# Analysis of Convection Cells on Sputnik Planum on Pluto

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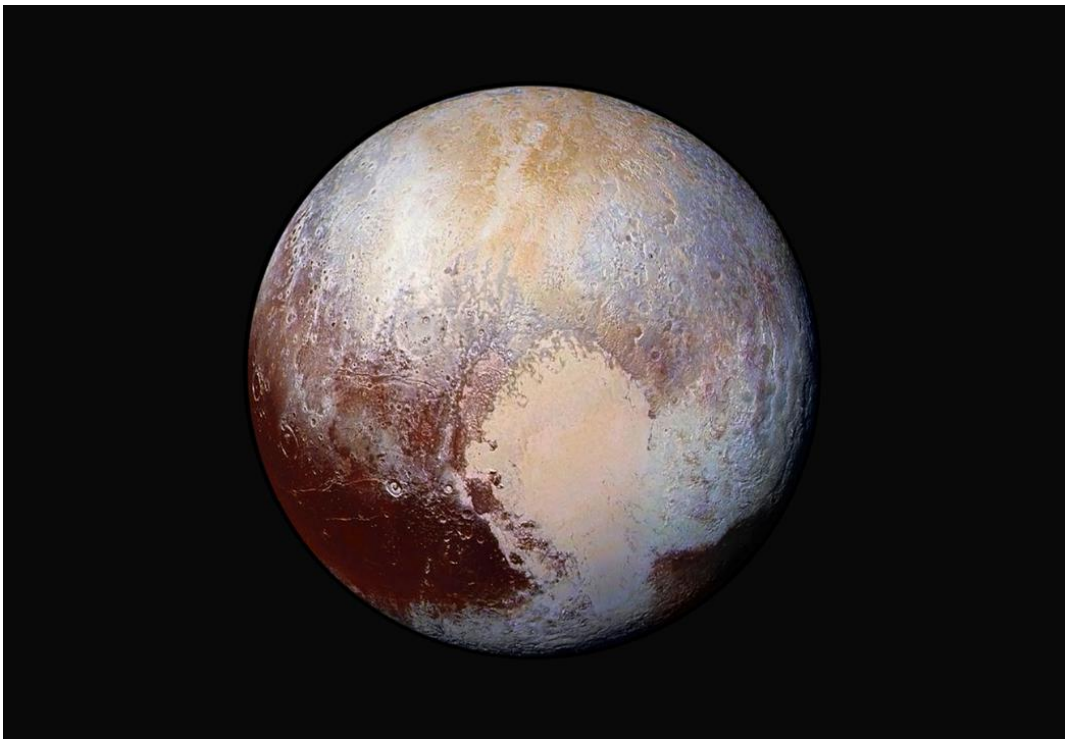
# Abstract

Pluto is a little-known icy dwarf planet located approximately 5.9 billion kilometers from the Sun (Frances, et. al, 2008). The New Horizons mission revealed new discoveries about Pluto, especially information about its geology, its atmosphere, and the geology and physical properties of its moons. One of the more anomalous features on Pluto are the ice polygons in Sputnik Planum, a young and geologically active icy plain. These ice polygons resemble the surface expression of Rayleigh-Bernard convection cells, and consist of volatile ices that make up nearly all of Sputnik Planum. The goal of this research was to measure the size and shape of these polygons and to use these measurements to evaluate the Rayleigh number and the minimum temperature difference required to drive convection. Measurements of the width and length of selected polygons show that they are of similar size and shape to one another, and that the shape tends to be elliptical. I assumed that the length of the polygons represented the size of the convection cells and used the average size to determine the dimensionless wavenumber k and the critical Rayleigh number for the onset of convection. These calculations suggest that the convection would require a small temperature difference to initiate, and that polygon formation is consistent with convection. I calculated convection initiation for convection cells with a range of aspect ratios, but the temperature difference required for convection is very small for all simulations. In addition, calculations were done to determine the minimum and maximum renewal rate of the cells using a maximum time limit of ten million years. Results showed that the renewal rate is likely on a scale of millimeters of movement per year, similar to plate tectonics.

## Introduction and Background

Pluto's existence was first predicted in 1905 by Percival Lowell and later discovered in 1930 by amateur astronomer Clyde Tombaugh (McBride, et. al, 2011). Until the recent NASA New Horizons mission, this icy object could only be observed through telescopes that provided low resolution images. Pluto has been of great interest to astronomers and planetary scientists since its discovery. New images of Pluto, sent back in the summer of 2015, revealed diverse, unusual features on Pluto's surface. These features include highly cratered areas, pitted terrain, icy plains, and features resembling the ice flow structures observed on glaciers on Earth. Many of these features were unexpected, due to Pluto's size and location in the Solar System (Figure 1).



(Figure 1: False color image of Pluto, courtesy of NASA. The heart shaped region is the Tombaugh Regio.)

Since Pluto's discovery, researchers have determined many fundamental physical and orbital characteristics of this icy object. Pluto is approximately 5.9 billion kilometers from the Sun and has a highly elliptical orbit. Due to its distance from the Sun and the shape of its orbit, one Plutonian year is equal to about 248 Earth years, and has an estimated rotation period of little

more than 6 Earth days (Frances, et. al 2008). Pluto rotates on its orbital plane with an axial tilt of 122 degrees and an axial inclination of 119.6 degrees, which results in a retrograde rotation. This in turn results in extreme seasonal variations of temperature on Pluto's surface, which is estimated to be approximately 40 K (McBride, et. al, 2011). In addition, this tilt seasonally exposes Pluto's polar regions to the faint light that it receives from the Sun. Compared to the planets in the Solar System, it is very small in size, with a radius of 1,152 kilometers (Frances, et. al, 2008). Pluto also has five moons; Charon (the largest moon), Styx, Nix, Kerberos, and Hydra. Previous studies done by Moore and McKinnon in 2016 have speculated that according to its calculated density and observed albedo, Pluto is composed of silicate rock, water ice, and various organic compounds in the form of volatile ices. However, not much information was known about Pluto prior to the New Horizons mission, due to its inaccessibility.

In order to gain access to Pluto, NASA launched the New Horizons spacecraft on January 19$^{th}$, 2006. This was the first reconnaissance mission of Pluto and the Kuiper Belt. Its purpose is to explore icy objects such as Pluto, and to determine how they may have evolved over time. In the summer of 2015, the New Horizons spacecraft performed a six-month long flyby study of Pluto and its moons. It is currently traveling farther into the Kuiper Belt to study other icy worlds at the edges of the Solar System with the goal of performing another flyby study in 2019.

