ to 1.1 x $10^5$ | This Report |
| T-3 Sea Ice | 5.0 x $10^3$ to 1.6 x $10^5$ | This Report |

## SUMMARY

Results from the study of black magnetic spherules from both the glacial and sea ice of Fletcher's Ice Island (T-3) are in good agreement with those of other investigators. Because spherules show evidence of remelting, it is concluded that the particles examined in this study can be extraterrestrial; they are opaque magnetic spherules, possibly an end product of meteorite ablation.

Calculated sedimentation rates for glacial ice spherules, extrapolated for the entire earth's surface, range from $1.1 \times 10^4$ to $1.1 \times 10^5$ metric tons per year. Calculated sedimentation rates for sea ice spherules range from $5.0 \times 10^3$ to $1.6 \times 10^5$ metric tons per year. These sedimentation rates are of the same order of magnitude as those of other researchers.

Vertical variations of cumulative mass for closely spaced glacial ice cores suggest a similar pattern of spherule deposition.

This study is the first reported occurrence of black magnetic spherules in sea ice. There is, as yet, no simple, satisfactory interpretation for the inclusion of spherules at depth in sea ice. Several alternative mechanisms are proposed but, without further research it is not possible to decide among them.

## RECOMMENDATIONS

Because there is no compositional information yet available for these particles, an X-ray diffraction study of the phases present, along with an electron microprobe study of the elemental composition, is recommended. These data should be examined for comparison with known meteoritic material and experimentally ablated meteoritic particles. The goal of such work should be the determination of the origin of such particles in terms of meteorite types and understanding the ablation process.

If experimental studies of ablated materials are undertaken, such material should be examined and compared to natural samples to determine if other types of spherules (nonmagnetic, glassy spherules) can be extraterrestrial. Glassy spheres are known from volcanic eruptions, but are all glassy spheres volcanic in origin? Stony meteorites might also produce spherules of this type.

A density study should be undertaken to determine if the assumed density is reasonable for this group of spherules. Methods used would be similar to that of Blanchard (1967).

The detailed study of a long glacial ice core through T-3 would be useful in verifying the observations by Langway (1967) of the cyclic nature of spherule deposition. For a study of this type, however, $O^{18}/O^{16}$ measurements should be made to determine the approximate age of formation of T-3 by a match with the Greenland stratigraphy (Johnsen and others, 1970, Dansgaard and others, 1970) and the increment of accumulated annual ice. If this information can be obtained for

T-3, a comparison of spherule sedimentation rates with the spherule sedimentation rates for the same interval of time in the Greenland core (Langway, 1967) would prove or disprove the hypothesis proposed by Schmidt and Cohen (1964) that the geomagnetic field will influence the deposition of such spherules. This long core from T-3 may also show large scale meteoritic events which may be correlated with those found in the Greenland core.

Finally, the core would show whether new sea ice is accreting at the base of the ice island, yielding information on the length of time such an ice platform will be useful as a research station.

New sea ice cores should be collected and examined in the laboratory to determine how spherules are included in such ice at depth. The mechanism at present is not clear and other sea ice cores should be collected and examined with this aim.

# APPENDIX A

# FORMULAS

Statistical information for computed values of percentage, cumu-

# FORMULAS

Statistical information for computed values of percentage, cumulative percentage, cumulative number per square meter per second, volume, mass, cumulative mass, average diameter, average mass, average mass diameter, and spherule influx or sedimentation rate are given below:

## Percentage and Cumulative Percentage

These computations are similar to those of Schmidt (1963). The percentage (P) for any diameter interval (d) is

$$P = \frac{n \cdot 100}{\Sigma n} \tag{1.1}$$

where n is the number of particles in 5-micron intervals.

Cumulative percentage (C.P.) is given as

$$C.P. = \Sigma P_k \tag{1.2}$$

where k begins with the smallest diameter interval, in this case 5 microns, and P is the percentage.

## Other Statistics

The following statistics appear in Langway (1967). d and n are defined as above.

$$\text{Cumulative number/meter}^2\text{/sec} = \frac{\Sigma n_i}{(a)(ts)} \tag{1.3}$$

where i begins with the largest size diameter in any sample, A is the cross-sectional area (the S.I.P.R.E. core), ($4.56 \times 10^{-3}$ $m^2$), and ts is the time (in seconds) that it took for the sample to accumulate, as determined from the rates in Table 1.

The volume represented by a size interval was computed as follows:

$$V = \frac{\pi}{6} (n \cdot d^3), \text{ cm}^3 \qquad (1.4),$$

where d is the diameter of the size interval in centimeters.

The mass represented by a size interval is:

$$M = \rho \left(\frac{\pi}{6} (n \cdot d^3)\right), \text{ grams} \qquad (1.5)$$

where $\rho$ is the density, assumed to be 4.54 grams/cm$^3$ (Franklin and others, 1967).

An important computation in this study is the cumulative mass (C.M.):

$$C.M. = \rho\left[\frac{\pi}{6} \Sigma (V)\right], \text{ grams} \qquad (1.6),$$

The average diameter of spherules in a sample ($\overline{X}_d$) is given by:

$$\overline{X}_d = \Sigma \frac{d_i \, n_i}{n_i}, \text{ microns} \qquad (1.7)$$

where i is a 5-micron interval.

The average mass ($\overline{m}$) of spherules in a sample is given by:

$$\overline{m} = \rho \frac{\pi}{6} \Sigma \frac{(n \cdot d^3)}{n}, \text{ grams} \qquad (1.8)$$

The average diameter of spherules ($\overline{X}_M$) based on an average mass consideration is given by:

$$\overline{X}_M = \frac{\sqrt[3]{\overline{m}}}{\rho(\frac{\pi}{6})}, \text{ microns} \qquad (1.9).$$

The spherule influx or sedimentation rate (F) is obtained in the following manner:

$$F = \frac{(C.M.)\ (5.0 \times 10^{14})}{(ty)\ (A)\ (10^{6})}\ , \text{ metric tons/year} \qquad (2.0),$$

where ty is the time represented by the sample in years, A is the area, given above, $10^6$ is a gram to metric ton conversion factor and $5.0 \times 10^{14}$ $m^2$ is the surface area of the earth as given by Gutenberg (1951).

# APPENDIX B

## DATA TABULATION

Before listing the statistical data for each case it should be noted that not all of the samples shown in Figure 1 yielded statistical data. Samples 1 and 10, for example, were surface dirt collected from cryoconite holes. Data from these two samples would not be pertinent to this study.

Statistical information was available for sample number 6, but because large numbers of reddish volcanic spherules were included, the sample is not listed here.

Samples number 13 and 16 were destroyed in shipment. Sample number 28 contained large quantities of metallic shavings. Sample number 31 was used in an unsuccessful heavy mineral separation. Samples number 36 and 22 were accidentally destroyed during the sample preparation.

The following computer generated sheets contain the symbol* which means "multiplied by" and the symbol ** which indicates "a power of ten follows."

The data have been grouped by treating spherules as integer micron values. The 5 micron interval includes spherules from 0 to 5 microns. The 10 micron interval includes spherules from 6-10 microns etc.

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 2 | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 17 | 9.8 | 9.8 | 173 |
| 10 | 57 | 32.9 | 42.8 | 156 |
| 15 | 44 | 25.4 | 68.2 | 99 |
| 20 | 26 | 15.0 | 83.2 | 55 |
| 25 | 17 | 9.8 | 93.1 | 29 |
| 30 | 2 | 1.2 | 94.2 | 12 |
| 35 | 2 | 1.2 | 95.4 | 10 |
| 40 | 1 | 0.6 | 96.0 | 8 |
| 45 | 2 | 1.2 | 97.1 | 7 |
| 50 | 2 | 1.2 | 98.3 | 5 |
| 55 | 1 | 0.6 | 98.8 | 3 |
| 60 | 2 | 1.2 | 100.0 | 2 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 2 | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 14.87 | 0.11 | 0.50 | 453.28 |
| 13.41 | 2.97 | 13.49 | 452.78 |
| 8.51 | 7.74 | 35.14 | 439.29 |
| 4.73 | 10.84 | 49.22 | 404.15 |
| 2.49 | 13.84 | 62.85 | 354.94 |
| 1.03 | 2.81 | 12.78 | 292.08 |
| 0.86 | 4.47 | 20.29 | 279.31 |
| 0.69 | 3.34 | 15.14 | 259.02 |
| 0.60 | 9.50 | 43.12 | 243.87 |
| 0.43 | 13.03 | 59.16 | 200.75 |
| 0.26 | 8.67 | 39.37 | 141.59 |
| 0.17 | 22.52 | 102.22 | 102.22 |

AVERAGE DIAMETER= 16.2 MICRONS
AVERAGE MASS = 2.62 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 22.3 MICRONS
ENTIRE EARTH INFLUX= 62587.9 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 3 | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 1 | 0.8 | 0.8 | 123 |
| 10 | 31 | 25.2 | 26.0 | 122 |
| 15 | 18 | 14.6 | 40.7 | 91 |
| 20 | 31 | 25.2 | 65.9 | 73 |
| 25 | 22 | 17.9 | 83.7 | 42 |
| 30 | 8 | 6.5 | 90.2 | 20 |
| 35 | 4 | 3.3 | 93.5 | 12 |
| 40 | 4 | 3.3 | 96.7 | 8 |
| 45 | 1 | 0.8 | 97.6 | 4 |
| 50 | 0 | 0.0 | 97.6 | 3 |
| 55 | 1 | 0.8 | 98.4 | 3 |
| 60 | 0 | 0.0 | 98.4 | 2 |
| 65 | 1 | 0.8 | 99.2 | 2 |
| 70 | 0 | 0.0 | 99.2 | 1 |
| 75 | 0 | 0.0 | 99.2 | 1 |
| 80 | 0 | 0.0 | 99.2 | 1 |
| 85 | 1 | 0.8 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 3 | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 10.57 | 0.01 | 0.03 | 585.26 |
| 10.49 | 1.62 | 7.34 | 585.23 |
| 7.82 | 3.17 | 14.37 | 577.90 |
| 6.27 | 12.93 | 58.68 | 563.52 |
| 3.61 | 17.92 | 81.34 | 504.84 |
| 1.72 | 11.26 | 51.11 | 423.50 |
| 1.03 | 8.94 | 40.58 | 372.39 |
| 0.69 | 13.34 | 60.58 | 331.81 |
| 0.34 | 4.75 | 21.56 | 271.23 |
| 0.26 | 0.0 | 0.0 | 249.67 |
| 0.26 | 8.67 | 39.37 | 249.67 |
| 0.17 | 0.0 | 0.0 | 210.30 |
| 0.17 | 14.31 | 64.98 | 210.30 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 32.01 | 145.32 | 145.32 |

AVERAGE DIAMETER= 20.7 MICRONS
AVERAGE MASS = 4.76 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 27.2 MICRONS
ENTIRE EARTH INFLUX= 80810.9 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 5 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 1 | 0.6 | 0.6 | 161 |
| 10 | 48 | 29.8 | 30.4 | 160 |
| 15 | 54 | 33.5 | 64.0 | 112 |
| 20 | 33 | 20.5 | 84.5 | 58 |
| 25 | 12 | 7.5 | 91.9 | 25 |
| 30 | 9 | 5.6 | 97.5 | 13 |
| 35 | 1 | 0.6 | 98.1 | 4 |
| 40 | 0 | 0.0 | 98.1 | 3 |
| 45 | 0 | 0.0 | 98.1 | 3 |
| 50 | 1 | 0.6 | 98.8 | 3 |
| 55 | 0 | 0.0 | 98.8 | 2 |
| 60 | 0 | 0.0 | 98.8 | 2 |
| 65 | 1 | 0.6 | 99.4 | 2 |
| 70 | 0 | 0.0 | 99.4 | 1 |
| 75 | 0 | 0.0 | 99.4 | 1 |
| 80 | 0 | 0.0 | 99.4 | 1 |
| 85 | 0 | 0.0 | 99.4 | 1 |
| 90 | 0 | 0.0 | 99.4 | 1 |
| 95 | 0 | 0.0 | 99.4 | 1 |
| 100 | 0 | 0.0 | 99.4 | 1 |
| 105 | 0 | 0.0 | 99.4 | 1 |
| 110 | 0 | 0.0 | 99.4 | 1 |
| 115 | 0 | 0.0 | 99.4 | 1 |
| 120 | 0 | 0.0 | 99.4 | 1 |
| 125 | 0 | 0.0 | 99.4 | 1 |
| 130 | 0 | 0.0 | 99.4 | 1 |
| 135 | 0 | 0.0 | 99.4 | 1 |
| 140 | 0 | 0.0 | 99.4 | 1 |
| 145 | 0 | 0.0 | 99.4 | 1 |
| 150 | 0 | 0.0 | 99.4 | 1 |
| 155 | 0 | 0.0 | 99.4 | 1 |
| 160 | 1 | 0.6 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 5 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 4.67 | 0.01 | 0.03 | 1292.77 |
| 4.64 | 2.50 | 11.36 | 1292.74 |
| 3.25 | 9.50 | 43.12 | 1281.38 |
| 1.68 | 13.76 | 62.47 | 1238.26 |
| 0.73 | 9.77 | 44.37 | 1175.79 |
| 0.38 | 12.67 | 57.50 | 1131.42 |
| 0.12 | 2.23 | 10.15 | 1073.92 |
| 0.09 | 0.0 | 0.0 | 1063.78 |
| 0.09 | 0.0 | 0.0 | 1063.78 |
| 0.09 | 6.51 | 29.58 | 1063.78 |
| 0.06 | 0.0 | 0.0 | 1034.20 |
| 0.06 | 0.0 | 0.0 | 1034.20 |
| 0.06 | 14.31 | 64.98 | 1034.20 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 0.0 | 0.0 | 969.22 |
| 0.03 | 213.48 | 969.22 | 969.22 |

AVERAGE DIAMETER= 17.6 MICRONS
AVERAGE MASS = 8.03 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 32.4 MICRONS
ENTIRE EARTH INFLUX= 60244.2 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 7 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 2 | 1.5 | 1.5 | 137 |
| 10 | 15 | 10.9 | 12.4 | 135 |
| 15 | 28 | 20.4 | 32.8 | 120 |
| 20 | 30 | 21.9 | 54.7 | 92 |
| 25 | 28 | 20.4 | 75.2 | 62 |
| 30 | 16 | 11.7 | 86.9 | 34 |
| 35 | 10 | 7.3 | 94.2 | 18 |
| 40 | 6 | 4.4 | 98.5 | 8 |
| 45 | 1 | 0.7 | 99.3 | 2 |
| 50 | 0 | 0.0 | 99.3 | 1 |
| 55 | 0 | 0.0 | 99.3 | 1 |
| 60 | 0 | 0.0 | 99.3 | 1 |
| 65 | 1 | 0.7 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 7 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 3.97 | 0.01 | 0.06 | 567.37 |
| 3.92 | 0.78 | 3.55 | 567.31 |
| 3.48 | 4.93 | 22.36 | 563.76 |
| 2.67 | 12.51 | 56.79 | 541.40 |
| 1.80 | 22.80 | 103.52 | 484.61 |
| 0.99 | 22.52 | 102.22 | 381.08 |
| 0.52 | 22.35 | 101.45 | 278.86 |
| 0.23 | 20.01 | 90.86 | 177.41 |
| 0.06 | 4.75 | 21.56 | 86.55 |
| 0.03 | 0.0 | 0.0 | 64.98 |
| 0.03 | 0.0 | 0.0 | 64.98 |
| 0.03 | 0.0 | 0.0 | 64.98 |
| 0.03 | 14.31 | 64.98 | 64.98 |