The New Horizons spacecraft uses several different instruments to acquire data. These instruments include: Alice, Ralph, SDC, LORRI, SWAP, PEPSSI, and REX (Stern, 2008). Alice, known as the Ultraviolet Imaging Spectrometer, is an instrument used to detect wavelengths in the ultraviolet region of the electromagnetic spectrum. Its main purpose is to scan Pluto's atmosphere and determine its composition and atmospheric structure. Ralph is an imaging telescope used to take images in visible and near infrared wavelengths. It is separated into two components – the Multispectral Visible Imaging Component (MVIC) and the Linear Etalon Imaging Spectral Array (LEISA). Both of these components take high resolution pictures of the surfaces of Pluto and Charon, and contribute to the study of their geology, geomorphology, and surface composition (Reuter, et. al, 2008). The SDC is the Student Dust Counter; an instrument developed by students at the University of Colorado, meant to detect dust grains in space as the spacecraft travels through the Solar System (Stern, 2008). This information would also provide a better understanding of collision rates in the outer edges of the Solar System. LORRI stands for

Long-Range Reconnaissance Imager, and it is another high resolution camera attached to the spacecraft. Its purpose is to take pictures of the surfaces of Pluto and Charon to determine if there is any evidence of geologic activity (Cheng, et. al, 2007). Another instrument is Solar Wind at Pluto (SWAP), whose main purpose is to study how Pluto interacts with solar wind at its distance from the Sun. The Pluto Energetic Particle Spectrometer Science Investigation instrument (PEPSSI) is used to study particles involved with the interaction between the solar wind and Pluto's atmosphere. Another instrument is the Radio Science Experiment (REX), which takes measurements for temperature and pressure in Pluto's atmosphere (Stern, 2008).

The pictures taken by the imaging systems revealed that the geology of Pluto and its moon Charon is far more complex than expected. There appears to be a variety of organic compounds in the form of ices, including water ice, nitrogen ice, methane ice, and carbon monoxide ice. Some regions display active ice flow and cryovolcanism, while others are heavily cratered with an estimated crater retention age of at least four billion years (Moore, et. al 2016). Several papers, such as *Geomorphological Mapping of the Encounter Hemisphere on Pluto* (White, et. al, 2016) and *The geology of Pluto and Charon through the eyes of New Horizons* (Moore, et. al, 2016) have taken a special interest in a heart-shaped icy plain, named Tombaugh Regio. While the eastern lobe is intriguing in its intricate bladed terrain, the focus of this interest goes to the western lobe of Tombaugh Regio – a flat plain called Sputnik Planum (SP). This region consists mainly of nitrogen ice, with some small amounts of water and carbon monoxide ice. It has an estimated area of 870,000 $km^2$ and is interpreted to be an unusually young surface (see Figure 1). Studies done by Moore, McKinnon, and Grundy have not confirmed any impact craters on the surface of SP, which suggests that the icy plain is very young and estimated to have a crater retention age of less than ten million years (Moore, et. al 2016; McKinnon, et. al 2016; Grundy, et. al 2016). Images from the New Horizons spacecraft revealed that SP displays a peculiar cellular pattern, similar to ice polygons. Each of these cells are surrounded by troughs that have been estimated to be one hundred meters deep, with the center of these cells raised by about fifty meters, relative to the edges of the cells. The western border of SP comprises a broken mountain chain of angular blocks, possibly composed of volatile ices that have broken apart and reformed (Moore, et. al, 2016).

The discovery of these features raised many questions about the geologic processes that occur on or near the surface of icy worlds, especially those lying in the Kuiper Belt at the outer edges of the Solar System. What kind of geologic processes could generate the features such as the ice polygons in Sputnik Planum? Researching Pluto and its moons is critical to understanding icy objects and will help us understand the processes that formed such features in the past, and will continue to modify our understanding of it in the future.

## Hypotheses

The focus of my research is the polygonal features of Sputnik Planum. I had several different hypotheses on the formation process of the features:

1. The polygonal features in SP are formed by convection cells with a characteristic length scale.
2. For surface convection to occur on Pluto, the critical temperature difference required for the onset of convection must be small. To test for this, the polygon size can be used to determine the critical Rayleigh number for convection, and therefore determine the critical temperature difference.
3. The convection rate is higher than the minimum convection rate; this can be determined from the apparent age of SP.

The null hypothesis is that there is a random or wide distribution of convection stability, which means that there is no method or characteristic length scale for these features. Therefore:

1. There is no characteristic length scale of polygon size.
2. With no characteristic length scale of polygon size, there is no length scale that can be used to constrain the wavenumber k, the critical Rayleigh number, and the minimum temperature difference required to drive convection.

To test these hypotheses, I measured the size and shape of polygons in three different images. These data were used to determine the size of the cells, polygon shape, and – by assuming different aspect ratios – the characteristics of convection.

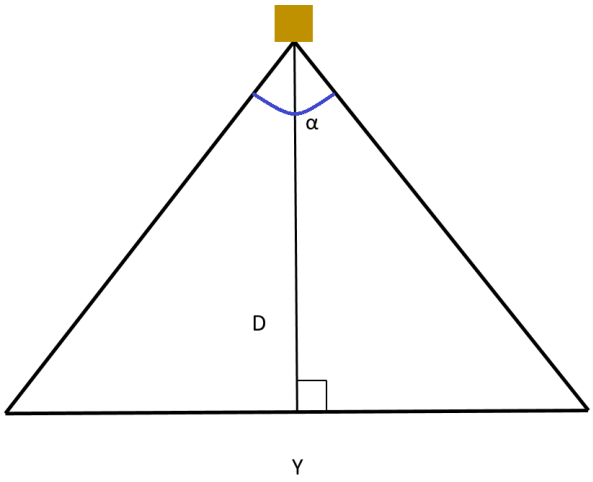
# Methods

I will present my methods in three sections. First, I will describe how I acquired the measurements and calculated size and shape characteristics of the polygonal features in each image. Second, I will describe my methods of analyzing the data using various equations to determine variables such as the critical Rayleigh number. Lastly, I will explain my method of selecting the sites and taking measurements.