AVERAGE DIAMETER= 22.3 MICRONS
AVERAGE MASS = 4.14 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 26.0 MICRONS
ENTIRE EARTH INFLUX= 26439.8 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 9 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 8 | 5.4 | 5.4 | 149 |
| 10 | 22 | 14.8 | 20.1 | 141 |
| 15 | 35 | 23.5 | 43.6 | 119 |
| 20 | 20 | 13.4 | 57.0 | 84 |
| 25 | 27 | 18.1 | 75.2 | 64 |
| 30 | 15 | 10.1 | 85.2 | 37 |
| 35 | 3 | 2.0 | 87.2 | 22 |
| 40 | 4 | 2.7 | 89.9 | 19 |
| 45 | 5 | 3.4 | 93.3 | 15 |
| 50 | 6 | 4.0 | 97.3 | 10 |
| 55 | 0 | 0.0 | 97.3 | 4 |
| 60 | 1 | 0.7 | 98.0 | 4 |
| 65 | 2 | 1.3 | 99.3 | 3 |
| 70 | 0 | 0.0 | 99.3 | 1 |
| 75 | 1 | 0.7 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 9 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 4.29 | 0.05 | 0.24 | 924.11 |
| 4.06 | 1.15 | 5.21 | 923.87 |
| 3.42 | 6.16 | 27.95 | 918.67 |
| 2.42 | 8.34 | 37.86 | 890.71 |
| 1.84 | 21.99 | 99.83 | 852.85 |
| 1.06 | 21.11 | 95.83 | 753.03 |
| 0.63 | 6.70 | 30.44 | 657.20 |
| 0.55 | 13.34 | 60.58 | 626.76 |
| 0.43 | 23.75 | 107.81 | 566.18 |
| 0.29 | 39.09 | 177.47 | 458.37 |
| 0.12 | 0.0 | 0.0 | 280.90 |
| 0.12 | 11.26 | 51.11 | 280.90 |
| 0.09 | 28.63 | 129.97 | 229.79 |
| 0.03 | 0.0 | 0.0 | 99.83 |
| 0.03 | 21.99 | 99.83 | 99.83 |

AVERAGE DIAMETER= 22.6 MICRONS
AVERAGE MASS = 6.20 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 29.7 MICRONS
ENTIRE EARTH INFLUX= 42708.3 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 15 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 7 | 9.7 | 9.7 | 72 |
| 10 | 5 | 6.9 | 16.7 | 65 |
| 15 | 8 | 11.1 | 27.8 | 60 |
| 20 | 17 | 23.6 | 51.4 | 52 |
| 25 | 13 | 18.1 | 69.4 | 35 |
| 30 | 7 | 9.7 | 79.2 | 22 |
| 35 | 4 | 5.6 | 84.7 | 15 |
| 40 | 3 | 4.2 | 88.9 | 11 |
| 45 | 2 | 2.8 | 91.7 | 8 |
| 50 | 2 | 2.8 | 94.4 | 6 |
| 55 | 2 | 2.8 | 97.2 | 4 |
| 60 | 1 | 1.4 | 98.6 | 2 |
| 65 | 0 | 0.0 | 98.6 | 1 |
| 70 | 0 | 0.0 | 98.6 | 1 |
| 75 | 1 | 1.4 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 15 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.07 | 0.05 | 0.21 | 550.71 |
| 1.87 | 0.26 | 1.18 | 550.51 |
| 1.73 | 1.41 | 6.39 | 549.32 |
| 1.50 | 7.09 | 32.18 | 542.93 |
| 1.01 | 10.59 | 48.06 | 510.75 |
| 0.63 | 9.85 | 44.72 | 462.69 |
| 0.43 | 8.94 | 40.58 | 417.97 |
| 0.32 | 10.01 | 45.43 | 377.39 |
| 0.23 | 9.50 | 43.12 | 331.95 |
| 0.17 | 13.03 | 59.16 | 288.83 |
| 0.12 | 17.34 | 78.74 | 229.67 |
| 0.06 | 11.26 | 51.11 | 150.94 |
| 0.03 | 0.0 | 0.0 | 99.83 |
| 0.03 | 0.0 | 0.0 | 99.83 |
| 0.03 | 21.99 | 99.83 | 99.83 |

AVERAGE DIAMETER= 24.7 MICRONS
AVERAGE MASS = 7.65 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 31.9 MICRONS
ENTIRE EARTH INFLUX= 25451.6 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 17 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 9 | 17.0 | 17.0 | 53 |
| 10 | 7 | 13.2 | 30.2 | 44 |
| 15 | 11 | 20.8 | 50.9 | 37 |
| 20 | 14 | 26.4 | 77.4 | 26 |
| 25 | 4 | 7.5 | 84.9 | 12 |
| 30 | 1 | 1.9 | 86.8 | 8 |
| 35 | 1 | 1.9 | 88.7 | 7 |
| 40 | 1 | 1.9 | 90.6 | 6 |
| 45 | 3 | 5.7 | 96.2 | 5 |
| 50 | 1 | 1.9 | 98.1 | 2 |
| 55 | 0 | 0.0 | 98.1 | 1 |
| 60 | 1 | 1.9 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 17 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.52 | 0.06 | 0.27 | 229.05 |
| 1.27 | 0.36 | 1.66 | 228.79 |
| 1.06 | 1.93 | 8.78 | 227.13 |
| 0.75 | 5.84 | 26.50 | 218.35 |
| 0.35 | 3.26 | 14.79 | 191.84 |
| 0.23 | 1.41 | 6.39 | 177.05 |
| 0.20 | 2.23 | 10.15 | 170.67 |
| 0.17 | 3.34 | 15.14 | 160.52 |
| 0.14 | 14.25 | 64.69 | 145.38 |
| 0.06 | 6.51 | 29.58 | 80.69 |
| 0.03 | 0.0 | 0.0 | 51.11 |
| 0.03 | 11.26 | 51.11 | 51.11 |

AVERAGE DIAMETER= 19.1 MICRONS
AVERAGE MASS = 4.32 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 26.3 MICRONS
ENTIRE EARTH INFLUX= 10585.8 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 18 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 8 | 11.0 | 11.0 | 73 |
| 10 | 9 | 12.3 | 23.3 | 65 |
| 15 | 20 | 27.4 | 50.7 | 56 |
| 20 | 13 | 17.8 | 68.5 | 36 |
| 25 | 11 | 15.1 | 83.6 | 23 |
| 30 | 2 | 2.7 | 86.3 | 12 |
| 35 | 3 | 4.1 | 90.4 | 10 |
| 40 | 2 | 2.7 | 93.2 | 7 |
| 45 | 0 | 0.0 | 93.2 | 5 |
| 50 | 0 | 0.0 | 93.2 | 5 |
| 55 | 1 | 1.4 | 94.5 | 5 |
| 60 | 1 | 1.4 | 95.9 | 4 |
| 65 | 0 | 0.0 | 95.9 | 3 |
| 70 | 1 | 1.4 | 97.3 | 3 |
| 75 | 0 | 0.0 | 97.3 | 2 |
| 80 | 1 | 1.4 | 98.6 | 2 |
| 85 | 0 | 0.0 | 98.6 | 1 |
| 90 | 1 | 1.4 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 18 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.10 | 0.05 | 0.24 | 622.41 |
| 1.87 | 0.47 | 2.13 | 622.17 |
| 1.61 | 3.52 | 15.97 | 620.04 |
| 1.04 | 5.42 | 24.61 | 604.07 |
| 0.66 | 8.96 | 40.67 | 579.46 |
| 0.35 | 2.81 | 12.78 | 538.79 |
| 0.29 | 6.70 | 30.44 | 526.02 |
| 0.20 | 6.67 | 30.29 | 495.58 |
| 0.14 | 0.0 | 0.0 | 465.29 |
| 0.14 | 0.0 | 0.0 | 465.29 |
| 0.14 | 8.67 | 39.37 | 465.29 |
| 0.12 | 11.26 | 51.11 | 425.92 |
| 0.09 | 0.0 | 0.0 | 374.81 |
| 0.09 | 17.88 | 81.16 | 374.81 |
| 0.06 | 0.0 | 0.0 | 293.65 |
| 0.06 | 26.69 | 121.15 | 293.65 |
| 0.03 | 0.0 | 0.0 | 172.50 |
| 0.03 | 38.00 | 172.50 | 172.50 |

AVERAGE DIAMETER= 21.4 MICRONS
AVERAGE MASS = 8.53 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 33.0 MICRONS
ENTIRE EARTH INFLUX= 28765.2 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 19 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 15 | 22.7 | 22.7 | 66 |
| 10 | 6 | 9.1 | 31.8 | 51 |
| 15 | 13 | 19.7 | 51.5 | 45 |
| 20 | 3 | 4.5 | 56.1 | 32 |
| 25 | 10 | 15.2 | 71.2 | 29 |
| 30 | 6 | 9.1 | 80.3 | 19 |
| 35 | 1 | 1.5 | 81.8 | 13 |
| 40 | 3 | 4.5 | 86.4 | 12 |
| 45 | 4 | 6.1 | 92.4 | 9 |
| 50 | 1 | 1.5 | 93.9 | 5 |
| 55 | 0 | 0.0 | 93.9 | 4 |
| 60 | 0 | 0.0 | 93.9 | 4 |
| 65 | 2 | 3.0 | 97.0 | 4 |
| 70 | 0 | 0.0 | 97.0 | 2 |
| 75 | 0 | 0.0 | 97.0 | 2 |
| 80 | 1 | 1.5 | 98.5 | 2 |
| 85 | 0 | 0.0 | 98.5 | 1 |
| 90 | 0 | 0.0 | 98.5 | 1 |
| 95 | 0 | 0.0 | 98.5 | 1 |
| 100 | 0 | 0.0 | 98.5 | 1 |
| 105 | 0 | 0.0 | 98.5 | 1 |
| 110 | 0 | 0.0 | 98.5 | 1 |
| 115 | 0 | 0.0 | 98.5 | 1 |
| 120 | 0 | 0.0 | 98.5 | 1 |
| 125 | 1 | 1.5 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 19 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.90 | 0.10 | 0.44 | 977.91 |
| 1.47 | 0.31 | 1.42 | 977.47 |
| 1.29 | 2.29 | 10.38 | 976.05 |
| 0.92 | 1.25 | 5.68 | 965.66 |
| 0.83 | 8.14 | 36.97 | 959.99 |
| 0.55 | 8.44 | 38.33 | 923.01 |
| 0.37 | 2.23 | 10.15 | 884.68 |
| 0.35 | 10.01 | 45.43 | 874.53 |
| 0.26 | 19.00 | 86.25 | 829.10 |
| 0.14 | 6.51 | 29.58 | 742.85 |
| 0.12 | 0.0 | 0.0 | 713.28 |
| 0.12 | 0.0 | 0.0 | 713.28 |
| 0.12 | 28.63 | 129.97 | 713.28 |
| 0.06 | 0.0 | 0.0 | 583.31 |
| 0.06 | 0.0 | 0.0 | 583.31 |
| 0.06 | 26.69 | 121.15 | 583.31 |
| 0.03 | 0.0 | 0.0 | 462.16 |
| 0.03 | 0.0 | 0.0 | 462.16 |
| 0.03 | 0.0 | 0.0 | 462.16 |
| 0.03 | 0.0 | 0.0 | 462.16 |
| 0.03 | 0.0 | 0.0 | 462.16 |
| 0.03 | 0.0 | 0.0 | 462.16 |
| 0.03 | 0.0 | 0.0 | 462.16 |
| 0.03 | 101.80 | 462.16 | 462.16 |

AVERAGE DIAMETER= 23.3 MICRONS
AVERAGE MASS = 14.82 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 39.7 MICRONS
ENTIRE EARTH INFLUX= 45194.8 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 20 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 8 | 12.1 | 12.1 | 66 |
| 10 | 13 | 19.7 | 31.8 | 58 |
| 15 | 9 | 13.6 | 45.5 | 45 |
| 20 | 9 | 13.6 | 59.1 | 36 |
| 25 | 11 | 16.7 | 75.8 | 27 |
| 30 | 5 | 7.6 | 83.3 | 16 |
| 35 | 5 | 7.6 | 90.9 | 11 |
| 40 | 2 | 3.0 | 93.9 | 6 |
| 45 | 2 | 3.0 | 97.0 | 4 |
| 50 | 1 | 1.5 | 98.5 | 2 |
| 55 | 0 | 0.0 | 98.5 | 1 |
| 60 | 0 | 0.0 | 98.5 | 1 |
| 65 | 1 | 1.5 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 20 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.90 | 0.05 | 0.24 | 318.85 |
| 1.67 | 0.68 | 3.08 | 318.61 |
| 1.29 | 1.58 | 7.19 | 315.54 |
| 1.04 | 3.75 | 17.04 | 308.35 |
| 0.78 | 8.96 | 40.67 | 291.31 |
| 0.46 | 7.04 | 31.94 | 250.64 |
| 0.32 | 11.17 | 50.73 | 218.70 |
| 0.17 | 6.67 | 30.29 | 167.97 |
| 0.12 | 9.50 | 43.12 | 137.69 |
| 0.06 | 6.51 | 29.58 | 94.56 |
| 0.03 | 0.0 | 0.0 | 64.98 |
| 0.03 | 0.0 | 0.0 | 64.98 |
| 0.03 | 14.31 | 64.98 | 64.98 |

AVERAGE DIAMETER= 20.8 MICRONS
AVERAGE MASS = 4.83 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 27.3 MICRONS
ENTIRE EARTH INFLUX= 14735.9 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 24 | 2.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 5 | 6.9 | 6.9 | 72 |
| 10 | 9 | 12.5 | 19.4 | 67 |
| 15 | 3 | 4.2 | 23.6 | 58 |
| 20 | 10 | 13.9 | 37.5 | 55 |
| 25 | 10 | 13.9 | 51.4 | 45 |
| 30 | 9 | 12.5 | 63.9 | 35 |
| 35 | 6 | 8.3 | 72.2 | 26 |
| 40 | 8 | 11.1 | 83.3 | 20 |
| 45 | 3 | 4.2 | 87.5 | 12 |
| 50 | 2 | 2.8 | 90.3 | 9 |
| 55 | 1 | 1.4 | 91.7 | 7 |
| 60 | 1 | 1.4 | 93.1 | 6 |
| 65 | 0 | 0.0 | 93.1 | 5 |
| 70 | 1 | 1.4 | 94.4 | 5 |
| 75 | 0 | 0.0 | 94.4 | 4 |
| 80 | 0 | 0.0 | 94.4 | 4 |
| 85 | 1 | 1.4 | 95.8 | 4 |
| 90 | 2 | 2.8 | 98.6 | 3 |
| 95 | 0 | 0.0 | 98.6 | 1 |
| 100 | 0 | 0.0 | 98.6 | 1 |
| 105 | 0 | 0.0 | 98.6 | 1 |
| 110 | 0 | 0.0 | 98.6 | 1 |
| 115 | 0 | 0.0 | 98.6 | 1 |
| 120 | 0 | 0.0 | 98.6 | 1 |
| 125 | 1 | 1.4 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 24 | 2.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 3.11 | 0.03 | 0.15 | 1548.06 |
| 2.90 | 0.47 | 2.13 | 1547.91 |
| 2.51 | 0.53 | 2.40 | 1545.78 |
| 2.38 | 4.17 | 18.93 | 1543.38 |
| 1.95 | 8.14 | 36.97 | 1524.45 |
| 1.51 | 12.67 | 57.50 | 1487.48 |
| 1.12 | 13.41 | 60.87 | 1429.98 |
| 0.86 | 26.69 | 121.15 | 1369.11 |
| 0.52 | 14.25 | 64.69 | 1247.96 |
| 0.39 | 13.03 | 59.16 | 1183.27 |
| 0.30 | 8.67 | 39.37 | 1124.11 |
| 0.26 | 11.26 | 51.11 | 1084.75 |
| 0.22 | 0.0 | 0.0 | 1033.64 |
| 0.22 | 17.88 | 81.16 | 1033.64 |
| 0.17 | 0.0 | 0.0 | 952.47 |
| 0.17 | 0.0 | 0.0 | 952.47 |
| 0.17 | 32.01 | 145.32 | 952.47 |
| 0.13 | 75.99 | 345.00 | 807.16 |
| 0.04 | 0.0 | 0.0 | 462.16 |
| 0.04 | 0.0 | 0.0 | 462.16 |
| 0.04 | 0.0 | 0.0 | 462.16 |
| 0.04 | 0.0 | 0.0 | 462.16 |
| 0.04 | 0.0 | 0.0 | 462.16 |
| 0.04 | 0.0 | 0.0 | 462.16 |
| 0.04 | 101.80 | 462.16 | 462.16 |

AVERAGE DIAMETER= 30.8 MICRONS
AVERAGE MASS = 21.50 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 45.0 MICRONS
ENTIRE EARTH INFLUX= 107539.1 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 27 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 7 | 17.1 | 17.1 | 41 |
| 10 | 3 | 7.3 | 24.4 | 34 |
| 15 | 6 | 14.6 | 39.0 | 31 |
| 20 | 5 | 12.2 | 51.2 | 25 |
| 25 | 5 | 12.2 | 63.4 | 20 |
| 30 | 6 | 14.6 | 78.0 | 15 |
| 35 | 4 | 9.8 | 87.8 | 9 |
| 40 | 1 | 2.4 | 90.2 | 5 |
| 45 | 1 | 2.4 | 92.7 | 4 |
| 50 | 3 | 7.3 | 100.0 | 3 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 27 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.18 | 0.05 | 0.21 | 238.01 |
| 0.98 | 0.16 | 0.71 | 237.81 |
| 0.89 | 1.06 | 4.79 | 237.10 |
| 0.72 | 2.08 | 9.46 | 232.31 |
| 0.58 | 4.07 | 18.49 | 222.84 |
| 0.43 | 8.44 | 38.33 | 204.36 |
| 0.26 | 8.94 | 40.58 | 166.02 |
| 0.14 | 3.34 | 15.14 | 125.44 |
| 0.12 | 4.75 | 21.56 | 110.30 |
| 0.09 | 19.54 | 88.73 | 88.73 |

AVERAGE DIAMETER= 22.8 MICRONS
AVERAGE MASS = 5.81 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 29.1 MICRONS
ENTIRE EARTH INFLUX= 11000.0 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 29 | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 14 | 35.9 | 35.9 | 39 |
| 10 | 7 | 17.9 | 53.8 | 25 |
| 15 | 2 | 5.1 | 59.0 | 18 |
| 20 | 7 | 17.9 | 76.9 | 16 |
| 25 | 1 | 2.6 | 79.5 | 9 |
| 30 | 1 | 2.6 | 82.1 | 8 |
| 35 | 4 | 10.3 | 92.3 | 7 |
| 40 | 1 | 2.6 | 94.9 | 3 |
| 45 | 1 | 2.6 | 97.4 | 2 |
| 50 | 1 | 2.6 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 29 | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 3.35 | 0.09 | 0.41 | 133.87 |
| 2.15 | 0.36 | 1.66 | 133.46 |
| 1.55 | 0.35 | 1.60 | 131.80 |
| 1.38 | 2.92 | 13.25 | 130.20 |
| 0.77 | 0.81 | 3.70 | 116.95 |
| 0.69 | 1.41 | 6.39 | 113.25 |
| 0.60 | 8.94 | 40.58 | 106.87 |
| 0.26 | 3.34 | 15.14 | 66.28 |
| 0.17 | 4.75 | 21.56 | 51.14 |
| 0.09 | 6.51 | 29.58 | 29.58 |

AVERAGE DIAMETER= 16.4 MICRONS
AVERAGE MASS = 3.43 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 24.4 MICRONS
ENTIRE EARTH INFLUX= 18484.4 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32A | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 10 | 35.7 | 35.7 | 28 |
| 10 | 8 | 28.6 | 64.3 | 18 |
| 15 | 1 | 3.6 | 67.9 | 10 |
| 20 | 0 | 0.0 | 67.9 | 9 |
| 25 | 3 | 10.7 | 78.6 | 9 |
| 30 | 1 | 3.6 | 82.1 | 6 |
| 35 | 0 | 0.0 | 82.1 | 5 |
| 40 | 2 | 7.1 | 89.3 | 5 |
| 45 | 3 | 10.7 | 100.0 | 3 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32A | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.41 | 0.07 | 0.30 | 115.44 |
| 1.55 | 0.42 | 1.89 | 115.15 |
| 0.86 | 0.18 | 0.80 | 113.25 |
| 0.77 | 0.0 | 0.0 | 112.46 |
| 0.77 | 2.44 | 11.09 | 112.46 |
| 0.52 | 1.41 | 6.39 | 101.36 |
| 0.43 | 0.0 | 0.0 | 94.98 |
| 0.43 | 6.67 | 30.29 | 94.98 |
| 0.26 | 14.25 | 64.69 | 64.69 |

AVERAGE DIAMETER= 16.6 MICRONS
AVERAGE MASS = 4.12 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 25.9 MICRONS
ENTIRE EARTH INFLUX= 15940.0 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32B | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 9 | 16.4 | 16.4 | 55 |
| 10 | 13 | 23.6 | 40.0 | 46 |
| 15 | 3 | 5.5 | 45.5 | 33 |
| 20 | 5 | 9.1 | 54.5 | 30 |
| 25 | 11 | 20.0 | 74.5 | 25 |
| 30 | 6 | 10.9 | 85.5 | 14 |
| 35 | 3 | 5.5 | 90.9 | 8 |
| 40 | 3 | 5.5 | 96.4 | 5 |
| 45 | 1 | 1.8 | 98.2 | 2 |
| 50 | 0 | 0.0 | 98.2 | 1 |
| 55 | 0 | 0.0 | 98.2 | 1 |
| 60 | 0 | 0.0 | 98.2 | 1 |
| 65 | 0 | 0.0 | 98.2 | 1 |
| 70 | 1 | 1.8 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 328 | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 4.73 | 0.06 | 0.27 | 272.80 |
| 3.95 | 0.68 | 3.08 | 272.53 |
| 2.84 | 0.53 | 2.40 | 269.46 |
| 2.58 | 2.08 | 9.46 | 267.06 |
| 2.15 | 8.96 | 40.67 | 257.60 |
| 1.20 | 8.44 | 38.33 | 216.93 |
| 0.69 | 6.70 | 30.44 | 178.59 |
| 0.43 | 10.01 | 45.43 | 148.16 |
| 0.17 | 4.75 | 21.56 | 102.72 |
| 0.09 | 0.0 | 0.0 | 81.16 |
| 0.09 | 0.0 | 0.0 | 81.16 |
| 0.09 | 0.0 | 0.0 | 81.16 |
| 0.09 | 0.0 | 0.0 | 81.16 |
| 0.09 | 17.88 | 81.16 | 81.16 |

AVERAGE DIAMETER= 20.3 MICRONS
AVERAGE MASS = 4.96 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 27.6 MICRONS
ENTIRE EARTH INFLUX= 37667.1 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32C | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 8 | 21.6 | 21.6 | 37 |
| 10 | 9 | 24.3 | 45.9 | 29 |
| 15 | 1 | 2.7 | 48.6 | 20 |
| 20 | 5 | 13.5 | 62.2 | 19 |
| 25 | 4 | 10.8 | 73.0 | 14 |
| 30 | 4 | 10.8 | 83.8 | 10 |
| 35 | 1 | 2.7 | 86.5 | 6 |
| 40 | 0 | 0.0 | 86.5 | 5 |
| 45 | 2 | 5.4 | 91.9 | 5 |
| 50 | 1 | 2.7 | 94.6 | 3 |
| 55 | 1 | 2.7 | 97.3 | 2 |
| 60 | 0 | 0.0 | 97.3 | 1 |
| 65 | 1 | 2.7 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32C | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 3.18 | 0.05 | 0.24 | 240.17 |
| 2.49 | 0.47 | 2.13 | 239.94 |
| 1.72 | 0.18 | 0.80 | 237.81 |
| 1.63 | 2.08 | 9.46 | 237.01 |
| 1.20 | 3.26 | 14.79 | 227.54 |
| 0.86 | 5.63 | 25.56 | 212.76 |
| 0.52 | 2.23 | 10.15 | 187.20 |
| 0.43 | 0.0 | 0.0 | 177.05 |
| 0.43 | 9.50 | 43.12 | 177.05 |
| 0.26 | 6.51 | 29.58 | 133.93 |
| 0.17 | 8.67 | 39.37 | 104.35 |
| 0.09 | 0.0 | 0.0 | 64.98 |
| 0.09 | 14.31 | 64.98 | 64.98 |

AVERAGE DIAMETER= 20.5 MICRONS
AVERAGE MASS = 6.49 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 30.2 MICRONS
ENTIRE EARTH INFLUX= 33162.4 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32D | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 8 | 21.6 | 21.6 | 37 |
| 10 | 9 | 24.3 | 45.9 | 29 |
| 15 | 4 | 10.8 | 56.8 | 20 |
| 20 | 4 | 10.8 | 67.6 | 16 |
| 25 | 3 | 8.1 | 75.7 | 12 |
| 30 | 0 | 0.0 | 75.7 | 9 |
| 35 | 6 | 16.2 | 91.9 | 9 |
| 40 | 1 | 2.7 | 94.6 | 3 |
| 45 | 0 | 0.0 | 94.6 | 2 |
| 50 | 1 | 2.7 | 97.3 | 2 |
| 55 | 0 | 0.0 | 97.3 | 1 |
| 60 | 0 | 0.0 | 97.3 | 1 |
| 65 | 0 | 0.0 | 97.3 | 1 |
| 70 | 0 | 0.0 | 97.3 | 1 |
| 75 | 0 | 0.0 | 97.3 | 1 |
| 80 | 0 | 0.0 | 97.3 | 1 |
| 85 | 1 | 2.7 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32D | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 3.18 | 0.05 | 0.24 | 275.13 |
| 2.49 | 0.47 | 2.13 | 274.90 |
| 1.72 | 0.70 | 3.19 | 272.77 |
| 1.38 | 1.67 | 7.57 | 269.57 |
| 1.03 | 2.44 | 11.09 | 262.00 |
| 0.77 | 0.0 | 0.0 | 250.91 |
| 0.77 | 13.41 | 60.87 | 250.91 |
| 0.26 | 3.34 | 15.14 | 190.04 |
| 0.17 | 0.0 | 0.0 | 174.90 |
| 0.17 | 6.51 | 29.58 | 174.90 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 32.01 | 145.32 | 145.32 |

AVERAGE DIAMETER= 19.7 MICRONS
AVERAGE MASS = 7.44 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 31.6 MICRONS
ENTIRE EARTH INFLUX= 37989.7 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32E | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 14 | 25.5 | 25.5 | 55 |
| 10 | 10 | 18.2 | 43.6 | 41 |
| 15 | 6 | 10.9 | 54.5 | 31 |
| 20 | 8 | 14.5 | 69.1 | 25 |
| 25 | 5 | 9.1 | 78.2 | 17 |
| 30 | 4 | 7.3 | 85.5 | 12 |
| 35 | 4 | 7.3 | 92.7 | 8 |
| 40 | 2 | 3.6 | 96.4 | 4 |
| 45 | 0 | 0.0 | 96.4 | 2 |
| 50 | 0 | 0.0 | 96.4 | 2 |
| 55 | 0 | 0.0 | 96.4 | 2 |
| 60 | 0 | 0.0 | 96.4 | 2 |
| 65 | 0 | 0.0 | 96.4 | 2 |
| 70 | 0 | 0.0 | 96.4 | 2 |
| 75 | 1 | 1.8 | 98.2 | 2 |
| 80 | 0 | 0.0 | 98.2 | 1 |
| 85 | 0 | 0.0 | 98.2 | 1 |
| 90 | 0 | 0.0 | 98.2 | 1 |
| 95 | 0 | 0.0 | 98.2 | 1 |
| 100 | 0 | 0.0 | 98.2 | 1 |
| 105 | 0 | 0.0 | 98.2 | 1 |
| 110 | 0 | 0.0 | 98.2 | 1 |
| 115 | 0 | 0.0 | 98.2 | 1 |
| 120 | 0 | 0.0 | 98.2 | 1 |
| 125 | 0 | 0.0 | 98.2 | 1 |
| 130 | 1 | 1.8 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32E | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 4.73 | 0.09 | 0.41 | 757.32 |
| 3.52 | 0.52 | 2.37 | 756.90 |
| 2.66 | 1.06 | 4.79 | 754.54 |
| 2.15 | 3.34 | 15.14 | 749.74 |
| 1.46 | 4.07 | 18.49 | 734.60 |
| 1.03 | 5.63 | 25.56 | 716.11 |
| 0.69 | 8.94 | 40.58 | 690.56 |
| 0.34 | 6.67 | 30.29 | 649.98 |
| 0.17 | 0.0 | 0.0 | 619.69 |
| 0.17 | 0.0 | 0.0 | 619.69 |
| 0.17 | 0.0 | 0.0 | 619.69 |
| 0.17 | 0.0 | 0.0 | 619.69 |
| 0.17 | 0.0 | 0.0 | 619.69 |
| 0.17 | 0.0 | 0.0 | 619.69 |
| 0.17 | 21.99 | 99.83 | 619.69 |
| 0.09 | 0.0 | 0.0 | 519.86 |
| 0.09 | 0.0 | 0.0 | 519.86 |
| 0.09 | 0.0 | 0.0 | 519.86 |
| 0.09 | 0.0 | 0.0 | 519.86 |
| 0.09 | 0.0 | 0.0 | 519.86 |
| 0.09 | 0.0 | 0.0 | 519.86 |
| 0.09 | 0.0 | 0.0 | 519.86 |
| 0.09 | 0.0 | 0.0 | 519.86 |
| 0.09 | 0.0 | 0.0 | 519.86 |
| 0.09 | 0.0 | 0.0 | 519.86 |
| 0.09 | 114.51 | 519.86 | 519.86 |