## Data Acquisition

In order to approach this problem I downloaded data available to the public at the Planetary Data Systems (PDS) site online. These data were taken with various instruments of the New Horizons spacecraft. This equipment was used to observe and take measurements on Pluto, including data on its atmosphere and high resolution pictures of its surface. I used data from the RALPH and LORRI instruments to conduct my research. I downloaded both the raw and calibrated data from PDS; the files are all in ".fit" format, which required a separate software to open the files. I downloaded the SAOImage ds9 imaging software, which allowed me to view the images and manipulate properties including color, scale, and region. I identified several images of SP, three of which I used to take distance measurements. I was able to take measurements of the polygon dimensions with the ruler tool, but the actual distance needed to be calculated, as the ruler tool only returned the angle of view of the image. This is the angle of aperture of the camera for that distance, measured in degrees. To compute this distance in meters, I first calculated the resolution of the image in meters per pixel. Each of the files on PDS came with a text that explained basic parameters pertaining to the image, including information on date and time that the image was taken, and time of camera exposure. In order to calculate the image resolution, I needed to know the pixel size of the image, the distance of the spacecraft from the surface of Pluto, and the angular aperture of the camera. I then used the following equation:

$$Y = \left(D * \tan\left(\frac{a}{2}\right)\right) * 2 \qquad \text{(Eq-1)}$$




(Figure 2: Visual representation of Equation 2.)

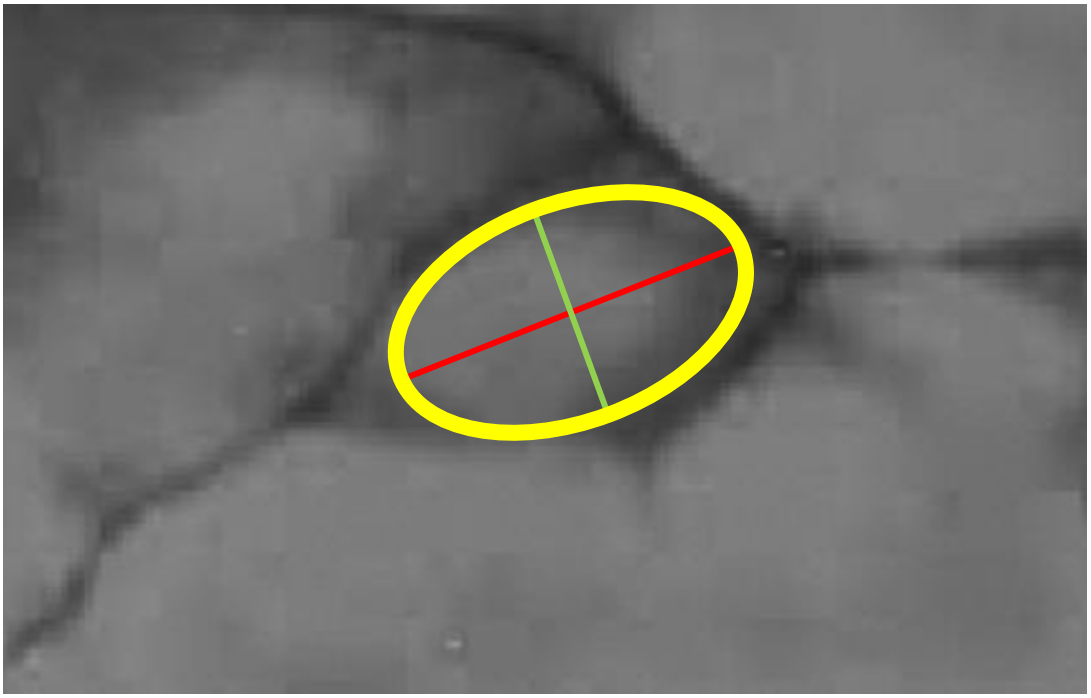
In Eq. 1 and Figure 2, Y is the width or the distance measured, D is the distance of the spacecraft from the surface, and a is the angular aperture of the camera, represented by the golden box.

Table 1 shows the resolutions for the images I identified and used to measure and analyze the polygonal features on SP.

**Table 1: Pixel Resolution for Images Used for Measurements**

| File Name | Distance (km) | Resolution (meters/pixel) |
|---|---|---|
| lor_0299174713_0x632 | 79893.106 | 394.8986432 |
| lor_0299174665_0x632 | 80544.651 | 398.1191242 |
| lor_0299174857_0x632 | 77939.448 | 385.2420291 |

Assuming that the polygons are generally elliptical in shape, I then determined the short axis (width) and long axis (length) of each polygon in meters (Figure 3). With these data I created a graphical representation of the relationship between the width and length of each of the cells, and determined a size distribution of polygons, which I assumed also provided the size distribution of cells in the image.



(Figure 3: Close up of an individual polygonal feature; assumed to be generally elliptical in shape, with the red line representing length and the green line representing width.)

I additionally calculated the area, eccentricity, and flattening of each cell. The formula for the area of an ellipse is as follows:

$$A = \pi ab \qquad \text{(Eq-2)}$$

In this equation, $A$ is the ellipse area, $a$ is the semi-major axis (half of the measured length of the cell), and $b$ is the semi-minor axis (half of the measured width of the cell). The eccentricity $\varepsilon$ of an ellipse is defined by:

$$\varepsilon = \sqrt{\frac{a^2 - b^2}{a^2}} \qquad \text{(Eq-3)}$$

Lastly, the flattening of an ellipse $f$ measures the compression along the diameter of the cell, and is represented by:

$$f = \frac{a - b}{a} \qquad \text{(Eq-4)}$$

To calculate the uncertainty for the measurement of the width and the length of each of the cells, I made each measurement three times and found the standard deviation. The measurement error was likely a function of the size of the convection cell. In addition, there is an absolute uncertainty with regards to pixel resolution, in which the smallest possible error was the number of meters per pixel, which varies with each image. The standard deviation calculated for the overall size and shape for the cells can determine whether or not there is a wide range of values. This would in turn determine if there was a characteristic size and shape to the polygonal features measured.