AVERAGE DIAMETER= 19.8 MICRONS
AVERAGE MASS = 13.77 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 38.8 MICRONS
ENTIRE EARTH INFLUX= 104567.8 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32F | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 4 | 14.3 | 14.3 | 28 |
| 10 | 3 | 10.7 | 25.0 | 24 |
| 15 | 2 | 7.1 | 32.1 | 21 |
| 20 | 7 | 25.0 | 57.1 | 19 |
| 25 | 6 | 21.4 | 78.6 | 12 |
| 30 | 2 | 7.1 | 85.7 | 6 |
| 35 | 2 | 7.1 | 92.9 | 4 |
| 40 | 2 | 7.1 | 100.0 | 2 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32F | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.41 | 0.03 | 0.12 | 101.22 |
| 2.06 | 0.16 | 0.71 | 101.10 |
| 1.80 | 0.35 | 1.60 | 100.39 |
| 1.63 | 2.92 | 13.25 | 98.79 |
| 1.03 | 4.89 | 22.18 | 85.54 |
| 0.52 | 2.81 | 12.78 | 63.36 |
| 0.34 | 4.47 | 20.29 | 50.58 |
| 0.17 | 6.67 | 30.29 | 30.29 |

AVERAGE DIAMETER= 20.7 MICRONS
AVERAGE MASS = 3.61 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 24.8 MICRONS
ENTIRE EARTH INFLUX= 13975.6 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32 | 6.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 53 | 22.1 | 22.1 | 240 |
| 10 | 52 | 21.7 | 43.7 | 187 |
| 15 | 17 | 7.1 | 50.8 | 135 |
| 20 | 29 | 12.1 | 62.9 | 118 |
| 25 | 32 | 13.3 | 76.2 | 89 |
| 30 | 17 | 7.1 | 83.3 | 57 |
| 35 | 16 | 6.7 | 90.0 | 40 |
| 40 | 10 | 4.2 | 94.2 | 24 |
| 45 | 6 | 2.5 | 96.7 | 14 |
| 50 | 2 | 0.8 | 97.5 | 8 |
| 55 | 1 | 0.4 | 97.9 | 6 |
| 60 | 0 | 0.0 | 97.9 | 5 |
| 65 | 1 | 0.4 | 98.3 | 5 |
| 70 | 1 | 0.4 | 98.7 | 4 |
| 75 | 1 | 0.4 | 99.2 | 3 |
| 80 | 0 | 0.0 | 99.2 | 2 |
| 85 | 1 | 0.4 | 99.6 | 2 |
| 90 | 0 | 0.0 | 99.6 | 1 |
| 95 | 0 | 0.0 | 99.6 | 1 |
| 100 | 0 | 0.0 | 99.6 | 1 |
| 105 | 0 | 0.0 | 99.6 | 1 |
| 110 | 0 | 0.0 | 99.6 | 1 |
| 115 | 0 | 0.0 | 99.6 | 1 |
| 120 | 0 | 0.0 | 99.6 | 1 |
| 125 | 0 | 0.0 | 99.6 | 1 |
| 130 | 1 | 0.4 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 32 | 6.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 3.46 | 0.35 | 1.57 | 1762.08 |
| 2.70 | 2.71 | 12.30 | 1760.52 |
| 1.95 | 2.99 | 13.58 | 1748.21 |
| 1.70 | 12.09 | 54.90 | 1734.64 |
| 1.28 | 26.06 | 118.31 | 1679.74 |
| 0.82 | 23.92 | 108.61 | 1561.43 |
| 0.58 | 35.75 | 162.32 | 1452.82 |
| 0.35 | 33.36 | 151.44 | 1290.49 |
| 0.20 | 28.50 | 129.37 | 1139.05 |
| 0.12 | 13.03 | 59.16 | 1009.68 |
| 0.09 | 8.67 | 39.37 | 950.52 |
| 0.07 | 0.0 | 0.0 | 911.15 |
| 0.07 | 14.31 | 64.98 | 911.15 |
| 0.06 | 17.88 | 81.16 | 846.17 |
| 0.04 | 21.99 | 99.83 | 765.01 |
| 0.03 | 0.0 | 0.0 | 665.18 |
| 0.03 | 32.01 | 145.32 | 665.18 |
| 0.01 | 0.0 | 0.0 | 519.86 |
| 0.01 | 0.0 | 0.0 | 519.86 |
| 0.01 | 0.0 | 0.0 | 519.86 |
| 0.01 | 0.0 | 0.0 | 519.86 |
| 0.01 | 0.0 | 0.0 | 519.86 |
| 0.01 | 0.0 | 0.0 | 519.86 |
| 0.01 | 0.0 | 0.0 | 519.86 |
| 0.01 | 0.0 | 0.0 | 519.86 |
| 0.01 | 114.51 | 519.86 | 519.86 |

AVERAGE DIAMETER= 19.8 MICRONS
AVERAGE MASS = 7.34 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 31.4 MICRONS
ENTIRE EARTH INFLUX= 40802.3 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 33 | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 0 | 0.0 | 0.0 | 24 |
| 10 | 11 | 45.8 | 45.8 | 24 |
| 15 | 3 | 12.5 | 58.3 | 13 |
| 20 | 3 | 12.5 | 70.8 | 10 |
| 25 | 3 | 12.5 | 83.3 | 7 |
| 30 | 1 | 4.2 | 87.5 | 4 |
| 35 | 0 | 0.0 | 87.5 | 3 |
| 40 | 1 | 4.2 | 91.7 | 3 |
| 45 | 0 | 0.0 | 91.7 | 2 |
| 50 | 1 | 4.2 | 95.8 | 2 |
| 55 | 0 | 0.0 | 95.8 | 1 |
| 60 | 0 | 0.0 | 95.8 | 1 |
| 65 | 0 | 0.0 | 95.8 | 1 |
| 70 | 0 | 0.0 | 95.8 | 1 |
| 75 | 0 | 0.0 | 95.8 | 1 |
| 80 | 0 | 0.0 | 95.8 | 1 |
| 85 | 1 | 4.2 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 33 | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.06 | 0.0 | 0.0 | 218.20 |
| 2.06 | 0.57 | 2.60 | 218.20 |
| 1.12 | 0.53 | 2.40 | 215.59 |
| 0.86 | 1.25 | 5.68 | 213.20 |
| 0.60 | 2.44 | 11.09 | 207.52 |
| 0.34 | 1.41 | 6.39 | 196.43 |
| 0.26 | 0.0 | 0.0 | 190.04 |
| 0.26 | 3.34 | 15.14 | 190.04 |
| 0.17 | 0.0 | 0.0 | 174.90 |
| 0.17 | 6.51 | 29.58 | 174.90 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 32.01 | 145.32 | 145.32 |

AVERAGE DIAMETER= 20.6 MICRONS
AVERAGE MASS = 9.09 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 33.7 MICRONS
ENTIRE EARTH INFLUX= 30128.0 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35A | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 4 | 12.5 | 12.5 | 32 |
| 10 | 13 | 40.6 | 53.1 | 28 |
| 15 | 3 | 9.4 | 62.5 | 15 |
| 20 | 2 | 6.3 | 68.8 | 12 |
| 25 | 3 | 9.4 | 78.1 | 10 |
| 30 | 0 | 0.0 | 78.1 | 7 |
| 35 | 5 | 15.6 | 93.8 | 7 |
| 40 | 2 | 6.3 | 100.0 | 2 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35A | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.75 | 0.03 | 0.12 | 101.48 |
| 2.41 | 0.68 | 3.08 | 101.36 |
| 1.29 | 0.53 | 2.40 | 98.29 |
| 1.03 | 0.83 | 3.79 | 95.89 |
| 0.86 | 2.44 | 11.09 | 92.11 |
| 0.60 | 0.0 | 0.0 | 81.01 |
| 0.60 | 11.17 | 50.73 | 81.01 |
| 0.17 | 6.67 | 30.29 | 30.29 |

AVERAGE DIAMETER= 17.7 MICRONS
AVERAGE MASS = 3.17 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 23.8 MICRONS
ENTIRE EARTH INFLUX= 14012.4 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35B | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 3 | 15.0 | 15.0 | 20 |
| 10 | 6 | 30.0 | 45.0 | 17 |
| 15 | 1 | 5.0 | 50.0 | 11 |
| 20 | 3 | 15.0 | 65.0 | 10 |
| 25 | 2 | 10.0 | 75.0 | 7 |
| 30 | 3 | 15.0 | 90.0 | 5 |
| 35 | 1 | 5.0 | 95.0 | 2 |
| 40 | 0 | 0.0 | 95.0 | 1 |
| 45 | 0 | 0.0 | 95.0 | 1 |
| 50 | 0 | 0.0 | 95.0 | 1 |
| 55 | 0 | 0.0 | 95.0 | 1 |
| 60 | 0 | 0.0 | 95.0 | 1 |
| 65 | 0 | 0.0 | 95.0 | 1 |
| 70 | 0 | 0.0 | 95.0 | 1 |
| 75 | 1 | 5.0 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 358 | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.72 | 0.02 | 0.09 | 144.52 |
| 1.46 | 0.31 | 1.42 | 144.43 |
| 0.95 | 0.18 | 0.80 | 143.01 |
| 0.86 | 1.25 | 5.68 | 142.21 |
| 0.60 | 1.63 | 7.39 | 136.53 |
| 0.43 | 4.22 | 19.17 | 129.14 |
| 0.17 | 2.23 | 10.15 | 109.97 |
| 0.09 | 0.0 | 0.0 | 99.83 |
| 0.09 | 0.0 | 0.0 | 99.83 |
| 0.09 | 0.0 | 0.0 | 99.83 |
| 0.09 | 0.0 | 0.0 | 99.83 |
| 0.09 | 0.0 | 0.0 | 99.83 |
| 0.09 | 0.0 | 0.0 | 99.83 |
| 0.09 | 0.0 | 0.0 | 99.83 |
| 0.09 | 21.99 | 99.83 | 99.83 |

AVERAGE DIAMETER= 20.0 MICRONS
AVERAGE MASS = 7.23 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 31.3 MICRONS
ENTIRE EARTH INFLUX= 19954.6 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35C | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 1 | 3.6 | 3.6 | 28 |
| 10 | 11 | 39.3 | 42.9 | 27 |
| 15 | 6 | 21.4 | 64.3 | 16 |
| 20 | 4 | 14.3 | 78.6 | 10 |
| 25 | 2 | 7.1 | 85.7 | 6 |
| 30 | 3 | 10.7 | 96.4 | 4 |
| 35 | 1 | 3.6 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35C | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.41 | 0.01 | 0.03 | 51.70 |
| 2.32 | 0.57 | 2.60 | 51.67 |
| 1.38 | 1.06 | 4.79 | 49.07 |
| 0.86 | 1.67 | 7.57 | 44.28 |
| 0.52 | 1.63 | 7.39 | 36.71 |
| 0.34 | 4.22 | 19.17 | 29.31 |
| 0.09 | 2.23 | 10.15 | 10.15 |

AVERAGE DIAMETER= 16.4 MICRONS
AVERAGE MASS = 1.85 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 19.8 MICRONS
ENTIRE EARTH INFLUX= 7138.9 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35D | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 4 | 21.1 | 21.1 | 19 |
| 10 | 6 | 31.6 | 52.6 | 15 |
| 15 | 4 | 21.1 | 73.7 | 9 |
| 20 | 1 | 5.3 | 78.9 | 5 |
| 25 | 1 | 5.3 | 84.2 | 4 |
| 30 | 0 | 0.0 | 84.2 | 3 |
| 35 | 1 | 5.3 | 89.5 | 3 |
| 40 | 1 | 5.3 | 94.7 | 2 |
| 45 | 0 | 0.0 | 94.7 | 1 |
| 50 | 0 | 0.0 | 94.7 | 1 |
| 55 | 0 | 0.0 | 94.7 | 1 |
| 60 | 0 | 0.0 | 94.7 | 1 |
| 65 | 1 | 5.3 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 350 | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.63 | 0.03 | 0.12 | 100.60 |
| 1.29 | 0.31 | 1.42 | 100.48 |
| 0.77 | 0.70 | 3.19 | 99.06 |
| 0.43 | 0.42 | 1.89 | 95.86 |
| 0.34 | 0.81 | 3.70 | 93.97 |
| 0.26 | 0.0 | 0.0 | 90.27 |
| 0.26 | 2.23 | 10.15 | 90.27 |
| 0.17 | 3.34 | 15.14 | 80.13 |
| 0.09 | 0.0 | 0.0 | 64.98 |
| 0.09 | 0.0 | 0.0 | 64.98 |
| 0.09 | 0.0 | 0.0 | 64.98 |
| 0.09 | 0.0 | 0.0 | 64.98 |
| 0.09 | 14.31 | 64.98 | 64.98 |

AVERAGE DIAMETER= 17.1 MICRONS
AVERAGE MASS = 5.29 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 28.2 MICRONS
ENTIRE EARTH INFLUX= 13889.8 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35E | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 6 | 28.6 | 28.6 | 21 |
| 10 | 6 | 28.6 | 57.1 | 15 |
| 15 | 0 | 0.0 | 57.1 | 9 |
| 20 | 1 | 4.8 | 61.9 | 9 |
| 25 | 3 | 14.3 | 76.2 | 8 |
| 30 | 1 | 4.8 | 81.0 | 5 |
| 35 | 1 | 4.8 | 85.7 | 4 |
| 40 | 2 | 9.5 | 95.2 | 3 |
| 45 | 0 | 0.0 | 95.2 | 1 |
| 50 | 0 | 0.0 | 95.2 | 1 |
| 55 | 1 | 4.8 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35E | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.80 | 0.04 | 0.18 | 100.77 |
| 1.29 | 0.31 | 1.42 | 100.60 |
| 0.77 | 0.0 | 0.0 | 99.18 |
| 0.77 | 0.42 | 1.89 | 99.18 |
| 0.69 | 2.44 | 11.09 | 97.28 |
| 0.43 | 1.41 | 6.39 | 86.19 |
| 0.34 | 2.23 | 10.15 | 79.80 |
| 0.26 | 6.67 | 30.29 | 69.66 |
| 0.09 | 0.0 | 0.0 | 39.37 |
| 0.09 | 0.0 | 0.0 | 39.37 |
| 0.09 | 8.67 | 39.37 | 39.37 |

AVERAGE DIAMETER= 18.3 MICRONS
AVERAGE MASS = 4.80 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 27.3 MICRONS
ENTIRE EARTH INFLUX= 13914.3 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35F | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 5 | 18.5 | 18.5 | 27 |
| 10 | 5 | 18.5 | 37.0 | 22 |
| 15 | 4 | 14.8 | 51.9 | 17 |
| 20 | 3 | 11.1 | 63.0 | 13 |
| 25 | 8 | 29.6 | 92.6 | 10 |
| 30 | 2 | 7.4 | 100.0 | 2 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35F | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.32 | 0.03 | 0.15 | 52.56 |
| 1.89 | 0.26 | 1.18 | 52.41 |
| 1.46 | 0.70 | 3.19 | 51.23 |
| 1.12 | 1.25 | 5.68 | 48.03 |
| 0.86 | 6.51 | 29.58 | 42.36 |
| 0.17 | 2.81 | 12.78 | 12.78 |

AVERAGE DIAMETER= 16.9 MICRONS
AVERAGE MASS = 1.95 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 20.2 MICRONS
ENTIRE EARTH INFLUX= 7257.3 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35G | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 4 | 18.2 | 18.2 | 22 |
| 10 | 8 | 36.4 | 54.5 | 18 |
| 15 | 4 | 18.2 | 72.7 | 10 |
| 20 | 3 | 13.6 | 86.4 | 6 |
| 25 | 2 | 9.1 | 95.5 | 3 |
| 30 | 0 | 0.0 | 95.5 | 1 |
| 35 | 1 | 4.5 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35G | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.89 | 0.03 | 0.12 | 28.42 |
| 1.55 | 0.42 | 1.89 | 28.31 |
| 0.86 | 0.70 | 3.19 | 26.41 |
| 0.52 | 1.25 | 5.68 | 23.22 |
| 0.26 | 1.63 | 7.39 | 17.54 |
| 0.09 | 0.0 | 0.0 | 10.15 |
| 0.09 | 2.23 | 10.15 | 10.15 |

AVERAGE DIAMETER= 13.9 MICRONS
AVERAGE MASS = 1.29 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 17.6 MICRONS
ENTIRE EARTH INFLUX= 3924.8 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35H | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 5 | 16.1 | 16.1 | 31 |
| 10 | 12 | 38.7 | 54.8 | 26 |
| 15 | 5 | 16.1 | 71.0 | 14 |
| 20 | 2 | 6.5 | 77.4 | 9 |
| 25 | 4 | 12.9 | 90.3 | 7 |
| 30 | 0 | 0.0 | 90.3 | 3 |
| 35 | 1 | 3.2 | 93.5 | 3 |
| 40 | 2 | 6.5 | 100.0 | 2 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35H | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.66 | 0.03 | 0.15 | 65.99 |
| 2.23 | 0.63 | 2.84 | 65.84 |
| 1.20 | 0.88 | 3.99 | 63.00 |
| 0.77 | 0.83 | 3.79 | 59.01 |
| 0.60 | 3.26 | 14.79 | 55.22 |
| 0.26 | 0.0 | 0.0 | 40.43 |
| 0.26 | 2.23 | 10.15 | 40.43 |
| 0.17 | 6.67 | 30.29 | 30.29 |

AVERAGE DIAMETER= 15.3 MICRONS
AVERAGE MASS = 2.13 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 20.8 MICRONS
ENTIRE EARTH INFLUX= 9111.5 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35 | 8.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 32 | 16.0 | 16.0 | 200 |
| 10 | 67 | 33.5 | 49.5 | 168 |
| 15 | 27 | 13.5 | 63.0 | 101 |
| 20 | 19 | 9.5 | 72.5 | 74 |
| 25 | 25 | 12.5 | 85.0 | 55 |
| 30 | 9 | 4.5 | 89.5 | 30 |
| 35 | 11 | 5.5 | 95.0 | 21 |
| 40 | 7 | 3.5 | 98.5 | 10 |
| 45 | 0 | 0.0 | 98.5 | 3 |
| 50 | 0 | 0.0 | 98.5 | 3 |
| 55 | 1 | 0.5 | 99.0 | 3 |
| 60 | 0 | 0.0 | 99.0 | 2 |
| 65 | 1 | 0.5 | 99.5 | 2 |
| 70 | 0 | 0.0 | 99.5 | 1 |
| 75 | 1 | 0.5 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 35 | 8.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.16 | 0.21 | 0.95 | 646.04 |
| 1.81 | 3.49 | 15.85 | 645.10 |
| 1.09 | 4.75 | 21.56 | 629.24 |
| 0.80 | 7.92 | 35.97 | 607.68 |
| 0.59 | 20.36 | 92.43 | 571.71 |
| 0.32 | 12.67 | 57.50 | 479.28 |
| 0.23 | 24.58 | 111.60 | 421.78 |
| 0.11 | 23.35 | 106.01 | 310.19 |
| 0.03 | 0.0 | 0.0 | 204.18 |
| 0.03 | 0.0 | 0.0 | 204.18 |
| 0.03 | 8.67 | 39.37 | 204.18 |
| 0.02 | 0.0 | 0.0 | 164.81 |
| 0.02 | 14.31 | 64.98 | 164.81 |
| 0.01 | 0.0 | 0.0 | 99.83 |
| 0.01 | 21.99 | 99.83 | 99.83 |

AVERAGE DIAMETER= 16.8 MICRONS
AVERAGE MASS = 3.23 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 23.9 MICRONS
ENTIRE EARTH INFLUX= 11202.3 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37A | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 3 | 10.3 | 10.3 | 29 |
| 10 | 6 | 20.7 | 31.0 | 26 |
| 15 | 4 | 13.8 | 44.8 | 20 |
| 20 | 5 | 17.2 | 62.1 | 16 |
| 25 | 4 | 13.8 | 75.9 | 11 |
| 30 | 1 | 3.4 | 79.3 | 7 |
| 35 | 1 | 3.4 | 82.8 | 6 |
| 40 | 2 | 6.9 | 89.7 | 5 |
| 45 | 0 | 0.0 | 89.7 | 3 |
| 50 | 0 | 0.0 | 89.7 | 3 |
| 55 | 1 | 3.4 | 93.1 | 3 |
| 60 | 0 | 0.0 | 93.1 | 2 |
| 65 | 1 | 3.4 | 96.6 | 2 |
| 70 | 0 | 0.0 | 96.6 | 1 |
| 75 | 0 | 0.0 | 96.6 | 1 |
| 80 | 1 | 3.4 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37A | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.49 | 0.02 | 0.09 | 301.28 |
| 2.23 | 0.31 | 1.42 | 301.19 |
| 1.72 | 0.70 | 3.19 | 299.77 |
| 1.38 | 2.08 | 9.46 | 296.58 |
| 0.95 | 3.26 | 14.79 | 287.11 |
| 0.60 | 1.41 | 6.39 | 272.33 |
| 0.52 | 2.23 | 10.15 | 265.94 |
| 0.43 | 6.67 | 30.29 | 255.79 |
| 0.26 | 0.0 | 0.0 | 225.50 |
| 0.26 | 0.0 | 0.0 | 225.50 |
| 0.26 | 8.67 | 39.37 | 225.50 |
| 0.17 | 0.0 | 0.0 | 186.13 |
| 0.17 | 14.31 | 64.98 | 186.13 |
| 0.09 | 0.0 | 0.0 | 121.15 |
| 0.09 | 0.0 | 0.0 | 121.15 |
| 0.09 | 26.69 | 121.15 | 121.15 |

AVERAGE DIAMETER= 23.4 MICRONS
AVERAGE MASS = 10.39 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 35.3 MICRONS
ENTIRE EARTH INFLUX= 41600.0 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37B | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 5 | 18.5 | 18.5 | 27 |
| 10 | 2 | 7.4 | 25.9 | 22 |
| 15 | 6 | 22.2 | 48.1 | 20 |
| 20 | 5 | 18.5 | 66.7 | 14 |
| 25 | 0 | 0.0 | 66.7 | 9 |
| 30 | 6 | 22.2 | 88.9 | 9 |
| 35 | 0 | 0.0 | 88.9 | 3 |
| 40 | 0 | 0.0 | 88.9 | 3 |
| 45 | 0 | 0.0 | 88.9 | 3 |
| 50 | 1 | 3.7 | 92.6 | 3 |
| 55 | 0 | 0.0 | 92.6 | 2 |
| 60 | 1 | 3.7 | 96.3 | 2 |
| 65 | 1 | 3.7 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37B | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.32 | 0.03 | 0.15 | 198.88 |
| 1.89 | 0.10 | 0.47 | 198.74 |
| 1.72 | 1.06 | 4.79 | 198.26 |
| 1.20 | 2.08 | 9.46 | 193.47 |
| 0.77 | 0.0 | 0.0 | 184.01 |
| 0.77 | 8.44 | 38.33 | 184.01 |
| 0.26 | 0.0 | 0.0 | 145.67 |
| 0.26 | 0.0 | 0.0 | 145.67 |
| 0.26 | 0.0 | 0.0 | 145.67 |
| 0.26 | 6.51 | 29.58 | 145.67 |
| 0.17 | 0.0 | 0.0 | 116.09 |
| 0.17 | 11.26 | 51.11 | 116.09 |
| 0.09 | 14.31 | 64.98 | 64.98 |

AVERAGE DIAMETER= 21.9 MICRONS
AVERAGE MASS = 7.37 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 31.5 MICRONS
ENTIRE EARTH INFLUX= 27461.1 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37C | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 2 | 7.7 | 7.7 | 26 |
| 10 | 2 | 7.7 | 15.4 | 24 |
| 15 | 3 | 11.5 | 26.9 | 22 |
| 20 | 4 | 15.4 | 42.3 | 19 |
| 25 | 8 | 30.8 | 73.1 | 15 |
| 30 | 1 | 3.8 | 76.9 | 7 |
| 35 | 3 | 11.5 | 88.5 | 6 |
| 40 | 1 | 3.8 | 92.3 | 3 |
| 45 | 0 | 0.0 | 92.3 | 2 |
| 50 | 0 | 0.0 | 92.3 | 2 |
| 55 | 0 | 0.0 | 92.3 | 2 |
| 60 | 0 | 0.0 | 92.3 | 2 |
| 65 | 0 | 0.0 | 92.3 | 2 |
| 70 | 1 | 3.8 | 96.2 | 2 |
| 75 | 0 | 0.0 | 96.2 | 1 |
| 80 | 0 | 0.0 | 96.2 | 1 |
| 85 | 0 | 0.0 | 96.2 | 1 |
| 90 | 0 | 0.0 | 96.2 | 1 |
| 95 | 1 | 3.8 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37C | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.23 | 0.01 | 0.06 | 376.08 |
| 2.06 | 0.10 | 0.47 | 376.03 |
| 1.89 | 0.53 | 2.40 | 375.55 |
| 1.63 | 1.67 | 7.57 | 373.16 |
| 1.29 | 6.51 | 29.58 | 365.58 |
| 0.60 | 1.41 | 6.39 | 336.01 |
| 0.52 | 6.70 | 30.44 | 329.62 |
| 0.26 | 3.34 | 15.14 | 299.18 |
| 0.17 | 0.0 | 0.0 | 284.04 |
| 0.17 | 0.0 | 0.0 | 284.04 |
| 0.17 | 0.0 | 0.0 | 284.04 |
| 0.17 | 0.0 | 0.0 | 284.04 |
| 0.17 | 0.0 | 0.0 | 284.04 |
| 0.17 | 17.88 | 81.16 | 284.04 |
| 0.09 | 0.0 | 0.0 | 202.88 |
| 0.09 | 0.0 | 0.0 | 202.88 |
| 0.09 | 0.0 | 0.0 | 202.88 |
| 0.09 | 0.0 | 0.0 | 202.88 |
| 0.09 | 44.69 | 202.88 | 202.88 |

AVERAGE DIAMETER= 26.7 MICRONS
AVERAGE MASS = 14.46 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 39.4 MICRONS
ENTIRE EARTH INFLUX= 51928.5 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37D | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 3 | 17.6 | 17.6 | 17 |
| 10 | 4 | 23.5 | 41.2 | 14 |
| 15 | 0 | 0.0 | 41.2 | 10 |
| 20 | 3 | 17.6 | 58.8 | 10 |
| 25 | 4 | 23.5 | 82.4 | 7 |
| 30 | 1 | 5.9 | 88.2 | 3 |
| 35 | 1 | 5.9 | 94.1 | 2 |
| 40 | 0 | 0.0 | 94.1 | 1 |
| 45 | 0 | 0.0 | 94.1 | 1 |
| 50 | 1 | 5.9 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37D | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.46 | 0.02 | 0.09 | 67.62 |
| 1.20 | 0.21 | 0.95 | 67.53 |
| 0.86 | 0.0 | 0.0 | 66.58 |
| 0.86 | 1.25 | 5.68 | 66.58 |
| 0.60 | 3.26 | 14.79 | 60.90 |
| 0.26 | 1.41 | 6.39 | 46.11 |
| 0.17 | 2.23 | 10.15 | 39.72 |
| 0.09 | 0.0 | 0.0 | 29.58 |
| 0.09 | 0.0 | 0.0 | 29.58 |
| 0.09 | 6.51 | 29.58 | 29.58 |

AVERAGE DIAMETER= 19.4 MICRONS
AVERAGE MASS = 3.98 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 25.6 MICRONS
ENTIRE EARTH INFLUX= 9336.1 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37E | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 0 | 0.0 | 0.0 | 24 |
| 10 | 5 | 20.8 | 20.8 | 24 |
| 15 | 4 | 16.7 | 37.5 | 19 |
| 20 | 4 | 16.7 | 54.2 | 15 |
| 25 | 4 | 16.7 | 70.8 | 11 |
| 30 | 2 | 8.3 | 79.2 | 7 |
| 35 | 1 | 4.2 | 83.3 | 5 |
| 40 | 1 | 4.2 | 87.5 | 4 |
| 45 | 2 | 8.3 | 95.8 | 3 |
| 50 | 1 | 4.2 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37E | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.06 | 0.0 | 0.0 | 137.51 |
| 2.06 | 0.26 | 1.18 | 137.51 |
| 1.63 | 0.70 | 3.19 | 136.33 |
| 1.29 | 1.67 | 7.57 | 133.13 |
| 0.95 | 3.26 | 14.79 | 125.56 |
| 0.60 | 2.81 | 12.78 | 110.77 |
| 0.43 | 2.23 | 10.15 | 97.99 |
| 0.34 | 3.34 | 15.14 | 87.85 |
| 0.26 | 9.50 | 43.12 | 72.70 |
| 0.09 | 6.51 | 29.58 | 29.58 |

AVERAGE DIAMETER= 23.5 MICRONS
AVERAGE MASS = 5.73 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 28.9 MICRONS
ENTIRE EARTH INFLUX= 18986.7 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37F | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 0 | 0.0 | 0.0 | 23 |
| 10 | 5 | 21.7 | 21.7 | 23 |
| 15 | 3 | 13.0 | 34.8 | 18 |
| 20 | 2 | 8.7 | 43.5 | 15 |
| 25 | 4 | 17.4 | 60.9 | 13 |
| 30 | 5 | 21.7 | 82.6 | 9 |
| 35 | 2 | 8.7 | 91.3 | 4 |
| 40 | 1 | 4.3 | 95.7 | 2 |
| 45 | 1 | 4.3 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37F | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.98 | 0.0 | 0.0 | 111.10 |
| 1.98 | 0.26 | 1.18 | 111.10 |
| 1.55 | 0.53 | 2.40 | 109.91 |
| 1.29 | 0.83 | 3.79 | 107.52 |
| 1.12 | 3.26 | 14.79 | 103.73 |
| 0.77 | 7.04 | 31.94 | 88.94 |
| 0.34 | 4.47 | 20.29 | 57.00 |
| 0.17 | 3.34 | 15.14 | 36.71 |
| 0.09 | 4.75 | 21.56 | 21.56 |