## Determination of Critical Rayleigh Number and Minimum Temperature Difference to Drive Convection

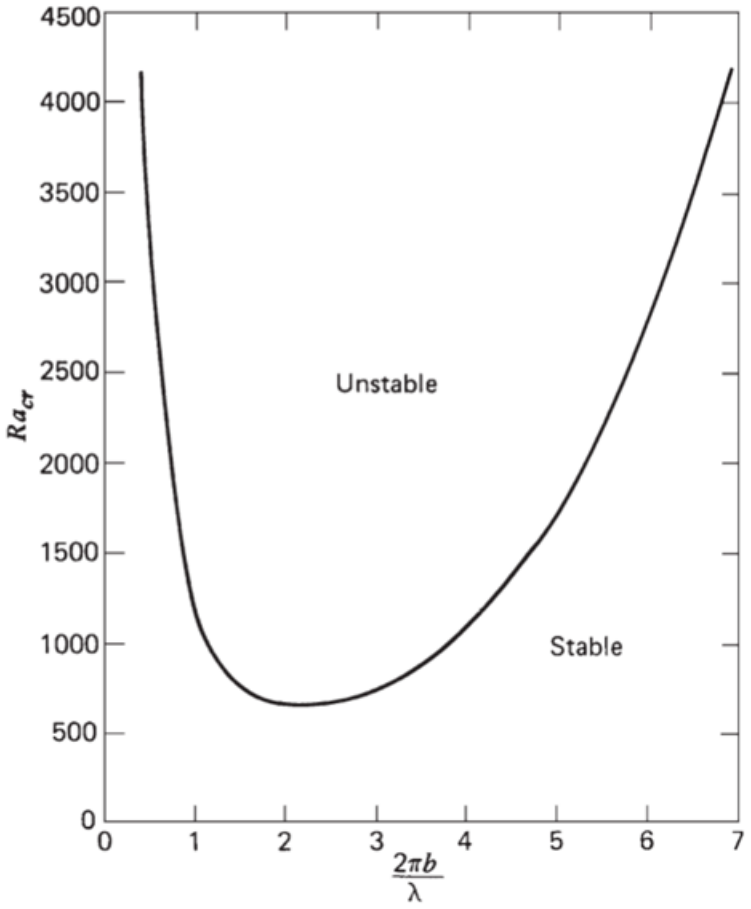
The size of the convection cells was used in the calculation of the critical Rayleigh number for convection cells. The equation to calculate the Rayleigh number is as follows:

$$Ra = \frac{(\pi^2 + \frac{4\pi^2 b^2}{\lambda^2})^3}{\frac{4\pi^2 b^2}{\lambda^2}} \quad \text{(Eq-5)}$$

In this equation, Ra is the Rayleigh number, λ is the length of the convection cell, and b is the cell height. The cell height is not known; therefore I took a range of aspect ratios of length to height and calculated the associated cell height, b. The critical Rayleigh number for the onset of convection is a function of the dimensionless wave number k. A graph of this relationship separates convecting materials from non-convecting materials is shown in Figure 4 (Turcotte, et. al 2014). The dimensionless wave number is represented by:

$$k = \frac{2\pi b}{\lambda} \quad \text{(Eq-6)}$$

In this equation, k is the dimensionless wave number, b is the height of the cell, and λ is the length of the cell. The height b was calculated from the various assumed aspect ratios that relate the length of the cell, λ, to the thickness, b.




(Figure 4: Critical Rayleigh number (y axis) versus dimensionless wave number (x axis))

The above figure represents the graph of the critical Rayleigh number as a function of the dimensionless wavenumber k. I used this graph to determine the maximum value of the Rayleigh number that would generate stable convection cells for a specified aspect ratio and thickness. The curve in the graph represents the boundary between stable and unstable convection. I used a Gaussian 3rd order fit equation calculated directly from Figure 4 using a data fit program and MATLAB (see Appendix I). Once I had the value of the critical Rayleigh number, I used another version of the Rayleigh number to determine the temperature difference required for the onset of convection:

$$Ra = \frac{\rho_0 g \alpha_v (T_1 - T_0) b^3}{\mu \kappa} \qquad \text{(Eq-7)}$$

In this equation, Ra is the Rayleigh number, $\rho_0$ is the density of the convecting material, g is the gravitational acceleration of Pluto which is at 0.7 m/s$^2$ (McBride, et. al, 2011), and $\alpha_v$ is the thermal expansion coefficient of the material (Heberlein, et. al 1970). $T_1$ and $T_0$ are the different temperatures at the surface and at the bottom of the convection cell, and b is the height of the cell. The value for $\mu$ is the viscosity of the convecting material, and $\kappa$ is the thermal diffusivity of the material (Forster 1963; calculated value, see Equation 9).

Once I determined the critical temperature difference, I used the maximum age of SP and the Peclet number, which is a dimensionless number that represents the ratio of convection to thermal diffusion. It is expressed as:

$$Pe = \frac{bv_x}{\kappa} \quad \text{(Eq-8)}$$

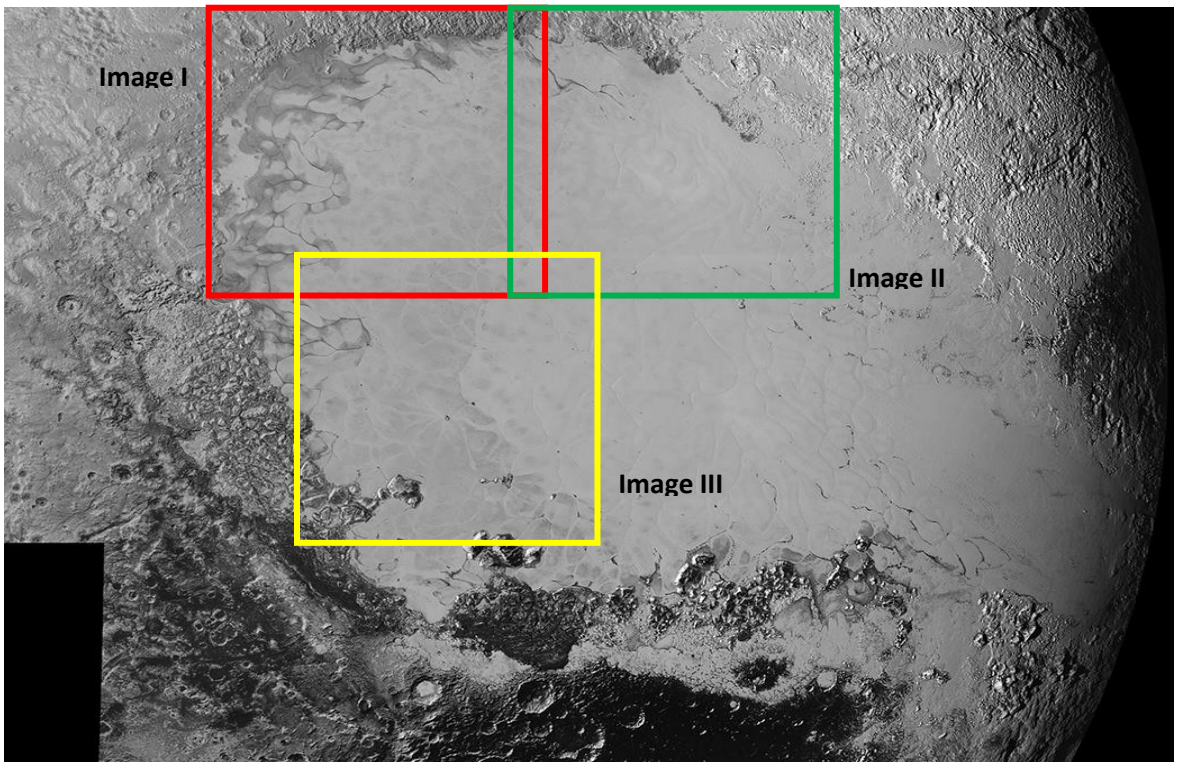
In which *Pe* is the Peclet number, *b* is the thickness, $v_x$ is the velocity, and $\kappa$ is the thermal diffusivity. A Peclet number equal to 1 has a convection rate equal to the thermal diffusivity. Therefore, a Peclet number slightly above 1 would correspond with the onset of convection. Therefore, I solved for the minimum velocity associated with convection for the range of aspect ratios previously described.

The other constraint on the convection velocity is the age of Sputnik Planum, which is estimated to be approximately 10 million years old. The velocity associated with the renewal of the surface of SP is distance/time. The distance in this expression could be the length of the individual cells, which would generate a small velocity; or it could be the length of the entire SP, which would generate a far higher velocity. To calculate for the minimum velocity associated with this renewal, I used the average length of the measured cells for each image. To calculate for the maximum velocity, I used the entire area of SP for the length scale. For both calculations, I assumed that the maximum time limit for renewal was at most 10 million years, due to the lack of craters on the surface of SP.

## Selection of Sites and Measurement of Geomorphic Data

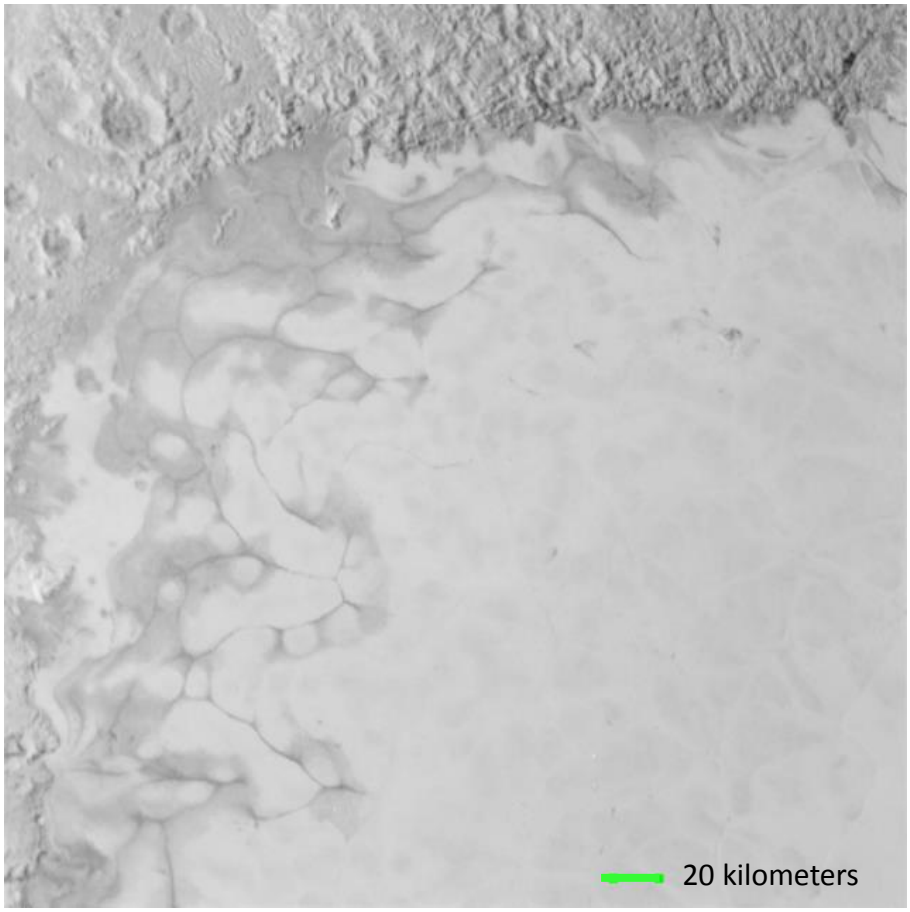
I used three different images taken by the LORRI instrument on the New Horizons spacecraft to take measurements of the cells. The three images were selected because they had the best resolution of the features, but were also randomly distributed on SP (Figure 5). Image I

is bounded by the red box, Image II by the green box, and Image III from the yellow box. These three images were the clearest images that I found and was able to use to take measurements.