AVERAGE DIAMETER= 23.5 MICRONS
AVERAGE MASS = 4.83 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 27.3 MICRONS
ENTIRE EARTH INFLUX= 15339.7 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37G | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 0 | 0.0 | 0.0 | 18 |
| 10 | 5 | 27.8 | 27.8 | 18 |
| 15 | 2 | 11.1 | 38.9 | 13 |
| 20 | 1 | 5.6 | 44.4 | 11 |
| 25 | 3 | 16.7 | 61.1 | 10 |
| 30 | 2 | 11.1 | 72.2 | 7 |
| 35 | 1 | 5.6 | 77.8 | 5 |
| 40 | 1 | 5.6 | 83.3 | 4 |
| 45 | 0 | 0.0 | 83.3 | 3 |
| 50 | 1 | 5.6 | 88.9 | 3 |
| 55 | 0 | 0.0 | 88.9 | 2 |
| 60 | 0 | 0.0 | 88.9 | 2 |
| 65 | 1 | 5.6 | 94.4 | 2 |
| 70 | 1 | 5.6 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37G | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.55 | 0.0 | 0.0 | 229.56 |
| 1.55 | 0.26 | 1.18 | 229.56 |
| 1.12 | 0.35 | 1.60 | 228.37 |
| 0.95 | 0.42 | 1.89 | 226.78 |
| 0.86 | 2.44 | 11.09 | 224.88 |
| 0.60 | 2.81 | 12.78 | 213.79 |
| 0.43 | 2.23 | 10.15 | 201.01 |
| 0.34 | 3.34 | 15.14 | 190.87 |
| 0.26 | 0.0 | 0.0 | 175.72 |
| 0.26 | 6.51 | 29.58 | 175.72 |
| 0.17 | 0.0 | 0.0 | 146.15 |
| 0.17 | 0.0 | 0.0 | 146.15 |
| 0.17 | 14.31 | 64.98 | 146.15 |
| 0.09 | 17.88 | 81.16 | 81.16 |

AVERAGE DIAMETER= 27.5 MICRONS
AVERAGE MASS = 12.75 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 37.8 MICRONS
ENTIRE EARTH INFLUX= 31696.3 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37H | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 0 | 0.0 | 0.0 | 9 |
| 10 | 2 | 22.2 | 22.2 | 9 |
| 15 | 4 | 44.4 | 66.7 | 7 |
| 20 | 0 | 0.0 | 66.7 | 3 |
| 25 | 1 | 11.1 | 77.8 | 3 |
| 30 | 0 | 0.0 | 77.8 | 2 |
| 35 | 0 | 0.0 | 77.8 | 2 |
| 40 | 1 | 11.1 | 88.9 | 2 |
| 45 | 0 | 0.0 | 88.9 | 1 |
| 50 | 0 | 0.0 | 88.9 | 1 |
| 55 | 0 | 0.0 | 88.9 | 1 |
| 60 | 0 | 0.0 | 88.9 | 1 |
| 65 | 0 | 0.0 | 88.9 | 1 |
| 70 | 0 | 0.0 | 88.9 | 1 |
| 75 | 0 | 0.0 | 88.9 | 1 |
| 80 | 0 | 0.0 | 88.9 | 1 |
| 85 | 1 | 11.1 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37H | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 0.77 | 0.0 | 0.0 | 167.83 |
| 0.77 | 0.10 | 0.47 | 167.83 |
| 0.60 | 0.70 | 3.19 | 167.35 |
| 0.26 | 0.0 | 0.0 | 164.16 |
| 0.26 | 0.81 | 3.70 | 164.16 |
| 0.17 | 0.0 | 0.0 | 160.46 |
| 0.17 | 0.0 | 0.0 | 160.46 |
| 0.17 | 3.34 | 15.14 | 160.46 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 0.0 | 0.0 | 145.32 |
| 0.09 | 32.01 | 145.32 | 145.32 |

AVERAGE DIAMETER= 25.6 MICRONS
AVERAGE MASS = 18.65 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 42.9 MICRONS
ENTIRE EARTH INFLUX= 23172.9 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37 | 8.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 13 | 7.5 | 7.5 | 173 |
| 10 | 31 | 17.9 | 25.4 | 160 |
| 15 | 26 | 15.0 | 40.5 | 129 |
| 20 | 24 | 13.9 | 54.3 | 103 |
| 25 | 28 | 16.2 | 70.5 | 79 |
| 30 | 18 | 10.4 | 80.9 | 51 |
| 35 | 9 | 5.2 | 86.1 | 33 |
| 40 | 7 | 4.0 | 90.2 | 24 |
| 45 | 3 | 1.7 | 91.9 | 17 |
| 50 | 4 | 2.3 | 94.2 | 14 |
| 55 | 1 | 0.6 | 94.8 | 10 |
| 60 | 1 | 0.6 | 95.4 | 9 |
| 65 | 3 | 1.7 | 97.1 | 8 |
| 70 | 2 | 1.2 | 98.3 | 5 |
| 75 | 0 | 0.0 | 98.3 | 3 |
| 80 | 1 | 0.6 | 98.8 | 3 |
| 85 | 1 | 0.6 | 99.4 | 2 |
| 90 | 0 | 0.0 | 99.4 | 1 |
| 95 | 1 | 0.6 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | 37 | 8.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.87 | 0.08 | 0.38 | 1589.85 |
| 1.73 | 1.62 | 7.34 | 1589.47 |
| 1.39 | 4.57 | 20.76 | 1582.13 |
| 1.11 | 10.01 | 45.43 | 1561.37 |
| 0.85 | 22.80 | 103.52 | 1515.93 |
| 0.55 | 25.33 | 115.00 | 1412.41 |
| 0.36 | 20.11 | 91.31 | 1297.41 |
| 0.26 | 23.35 | 106.01 | 1206.10 |
| 0.18 | 14.25 | 64.69 | 1100.10 |
| 0.15 | 26.06 | 118.31 | 1035.41 |
| 0.11 | 8.67 | 39.37 | 917.10 |
| 0.10 | 11.26 | 51.11 | 877.73 |
| 0.09 | 42.94 | 194.95 | 826.62 |
| 0.05 | 35.75 | 162.32 | 631.67 |
| 0.03 | 0.0 | 0.0 | 469.34 |
| 0.03 | 26.69 | 121.15 | 469.34 |
| 0.02 | 32.01 | 145.32 | 348.19 |
| 0.01 | 0.0 | 0.0 | 202.88 |
| 0.01 | 44.69 | 202.88 | 202.88 |

AVERAGE DIAMETER= 23.8 MICRONS
AVERAGE MASS = 9.19 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 33.9 MICRONS
ENTIRE EARTH INFLUX= 27567.8 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | COMPOSITE | |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 200 | 10.7 | 10.7 | 1862 |
| 10 | 393 | 21.1 | 31.8 | 1662 |
| 15 | 324 | 17.4 | 49.2 | 1269 |
| 20 | 293 | 15.7 | 65.0 | 945 |
| 25 | 259 | 13.9 | 78.9 | 652 |
| 30 | 132 | 7.1 | 86.0 | 393 |
| 35 | 84 | 4.5 | 90.5 | 261 |
| 40 | 61 | 3.3 | 93.8 | 177 |
| 45 | 34 | 1.8 | 95.6 | 116 |
| 50 | 27 | 1.5 | 97.0 | 82 |
| 55 | 9 | 0.5 | 97.5 | 55 |
| 60 | 8 | 0.4 | 98.0 | 46 |
| 65 | 13 | 0.7 | 98.7 | 38 |
| 70 | 5 | 0.3 | 98.9 | 25 |
| 75 | 4 | 0.2 | 99.1 | 20 |
| 80 | 3 | 0.2 | 99.3 | 16 |
| 85 | 5 | 0.3 | 99.6 | 13 |
| 90 | 3 | 0.2 | 99.7 | 8 |
| 95 | 1 | 0.1 | 99.8 | 5 |
| 100 | 0 | 0.0 | 99.8 | 4 |
| 105 | 0 | 0.0 | 99.8 | 4 |
| 110 | 0 | 0.0 | 99.8 | 4 |
| 115 | 0 | 0.0 | 99.8 | 4 |
| 120 | 0 | 0.0 | 99.8 | 4 |
| 125 | 2 | 0.1 | 99.9 | 4 |
| 130 | 1 | 0.1 | 99.9 | 2 |
| 135 | 0 | 0.0 | 99.9 | 1 |
| 140 | 0 | 0.0 | 99.9 | 1 |
| 145 | 0 | 0.0 | 99.9 | 1 |
| 150 | 0 | 0.0 | 99.9 | 1 |
| 155 | 0 | 0.0 | 99.9 | 1 |
| 160 | 1 | 0.1 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| T-3 | GLACIAL ICE | COMPOSITE | |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.93 | 1.30 | 5.92 | 12657.82 |
| 2.61 | 20.48 | 92.99 | 12651.91 |
| 2.00 | 56.99 | 258.75 | 12558.91 |
| 1.49 | 122.17 | 554.65 | 12300.17 |
| 1.03 | 210.92 | 957.59 | 11745.52 |
| 0.62 | 185.76 | 843.33 | 10787.93 |
| 0.41 | 187.71 | 852.20 | 9944.61 |
| 0.28 | 203.48 | 923.78 | 9092.40 |
| 0.18 | 161.48 | 733.12 | 8168.62 |
| 0.13 | 175.90 | 798.61 | 7435.50 |
| 0.09 | 78.04 | 354.32 | 6636.89 |
| 0.07 | 90.06 | 408.89 | 6282.58 |
| 0.06 | 186.07 | 844.78 | 5873.70 |
| 0.04 | 89.39 | 405.81 | 5028.92 |
| 0.03 | 87.95 | 399.30 | 4623.11 |
| 0.03 | 80.06 | 363.46 | 4223.81 |
| 0.02 | 160.04 | 726.59 | 3860.35 |
| 0.01 | 113.99 | 517.50 | 3133.77 |
| 0.01 | 44.69 | 202.88 | 2616.27 |
| 0.01 | 0.0 | 0.0 | 2413.40 |
| 0.01 | 0.0 | 0.0 | 2413.40 |
| 0.01 | 0.0 | 0.0 | 2413.40 |
| 0.01 | 0.0 | 0.0 | 2413.40 |
| 0.01 | 0.0 | 0.0 | 2413.40 |
| 0.01 | 203.59 | 924.32 | 2413.40 |
| 0.00 | 114.51 | 519.86 | 1489.08 |
| 0.00 | 0.0 | 0.0 | 969.22 |
| 0.00 | 0.0 | 0.0 | 969.22 |
| 0.00 | 0.0 | 0.0 | 969.22 |
| 0.00 | 0.0 | 0.0 | 969.22 |
| 0.00 | 0.0 | 0.0 | 969.22 |
| 0.00 | 213.48 | 969.22 | 969.22 |

AVERAGE DIAMETER= 20.6 MICRONS
AVERAGE MASS = 6.80 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 30.6 MICRONS
ENTIRE EARTH INFLUX= 31992.7 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 4 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 0 | 0.0 | 0.0 | 26 |
| 10 | 2 | 7.7 | 7.7 | 26 |
| 15 | 3 | 11.5 | 19.2 | 24 |
| 20 | 7 | 26.9 | 46.2 | 21 |
| 25 | 7 | 26.9 | 73.1 | 14 |
| 30 | 2 | 7.7 | 80.8 | 7 |
| 35 | 3 | 11.5 | 92.3 | 5 |
| 40 | 0 | 0.0 | 92.3 | 2 |
| 45 | 2 | 7.7 | 100.0 | 2 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 4 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.01 | 0.0 | 0.0 | 128.34 |
| 2.01 | 0.10 | 0.47 | 128.34 |
| 1.86 | 0.53 | 2.40 | 127.87 |
| 1.62 | 2.92 | 13.25 | 125.47 |
| 1.08 | 5.70 | 25.88 | 112.22 |
| 0.54 | 2.81 | 12.78 | 86.34 |
| 0.39 | 6.70 | 30.44 | 73.56 |
| 0.15 | 0.0 | 0.0 | 43.12 |
| 0.15 | 9.50 | 43.12 | 43.12 |

AVERAGE DIAMETER= 24.4 MICRONS
AVERAGE MASS = 4.94 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 27.5 MICRONS
ENTIRE EARTH INFLUX= 15948.6 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 8 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 8 | 3.8 | 3.8 | 208 |
| 10 | 24 | 11.5 | 15.4 | 200 |
| 15 | 49 | 23.6 | 38.9 | 176 |
| 20 | 58 | 27.9 | 66.8 | 127 |
| 25 | 42 | 20.2 | 87.0 | 69 |
| 30 | 16 | 7.7 | 94.7 | 27 |
| 35 | 6 | 2.9 | 97.6 | 11 |
| 40 | 4 | 1.9 | 99.5 | 5 |
| 45 | 1 | 0.5 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 8 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 16.09 | 0.05 | 0.24 | 555.36 |
| 15.47 | 1.25 | 5.68 | 555.12 |
| 13.61 | 8.62 | 39.13 | 549.44 |
| 9.82 | 24.18 | 109.79 | 510.31 |
| 5.34 | 34.20 | 155.28 | 400.52 |
| 2.09 | 22.52 | 102.22 | 245.23 |
| 0.85 | 13.41 | 60.87 | 143.01 |
| 0.39 | 13.34 | 60.58 | 82.14 |
| 0.08 | 4.75 | 21.56 | 21.56 |

AVERAGE DIAMETER= 19.8 MICRONS
AVERAGE MASS = 2.67 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 22.4 MICRONS
ENTIRE EARTH INFLUX= 69013.8 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 11 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 0 | 0.0 | 0.0 | 21 |
| 10 | 1 | 4.8 | 4.8 | 21 |
| 15 | 9 | 42.9 | 47.6 | 20 |
| 20 | 1 | 4.8 | 52.4 | 11 |
| 25 | 5 | 23.8 | 76.2 | 10 |
| 30 | 4 | 19.0 | 95.2 | 5 |
| 35 | 0 | 0.0 | 95.2 | 1 |
| 40 | 1 | 4.8 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 11 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.62 | 0.0 | 0.0 | 68.50 |
| 1.62 | 0.05 | 0.24 | 68.50 |
| 1.55 | 1.58 | 7.19 | 68.27 |
| 0.85 | 0.42 | 1.89 | 61.08 |
| 0.77 | 4.07 | 18.49 | 59.19 |
| 0.39 | 5.63 | 25.56 | 40.70 |
| 0.08 | 0.0 | 0.0 | 15.14 |
| 0.08 | 3.34 | 15.14 | 15.14 |

AVERAGE DIAMETER= 21.4 MICRONS
AVERAGE MASS = 3.26 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 24.0 MICRONS
ENTIRE EARTH INFLUX= 8512.8 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 12 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 3 | 9.4 | 9.4 | 32 |
| 10 | 2 | 6.3 | 15.6 | 29 |
| 15 | 8 | 25.0 | 40.6 | 27 |
| 20 | 3 | 9.4 | 50.0 | 19 |
| 25 | 6 | 18.8 | 68.8 | 16 |
| 30 | 3 | 9.4 | 78.1 | 10 |
| 35 | 0 | 0.0 | 78.1 | 7 |
| 40 | 0 | 0.0 | 78.1 | 7 |
| 45 | 1 | 3.1 | 81.3 | 7 |
| 50 | 2 | 6.3 | 87.5 | 6 |
| 55 | 2 | 6.3 | 93.8 | 4 |
| 60 | 1 | 3.1 | 96.9 | 2 |
| 65 | 0 | 0.0 | 96.9 | 1 |
| 70 | 0 | 0.0 | 96.9 | 1 |
| 75 | 1 | 3.1 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 12 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 2.48 | 0.02 | 0.09 | 364.37 |
| 2.24 | 0.10 | 0.47 | 364.28 |
| 2.09 | 1.41 | 6.39 | 363.81 |
| 1.47 | 1.25 | 5.68 | 357.42 |
| 1.24 | 4.89 | 22.18 | 351.74 |
| 0.77 | 4.22 | 19.17 | 329.56 |
| 0.54 | 0.0 | 0.0 | 310.39 |
| 0.54 | 0.0 | 0.0 | 310.39 |
| 0.54 | 4.75 | 21.56 | 310.39 |
| 0.46 | 13.03 | 59.16 | 288.83 |
| 0.31 | 17.34 | 78.74 | 229.67 |
| 0.15 | 11.26 | 51.11 | 150.94 |
| 0.08 | 0.0 | 0.0 | 99.83 |
| 0.08 | 0.0 | 0.0 | 99.83 |
| 0.08 | 21.99 | 99.83 | 99.83 |

AVERAGE DIAMETER= 26.4 MICRONS
AVERAGE MASS = 11.39 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 36.4 MICRONS
ENTIRE EARTH INFLUX= 45280.1 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 14 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 1 | 5.9 | 5.9 | 17 |
| 10 | 0 | 0.0 | 5.9 | 16 |
| 15 | 6 | 35.3 | 41.2 | 16 |
| 20 | 7 | 41.2 | 82.4 | 10 |
| 25 | 3 | 17.6 | 100.0 | 3 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 14 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.48 | 0.01 | 0.03 | 29.16 |
| 1.39 | 0.0 | 0.0 | 29.13 |
| 1.39 | 1.06 | 4.79 | 29.13 |
| 0.87 | 2.92 | 13.25 | 24.34 |
| 0.26 | 2.44 | 11.09 | 11.09 |

AVERAGE DIAMETER= 18.2 MICRONS
AVERAGE MASS = 1.72 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 19.4 MICRONS
ENTIRE EARTH INFLUX= 4077.2 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 21 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 2 | 3.8 | 3.8 | 52 |
| 10 | 4 | 7.7 | 11.5 | 50 |
| 15 | 6 | 11.5 | 23.1 | 46 |
| 20 | 15 | 28.8 | 51.9 | 40 |
| 25 | 9 | 17.3 | 69.2 | 25 |
| 30 | 5 | 9.6 | 78.8 | 16 |
| 35 | 6 | 11.5 | 90.4 | 11 |
| 40 | 2 | 3.8 | 94.2 | 5 |
| 45 | 0 | 0.0 | 94.2 | 3 |
| 50 | 1 | 1.9 | 96.2 | 3 |
| 55 | 1 | 1.9 | 98.1 | 2 |
| 60 | 1 | 1.9 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 21 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 4.02 | 0.01 | 0.06 | 310.63 |
| 3.87 | 0.21 | 0.95 | 310.57 |
| 3.56 | 1.06 | 4.79 | 309.62 |
| 3.09 | 6.25 | 28.39 | 304.83 |
| 1.93 | 7.33 | 33.28 | 276.44 |
| 1.24 | 7.04 | 31.94 | 243.16 |
| 0.85 | 13.41 | 60.87 | 211.22 |
| 0.39 | 6.67 | 30.29 | 150.35 |
| 0.23 | 0.0 | 0.0 | 120.06 |
| 0.23 | 6.51 | 29.58 | 120.06 |
| 0.15 | 8.67 | 39.37 | 90.48 |
| 0.08 | 11.26 | 51.11 | 51.11 |

AVERAGE DIAMETER= 24.4 MICRONS
AVERAGE MASS = 5.97 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 29.3 MICRONS
ENTIRE EARTH INFLUX= 38601.5 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 23 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 3 | 13.6 | 13.6 | 22 |
| 10 | 3 | 13.6 | 27.3 | 19 |
| 15 | 0 | 0.0 | 27.3 | 16 |
| 20 | 2 | 9.1 | 36.4 | 16 |
| 25 | 4 | 18.2 | 54.5 | 14 |
| 30 | 4 | 18.2 | 72.7 | 10 |
| 35 | 0 | 0.0 | 72.7 | 6 |
| 40 | 0 | 0.0 | 72.7 | 6 |
| 45 | 1 | 4.5 | 77.3 | 6 |
| 50 | 1 | 4.5 | 81.8 | 5 |
| 55 | 0 | 0.0 | 81.8 | 4 |
| 60 | 0 | 0.0 | 81.8 | 4 |
| 65 | 2 | 9.1 | 90.9 | 4 |
| 70 | 0 | 0.0 | 90.9 | 2 |
| 75 | 2 | 9.1 | 100.0 | 2 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 23 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 1.70 | 0.02 | 0.09 | 425.69 |
| 1.47 | 0.16 | 0.71 | 425.60 |
| 1.24 | 0.0 | 0.0 | 424.89 |
| 1.24 | 0.83 | 3.79 | 424.89 |
| 1.08 | 3.26 | 14.79 | 421.10 |
| 0.77 | 5.63 | 25.56 | 406.31 |
| 0.46 | 0.0 | 0.0 | 380.76 |
| 0.46 | 0.0 | 0.0 | 380.76 |
| 0.46 | 4.75 | 21.56 | 380.76 |
| 0.39 | 6.51 | 29.58 | 359.20 |
| 0.31 | 0.0 | 0.0 | 329.62 |
| 0.31 | 0.0 | 0.0 | 329.62 |
| 0.31 | 28.63 | 129.97 | 329.62 |
| 0.15 | 0.0 | 0.0 | 199.65 |
| 0.15 | 43.98 | 199.65 | 199.65 |

AVERAGE DIAMETER= 30.9 MICRONS
AVERAGE MASS = 19.35 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 43.4 MICRONS
ENTIRE EARTH INFLUX= 52899.7 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| PACK ICE | SEA ICE | 25 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 2 | 2.7 | 2.7 | 74 |
| 10 | 2 | 2.7 | 5.4 | 72 |
| 15 | 14 | 18.9 | 24.3 | 70 |
| 20 | 13 | 17.6 | 41.9 | 56 |
| 25 | 19 | 25.7 | 67.6 | 43 |
| 30 | 9 | 12.2 | 79.7 | 24 |
| 35 | 3 | 4.1 | 83.8 | 15 |
| 40 | 5 | 6.8 | 90.5 | 12 |
| 45 | 5 | 6.8 | 97.3 | 7 |
| 50 | 0 | 0.0 | 97.3 | 2 |
| 55 | 0 | 0.0 | 97.3 | 2 |
| 60 | 0 | 0.0 | 97.3 | 2 |
| 65 | 0 | 0.0 | 97.3 | 2 |
| 70 | 1 | 1.4 | 98.6 | 2 |
| 75 | 1 | 1.4 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| PACK ICE | SEA ICE | 25 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 6.87 | 0.01 | 0.06 | 559.02 |
| 6.68 | 0.10 | 0.47 | 558.97 |
| 6.50 | 2.46 | 11.18 | 558.49 |
| 5.20 | 5.42 | 24.61 | 547.31 |
| 3.99 | 15.47 | 70.25 | 522.70 |
| 2.23 | 12.67 | 57.50 | 452.46 |
| 1.39 | 6.70 | 30.44 | 394.96 |
| 1.11 | 16.68 | 75.72 | 364.52 |
| 0.65 | 23.75 | 107.81 | 288.80 |
| 0.19 | 0.0 | 0.0 | 180.99 |
| 0.19 | 0.0 | 0.0 | 180.99 |
| 0.19 | 0.0 | 0.0 | 180.99 |
| 0.19 | 0.0 | 0.0 | 180.99 |
| 0.19 | 17.88 | 81.16 | 180.99 |
| 0.09 | 21.99 | 99.83 | 99.83 |

AVERAGE DIAMETER= 25.9 MICRONS
AVERAGE MASS = 7.55 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 31.7 MICRONS
ENTIRE EARTH INFLUX= 83363.4 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 26 | 2.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 5 | 8.1 | 8.1 | 62 |
| 10 | 5 | 8.1 | 16.1 | 57 |
| 15 | 8 | 12.9 | 29.0 | 52 |
| 20 | 15 | 24.2 | 53.2 | 44 |
| 25 | 13 | 21.0 | 74.2 | 29 |
| 30 | 8 | 12.9 | 87.1 | 16 |
| 35 | 1 | 1.6 | 88.7 | 8 |
| 40 | 3 | 4.8 | 93.5 | 7 |
| 45 | 1 | 1.6 | 95.2 | 4 |
| 50 | 1 | 1.6 | 96.8 | 3 |
| 55 | 1 | 1.6 | 98.4 | 2 |
| 60 | 0 | 0.0 | 98.4 | 1 |
| 65 | 0 | 0.0 | 98.4 | 1 |
| 70 | 0 | 0.0 | 98.4 | 1 |
| 75 | 0 | 0.0 | 98.4 | 1 |
| 80 | 1 | 1.6 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 26 | 2.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 7.19 | 0.03 | 0.15 | 402.53 |
| 6.61 | 0.26 | 1.18 | 402.38 |
| 6.03 | 1.41 | 6.39 | 401.20 |
| 5.11 | 6.25 | 28.39 | 394.81 |
| 3.36 | 10.59 | 48.06 | 366.41 |
| 1.86 | 11.26 | 51.11 | 318.35 |
| 0.93 | 2.23 | 10.15 | 267.24 |
| 0.81 | 10.01 | 45.43 | 257.09 |
| 0.46 | 4.75 | 21.56 | 211.66 |
| 0.35 | 6.51 | 29.58 | 190.10 |
| 0.23 | 8.67 | 39.37 | 160.52 |
| 0.12 | 0.0 | 0.0 | 121.15 |
| 0.12 | 0.0 | 0.0 | 121.15 |
| 0.12 | 0.0 | 0.0 | 121.15 |
| 0.12 | 0.0 | 0.0 | 121.15 |
| 0.12 | 26.69 | 121.15 | 121.15 |

AVERAGE DIAMETER= 23.3 MICRONS
AVERAGE MASS = 6.49 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 30.2 MICRONS
ENTIRE EARTH INFLUX= 75032.4 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 30A | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 0 | 0.0 | 0.0 | 29 |
| 10 | 2 | 6.9 | 6.9 | 29 |
| 15 | 5 | 17.2 | 24.1 | 27 |
| 20 | 4 | 13.8 | 37.9 | 22 |
| 25 | 9 | 31.0 | 69.0 | 18 |
| 30 | 6 | 20.7 | 89.7 | 9 |
| 35 | 2 | 6.9 | 96.6 | 3 |
| 40 | 0 | 0.0 | 96.6 | 1 |
| 45 | 0 | 0.0 | 96.6 | 1 |
| 50 | 1 | 3.4 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 30A | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 6.73 | 0.0 | 0.0 | 133.52 |
| 6.73 | 0.10 | 0.47 | 133.52 |
| 6.27 | 0.88 | 3.99 | 133.04 |
| 5.11 | 1.67 | 7.57 | 129.05 |
| 4.18 | 7.33 | 33.28 | 121.48 |
| 2.09 | 8.44 | 38.33 | 88.20 |
| 0.70 | 4.47 | 20.29 | 49.87 |
| 0.23 | 0.0 | 0.0 | 29.58 |
| 0.23 | 0.0 | 0.0 | 29.58 |
| 0.23 | 6.51 | 29.58 | 29.58 |

AVERAGE DIAMETER= 24.1 MICRONS
AVERAGE MASS = 4.60 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 26.9 MICRONS
ENTIRE EARTH INFLUX= 49775.5 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 308 | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 7 | 13.2 | 13.2 | 53 |
| 10 | 8 | 15.1 | 28.3 | 46 |
| 15 | 10 | 18.9 | 47.2 | 38 |
| 20 | 7 | 13.2 | 60.4 | 28 |
| 25 | 11 | 20.8 | 81.1 | 21 |
| 30 | 7 | 13.2 | 94.3 | 10 |
| 35 | 1 | 1.9 | 96.2 | 3 |
| 40 | 1 | 1.9 | 98.1 | 2 |
| 45 | 0 | 0.0 | 98.1 | 1 |
| 50 | 0 | 0.0 | 98.1 | 1 |
| 55 | 0 | 0.0 | 98.1 | 1 |
| 60 | 0 | 0.0 | 98.1 | 1 |
| 65 | 0 | 0.0 | 98.1 | 1 |
| 70 | 0 | 0.0 | 98.1 | 1 |
| 75 | 0 | 0.0 | 98.1 | 1 |
| 80 | 0 | 0.0 | 98.1 | 1 |
| 85 | 0 | 0.0 | 98.1 | 1 |
| 90 | 0 | 0.0 | 98.1 | 1 |
| 95 | 0 | 0.0 | 98.1 | 1 |
| 100 | 0 | 0.0 | 98.1 | 1 |
| 105 | 0 | 0.0 | 98.1 | 1 |
| 110 | 0 | 0.0 | 98.1 | 1 |
| 115 | 0 | 0.0 | 98.1 | 1 |
| 120 | 0 | 0.0 | 98.1 | 1 |
| 125 | 0 | 0.0 | 98.1 | 1 |
| 130 | 0 | 0.0 | 98.1 | 1 |
| 135 | 0 | 0.0 | 98.1 | 1 |
| 140 | 0 | 0.0 | 98.1 | 1 |
| 145 | 1 | 1.9 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 30B | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 12.30 | 0.05 | 0.21 | 855.40 |
| 10.67 | 0.42 | 1.89 | 855.19 |
| 8.82 | 1.76 | 7.99 | 853.30 |
| 6.50 | 2.92 | 13.25 | 845.31 |
| 4.87 | 8.96 | 40.67 | 832.06 |
| 2.32 | 9.85 | 44.72 | 791.39 |
| 0.70 | 2.23 | 10.15 | 746.67 |
| 0.46 | 3.34 | 15.14 | 736.52 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 0.0 | 0.0 | 721.38 |
| 0.23 | 158.89 | 721.38 | 721.38 |

AVERAGE DIAMETER= 20.9 MICRONS
AVERAGE MASS = 16.14 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 40.9 MICRONS
ENTIRE EARTH INFLUX= 318898.3 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 30C | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 7 | 13.7 | 13.7 | 51 |
| 10 | 5 | 9.8 | 23.5 | 44 |
| 15 | 7 | 13.7 | 37.3 | 39 |
| 20 | 10 | 19.6 | 56.9 | 32 |
| 25 | 3 | 5.9 | 62.7 | 22 |
| 30 | 8 | 15.7 | 78.4 | 19 |
| 35 | 4 | 7.8 | 86.3 | 11 |
| 40 | 3 | 5.9 | 92.2 | 7 |
| 45 | 0 | 0.0 | 92.2 | 4 |
| 50 | 2 | 3.9 | 96.1 | 4 |
| 55 | 1 | 2.0 | 98.0 | 2 |
| 60 | 0 | 0.0 | 98.0 | 1 |
| 65 | 0 | 0.0 | 98.0 | 1 |
| 70 | 0 | 0.0 | 98.0 | 1 |
| 75 | 1 | 2.0 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 30C | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 11.84 | 0.05 | 0.21 | 372.48 |
| 10.21 | 0.26 | 1.18 | 372.27 |
| 9.05 | 1.23 | 5.59 | 371.09 |
| 7.43 | 4.17 | 18.93 | 365.50 |
| 5.11 | 2.44 | 11.09 | 346.57 |
| 4.41 | 11.26 | 51.11 | 335.47 |
| 2.55 | 8.94 | 40.58 | 284.36 |
| 1.62 | 10.01 | 45.43 | 243.78 |
| 0.93 | 0.0 | 0.0 | 198.35 |
| 0.93 | 13.03 | 59.16 | 198.35 |
| 0.46 | 8.67 | 39.37 | 139.19 |
| 0.23 | 0.0 | 0.0 | 99.83 |
| 0.23 | 0.0 | 0.0 | 99.83 |
| 0.23 | 0.0 | 0.0 | 99.83 |
| 0.23 | 21.99 | 99.83 | 99.83 |