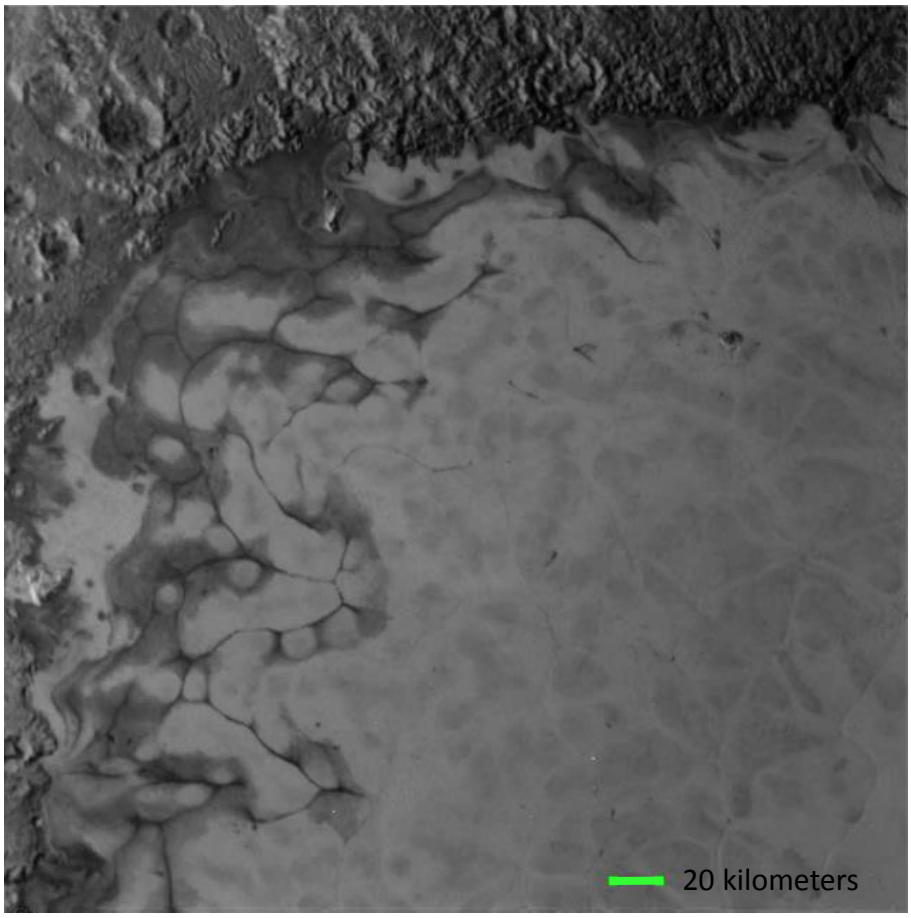



(Figure 5: Location of Images I, II, and III on SP. Image I surrounded by red, Image II by green, and Image III by yellow. Image of SP courtesy of NASA. No image scale available.)

The first image file I used was labeled lor_0299174713_0x632_sci.fit (Image I), taken on July 14th, 2015. I changed the image scale settings from linear to squared in order to have more contrast to more easily identify the individual cells.



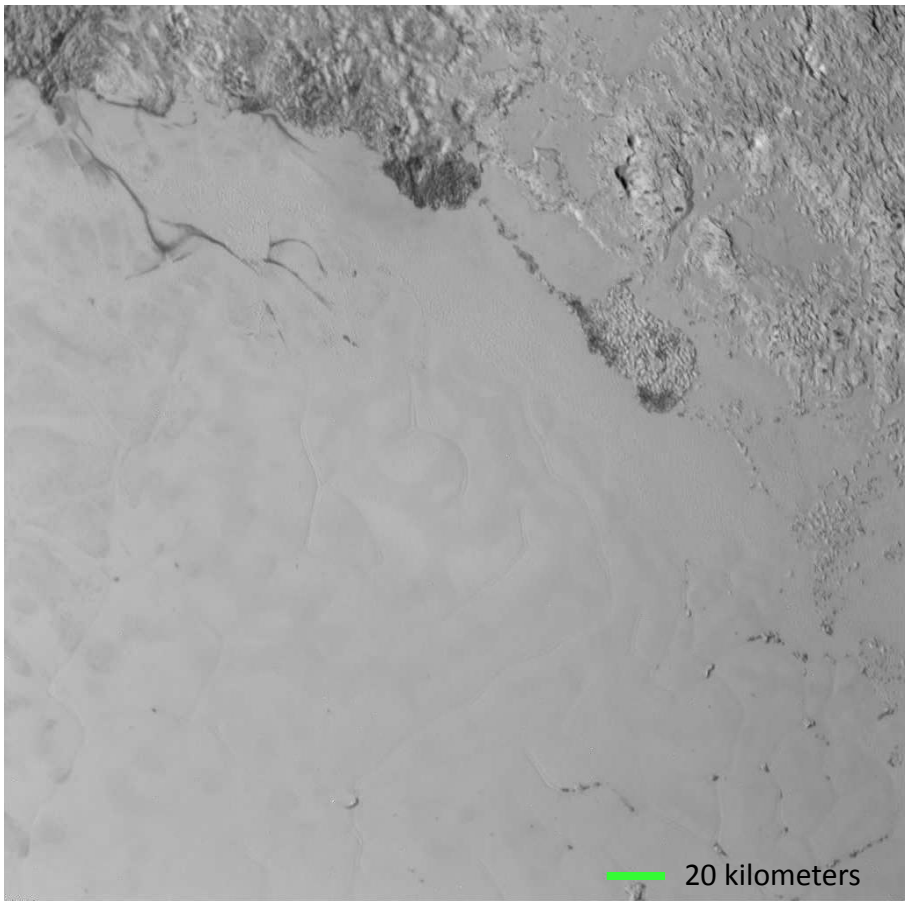

(Figure 6: Gray color, linearly scaled Image I.)



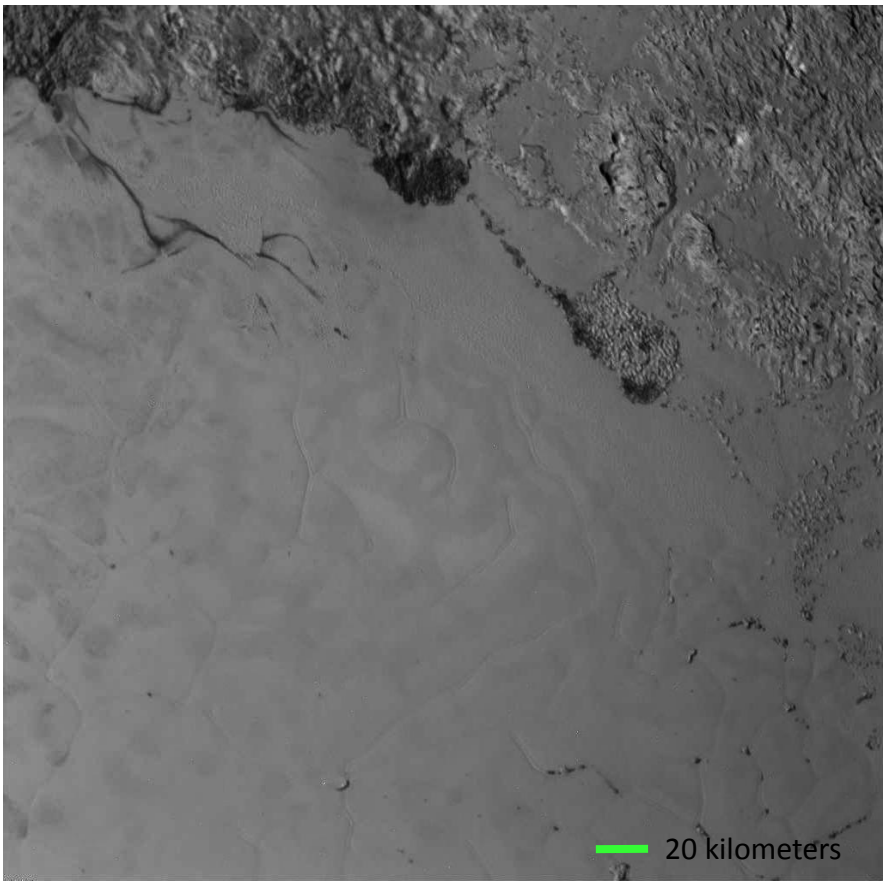

(Figure 7: Gray color, values squared scaling of Image I.)

Figure 6 shows the image scaled linearly, and Figure 7 shows the image scaled to the image values squared. This resulted in a far clearer image, with easily seen features such as the mountainous border of SP, a few craters, and especially the polygonal shapes characteristic of SP. Both versions of Image I were manipulated and saved using the SAOImage ds9 software. Using the ruler tool in the ds9 software, I was able to identify and measure the width and length of 118 different cells.

The second image I used was a file labeled lor_0299174665_0x632_sci.fit (Image II), taken on the same day as the previous image. I used both the linear and squared scaling as well as the gray color setting.



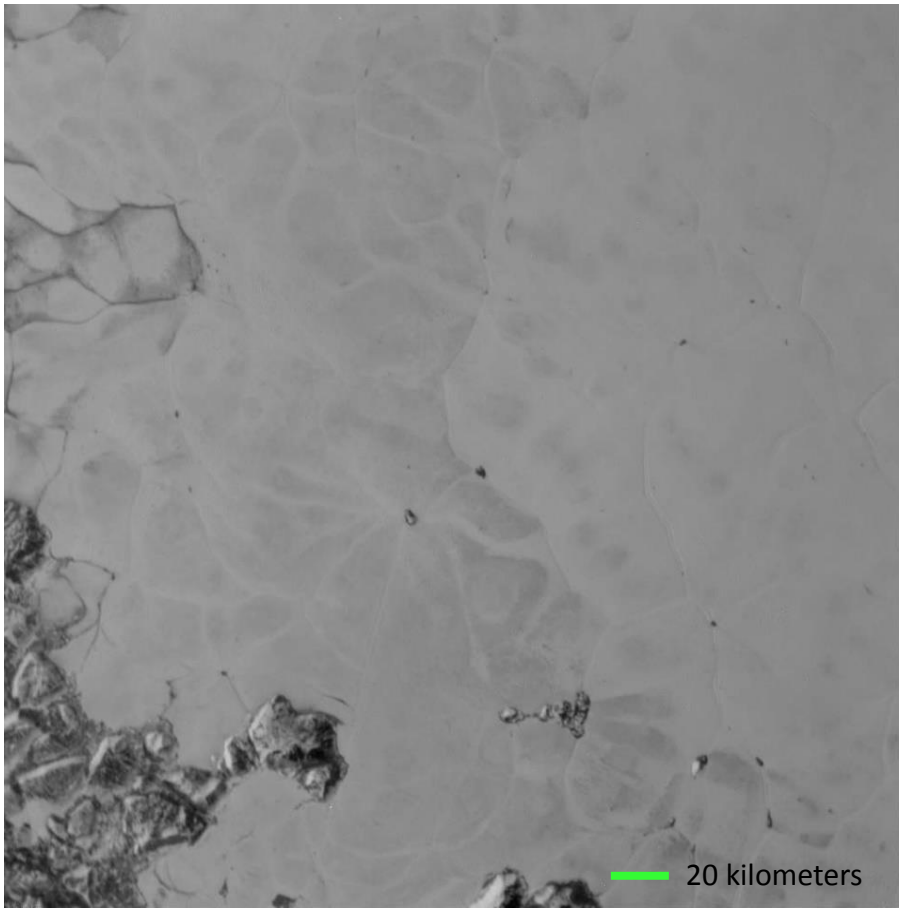

(Figure 8: Gray color, linearly scaled Image II.)