AVERAGE DIAMETER= 23.4 MICRONS
AVERAGE MASS = 7.30 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 31.4 MICRONS
ENTIRE EARTH INFLUX= 138861.7 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 30 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 14 | 10.5 | 10.5 | 133 |
| 10 | 15 | 11.3 | 21.8 | 119 |
| 15 | 22 | 16.5 | 38.3 | 104 |
| 20 | 21 | 15.8 | 54.1 | 82 |
| 25 | 23 | 17.3 | 71.4 | 61 |
| 30 | 21 | 15.8 | 87.2 | 38 |
| 35 | 7 | 5.3 | 92.5 | 17 |
| 40 | 4 | 3.0 | 95.5 | 10 |
| 45 | 0 | 0.0 | 95.5 | 6 |
| 50 | 3 | 2.3 | 97.7 | 6 |
| 55 | 1 | 0.8 | 98.5 | 3 |
| 60 | 0 | 0.0 | 98.5 | 2 |
| 65 | 0 | 0.0 | 98.5 | 2 |
| 70 | 0 | 0.0 | 98.5 | 2 |
| 75 | 1 | 0.8 | 99.2 | 2 |
| 80 | 0 | 0.0 | 99.2 | 1 |
| 85 | 0 | 0.0 | 99.2 | 1 |
| 90 | 0 | 0.0 | 99.2 | 1 |
| 95 | 0 | 0.0 | 99.2 | 1 |
| 100 | 0 | 0.0 | 99.2 | 1 |
| 105 | 0 | 0.0 | 99.2 | 1 |
| 110 | 0 | 0.0 | 99.2 | 1 |
| 115 | 0 | 0.0 | 99.2 | 1 |
| 120 | 0 | 0.0 | 99.2 | 1 |
| 125 | 0 | 0.0 | 99.2 | 1 |
| 130 | 0 | 0.0 | 99.2 | 1 |
| 135 | 0 | 0.0 | 99.2 | 1 |
| 140 | 0 | 0.0 | 99.2 | 1 |
| 145 | 1 | 0.8 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 30 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 10.29 | 0.09 | 0.41 | 1361.39 |
| 9.21 | 0.78 | 3.55 | 1360.98 |
| 8.04 | 3.87 | 17.57 | 1357.43 |
| 6.34 | 8.76 | 39.75 | 1339.86 |
| 4.72 | 18.73 | 85.04 | 1300.10 |
| 2.94 | 29.55 | 134.17 | 1215.07 |
| 1.32 | 15.64 | 71.02 | 1080.90 |
| 0.77 | 13.34 | 60.58 | 1009.88 |
| 0.46 | 0.0 | 0.0 | 949.31 |
| 0.46 | 19.54 | 88.73 | 949.31 |
| 0.23 | 8.67 | 39.37 | 860.57 |
| 0.15 | 0.0 | 0.0 | 821.21 |
| 0.15 | 0.0 | 0.0 | 821.21 |
| 0.15 | 0.0 | 0.0 | 821.21 |
| 0.15 | 21.99 | 99.83 | 821.21 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 0.0 | 0.0 | 721.38 |
| 0.08 | 158.89 | 721.38 | 721.38 |

AVERAGE DIAMETER= 22.6 MICRONS
AVERAGE MASS = 10.24 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 35.1 MICRONS
ENTIRE EARTH INFLUX= 169178.6 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 34A | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 5 | 25.0 | 25.0 | 20 |
| 10 | 4 | 20.0 | 45.0 | 15 |
| 15 | 0 | 0.0 | 45.0 | 11 |
| 20 | 5 | 25.0 | 70.0 | 11 |
| 25 | 1 | 5.0 | 75.0 | 6 |
| 30 | 1 | 5.0 | 80.0 | 5 |
| 35 | 2 | 10.0 | 90.0 | 4 |
| 40 | 0 | 0.0 | 90.0 | 2 |
| 45 | 1 | 5.0 | 95.0 | 2 |
| 50 | 1 | 5.0 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 34A | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 4.22 | 0.03 | 0.15 | 92.08 |
| 3.16 | 0.21 | 0.95 | 91.93 |
| 2.32 | 0.0 | 0.0 | 90.98 |
| 2.32 | 2.08 | 9.46 | 90.98 |
| 1.27 | 0.81 | 3.70 | 81.52 |
| 1.05 | 1.41 | 6.39 | 77.82 |
| 0.84 | 4.47 | 20.29 | 71.43 |
| 0.42 | 0.0 | 0.0 | 51.14 |
| 0.42 | 4.75 | 21.56 | 51.14 |
| 0.21 | 6.51 | 29.58 | 29.58 |

AVERAGE DIAMETER= 19.3 MICRONS
AVERAGE MASS = 4.60 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 26.9 MICRONS
ENTIRE EARTH INFLUX= 31206.2 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 348 | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 10 | 40.0 | 40.0 | 25 |
| 10 | 1 | 4.0 | 44.0 | 15 |
| 15 | 1 | 4.0 | 48.0 | 14 |
| 20 | 0 | 0.0 | 48.0 | 13 |
| 25 | 4 | 16.0 | 64.0 | 13 |
| 30 | 4 | 16.0 | 80.0 | 9 |
| 35 | 1 | 4.0 | 84.0 | 5 |
| 40 | 0 | 0.0 | 84.0 | 4 |
| 45 | 3 | 12.0 | 96.0 | 4 |
| 50 | 1 | 4.0 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 348 | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 5.27 | 0.07 | 0.30 | 146.09 |
| 3.16 | 0.05 | 0.24 | 145.79 |
| 2.95 | 0.18 | 0.80 | 145.55 |
| 2.74 | 0.0 | 0.0 | 144.76 |
| 2.74 | 3.26 | 14.79 | 144.76 |
| 1.90 | 5.63 | 25.56 | 129.97 |
| 1.05 | 2.23 | 10.15 | 104.41 |
| 0.84 | 0.0 | 0.0 | 94.27 |
| 0.84 | 14.25 | 64.69 | 94.27 |
| 0.21 | 6.51 | 29.58 | 29.58 |

AVERAGE DIAMETER= 20.6 MICRONS
AVERAGE MASS = 5.84 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 29.1 MICRONS
ENTIRE EARTH INFLUX= 49510.9 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 34C | 1.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 8 | 15.4 | 15.4 | 52 |
| 10 | 3 | 5.8 | 21.2 | 44 |
| 15 | 7 | 13.5 | 34.6 | 41 |
| 20 | 9 | 17.3 | 51.9 | 34 |
| 25 | 9 | 17.3 | 69.2 | 25 |
| 30 | 4 | 7.7 | 76.9 | 16 |
| 35 | 3 | 5.8 | 82.7 | 12 |
| 40 | 4 | 7.7 | 90.4 | 9 |
| 45 | 3 | 5.8 | 96.2 | 5 |
| 50 | 2 | 3.8 | 100.0 | 2 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 34C | 1.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 10.97 | 0.05 | 0.24 | 297.26 |
| 9.28 | 0.16 | 0.71 | 297.02 |
| 8.65 | 1.23 | 5.59 | 296.31 |
| 7.17 | 3.75 | 17.04 | 290.72 |
| 5.27 | 7.33 | 33.28 | 273.69 |
| 3.38 | 5.63 | 25.56 | 240.41 |
| 2.53 | 6.70 | 30.44 | 214.86 |
| 1.90 | 13.34 | 60.58 | 184.42 |
| 1.05 | 14.25 | 64.69 | 123.84 |
| 0.42 | 13.03 | 59.16 | 59.16 |

AVERAGE DIAMETER= 23.1 MICRONS
AVERAGE MASS = 5.72 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 28.9 MICRONS
ENTIRE EARTH INFLUX= 100745.8 METRIC TONS /YEAR

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 34 | 3.0 |

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 23 | 23.7 | 23.7 | 97 |
| 10 | 8 | 8.2 | 32.0 | 74 |
| 15 | 8 | 8.2 | 40.2 | 66 |
| 20 | 14 | 14.4 | 54.6 | 58 |
| 25 | 14 | 14.4 | 69.1 | 44 |
| 30 | 9 | 9.3 | 78.4 | 30 |
| 35 | 6 | 6.2 | 84.5 | 21 |
| 40 | 4 | 4.1 | 88.7 | 15 |
| 45 | 7 | 7.2 | 95.9 | 11 |
| 50 | 4 | 4.1 | 100.0 | 4 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 34 | 3.0 |

MASS CALCULATIONS

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 6.75 | 0.15 | 0.68 | 535.42 |
| 5.15 | 0.42 | 1.89 | 534.74 |
| 4.59 | 1.41 | 6.39 | 532.85 |
| 4.04 | 5.84 | 26.50 | 526.46 |
| 3.06 | 11.40 | 51.76 | 499.96 |
| 2.09 | 12.67 | 57.50 | 448.20 |
| 1.46 | 13.41 | 60.87 | 390.70 |
| 1.04 | 13.34 | 60.58 | 329.83 |
| 0.77 | 33.25 | 150.94 | 269.25 |
| 0.28 | 26.06 | 118.31 | 118.31 |

| | | |
|---|---|---|
| AVERAGE DIAMETER= | 21.6 | MICRONS |
| AVERAGE MASS = | 5.52 | *10**-8 GRAMS |
| AVERAGE DIAMETER MASS= | 28.6 | MICRONS |
| ENTIRE EARTH INFLUX= | 59882.7 | METRIC TONS /YEAR |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| COLBY BAY | SEA ICE | 34 | 3.0 |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 6.75 | 0.15 | 0.68 | 535.42 |
| 5.15 | 0.42 | 1.89 | 534.74 |
| 4.59 | 1.41 | 6.39 | 532.85 |
| 4.04 | 5.84 | 26.50 | 526.46 |
| 3.06 | 11.40 | 51.76 | 499.96 |
| 2.09 | 12.67 | 57.50 | 448.20 |
| 1.46 | 13.41 | 60.87 | 390.70 |
| 1.04 | 13.34 | 60.58 | 329.83 |
| 0.77 | 33.25 | 150.94 | 269.25 |
| 0.28 | 26.06 | 118.31 | 118.31 |

AVERAGE DIAMETER= 21.6 MICRONS
AVERAGE MASS = 5.52 *10**-8 GRAMS
AVERAGE DIAMETER MASS= 28.6 MICRONS
ENTIRE EARTH INFLUX= 59882.7 METRIC TONS /YEAR

LOCATION ICE TYPE

SEA ICE

SAMPLE NUMBER COMPOSITE

LENGTH METERS

| SIZE INTERVAL (MICRONS) | SPHERULE NUMBERS | PERCENTAGE | CUMULATIVE PERCENTAGE | CUMULATIVE NUMBER OF SPHERULES |
|---|---|---|---|---|
| 5 | 61 | 8.2 | 8.2 | 744 |
| 10 | 66 | 8.9 | 17.1 | 683 |
| 15 | 133 | 17.9 | 34.9 | 617 |
| 20 | 156 | 21.0 | 55.9 | 484 |
| 25 | 145 | 19.5 | 75.4 | 328 |
| 30 | 81 | 10.9 | 86.3 | 183 |
| 35 | 32 | 4.3 | 90.6 | 102 |
| 40 | 23 | 3.1 | 93.7 | 70 |
| 45 | 18 | 2.4 | 96.1 | 47 |
| 50 | 12 | 1.6 | 97.7 | 29 |
| 55 | 5 | 0.7 | 98.4 | 17 |
| 60 | 2 | 0.3 | 98.7 | 12 |
| 65 | 2 | 0.3 | 98.9 | 10 |
| 70 | 1 | 0.1 | 99.1 | 8 |
| 75 | 5 | 0.7 | 99.7 | 7 |
| 80 | 1 | 0.1 | 99.9 | 2 |
| 85 | 0 | 0.0 | 99.9 | 1 |
| 90 | 0 | 0.0 | 99.9 | 1 |
| 95 | 0 | 0.0 | 99.9 | 1 |
| 100 | 0 | 0.0 | 99.9 | 1 |
| 105 | 0 | 0.0 | 99.9 | 1 |
| 110 | 0 | 0.0 | 99.9 | 1 |
| 115 | 0 | 0.0 | 99.9 | 1 |
| 120 | 0 | 0.0 | 99.9 | 1 |
| 125 | 0 | 0.0 | 99.9 | 1 |
| 130 | 0 | 0.0 | 99.9 | 1 |
| 135 | 0 | 0.0 | 99.9 | 1 |
| 140 | 0 | 0.0 | 99.9 | 1 |
| 145 | 1 | 0.1 | 100.0 | 1 |

| LOCATION | ICE TYPE | SAMPLE NUMBER | LENGTH METERS |
|---|---|---|---|
| | SEA ICE | COMPOSITE | |

| CUMULATIVE NUMBER OF SPHERULES PER SQUARE METER PER SECOND *10**-4 | MASS CALCULATIONS VOLUME (CUBIC CENTIMETERS) *10**-8 | MASS (GRAMS) *10**-8 | CUMULATIVE MASS (GRAMS) *10**-8 |
|---|---|---|---|
| 3.75 | 0.40 | 1.80 | 4740.41 |
| 3.45 | 3.44 | 15.62 | 4738.61 |
| 3.11 | 23.40 | 106.21 | 4722.99 |
| 2.44 | 65.05 | 295.31 | 4616.78 |
| 1.65 | 118.08 | 536.10 | 4321.47 |
| 0.92 | 113.99 | 517.50 | 3785.37 |
| 0.51 | 71.51 | 324.65 | 3267.88 |
| 0.35 | 76.72 | 348.31 | 2943.23 |
| 0.24 | 85.49 | 388.12 | 2594.91 |
| 0.15 | 78.18 | 354.94 | 2206.79 |
| 0.09 | 43.36 | 196.84 | 1851.85 |
| 0.06 | 22.52 | 102.22 | 1655.01 |
| 0.05 | 28.63 | 129.97 | 1552.79 |
| 0.04 | 17.88 | 81.16 | 1422.82 |
| 0.04 | 109.94 | 499.13 | 1341.66 |
| 0.01 | 26.69 | 121.15 | 842.53 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 0.0 | 0.0 | 721.38 |
| 0.01 | 158.89 | 721.38 | 721.38 |

| | | |
|---|---|---|
| AVERAGE DIAMETER | 22.6 | MICRONS |
| AVERAGE MASS = | 6.37 | *10**-8 GRAMS |
| AVERAGE DIAMETER MASS = | 30.0 | MICRONS |
| ENTIRE EARTH INFLUX = | 38418.7 | METRIC TONS /YEAR |

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## REFERENCES CITED


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