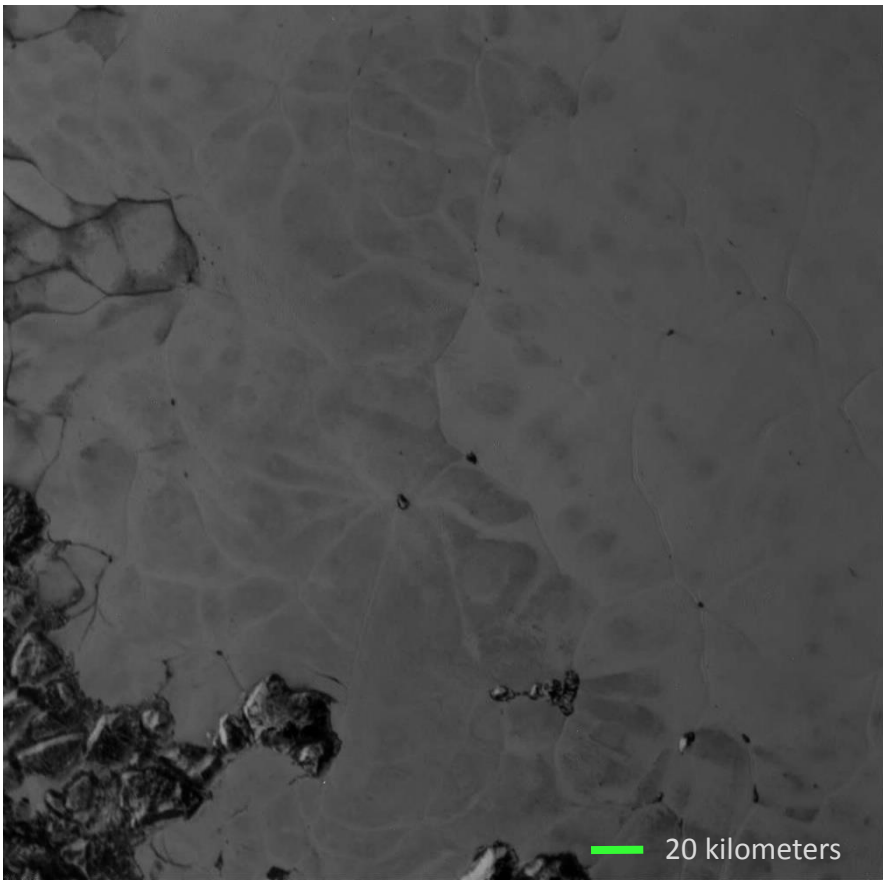

(Figure 9: Gray color, values squared scaling of Image II.)

Figure 8 shows Image II with linear scaling, and Figure 9 shows Image II with squared scaling. I was able to identify 88 individual cells in Image II.

The third image I used was labeled lor_00299174857_0x632_sci.fit (Image III), also taken on the same day as Images I and II. Figure 10 shows the image with linear scaling, and Figure 11 shows the image with squared scaling. In this image, I was able to identify 176 individual cells.




(Figure 10: Gray color, linearly scaled Image III.)




(Figure 11: Gray color, values squared scaling of Image III.)

In order to obtain these data from the above images, I first determined the image resolution with Equation 1 and converted the distances to meters. Each cell's width and length were measured three times, which was used to determine measurement error for each cell. The measurements were used to calculate the size and shape characteristics of each cell. Table 2 summarizes the results for the length, width, and shape characteristics for this image (refer to the Appendix for full data).

# Results

I will present the results in three sections: the measurements and the geomorphic data, the calculations of the critical Rayleigh number and critical temperature, and estimations of convection velocity constrained by the Peclet number and the maximum age estimates of the Sputnik Planum surface.

## Polygon Geomorphic Characteristics

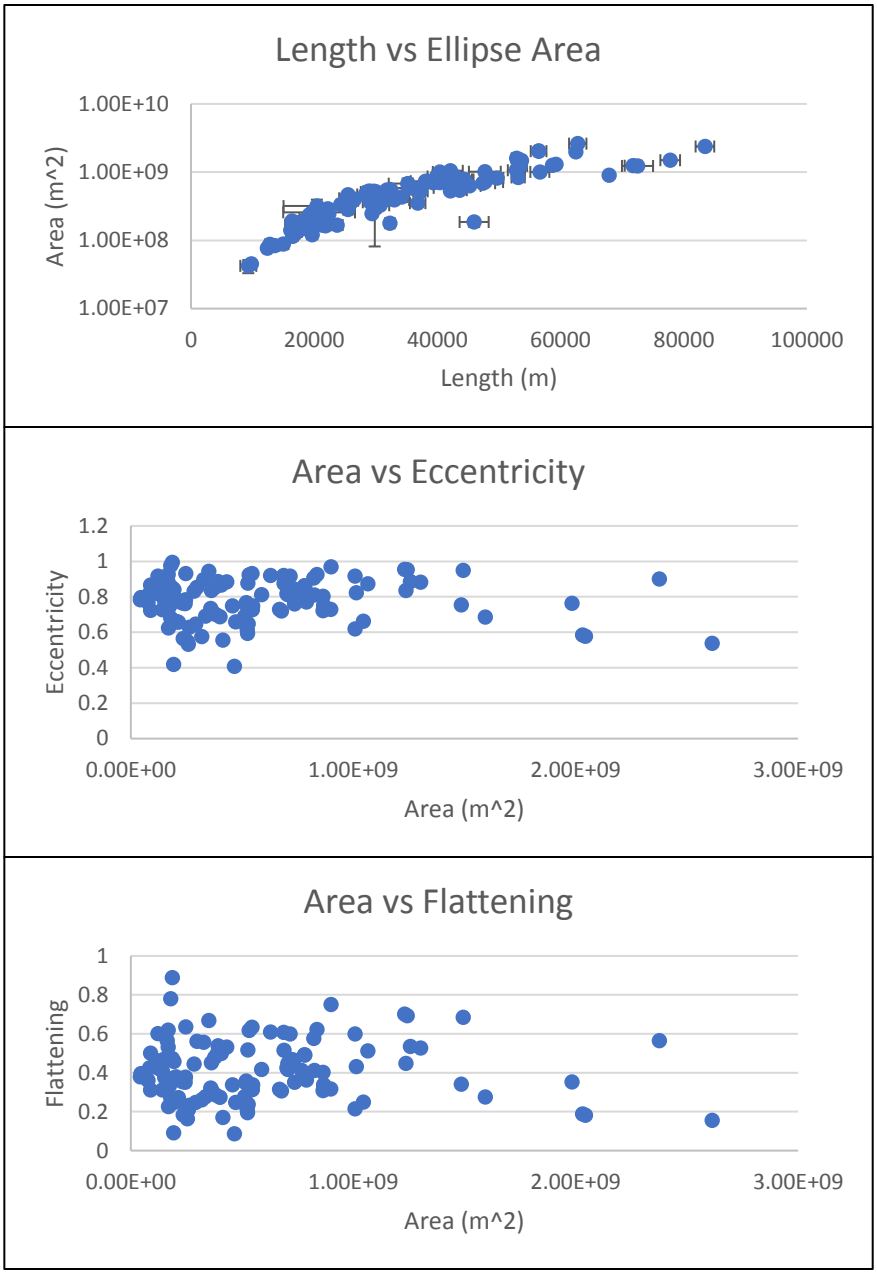
The results of the geomorphological measurements are shown in Table II. After measuring each individual cell's width and length three times each, I first took the average of those three measurements, then took the average of those measurements for the entire data set (see Appendix for full data). These data for Images I, II, and III were then combined and presented along with the mean and standard deviation. Polygon width, length, and area are all similar for the three measured sites. The mean width, length, and area are also all within the standard deviations of the other sites.

**Table II: Mean Width, Length, Area, and Shape of Polygonal Features**

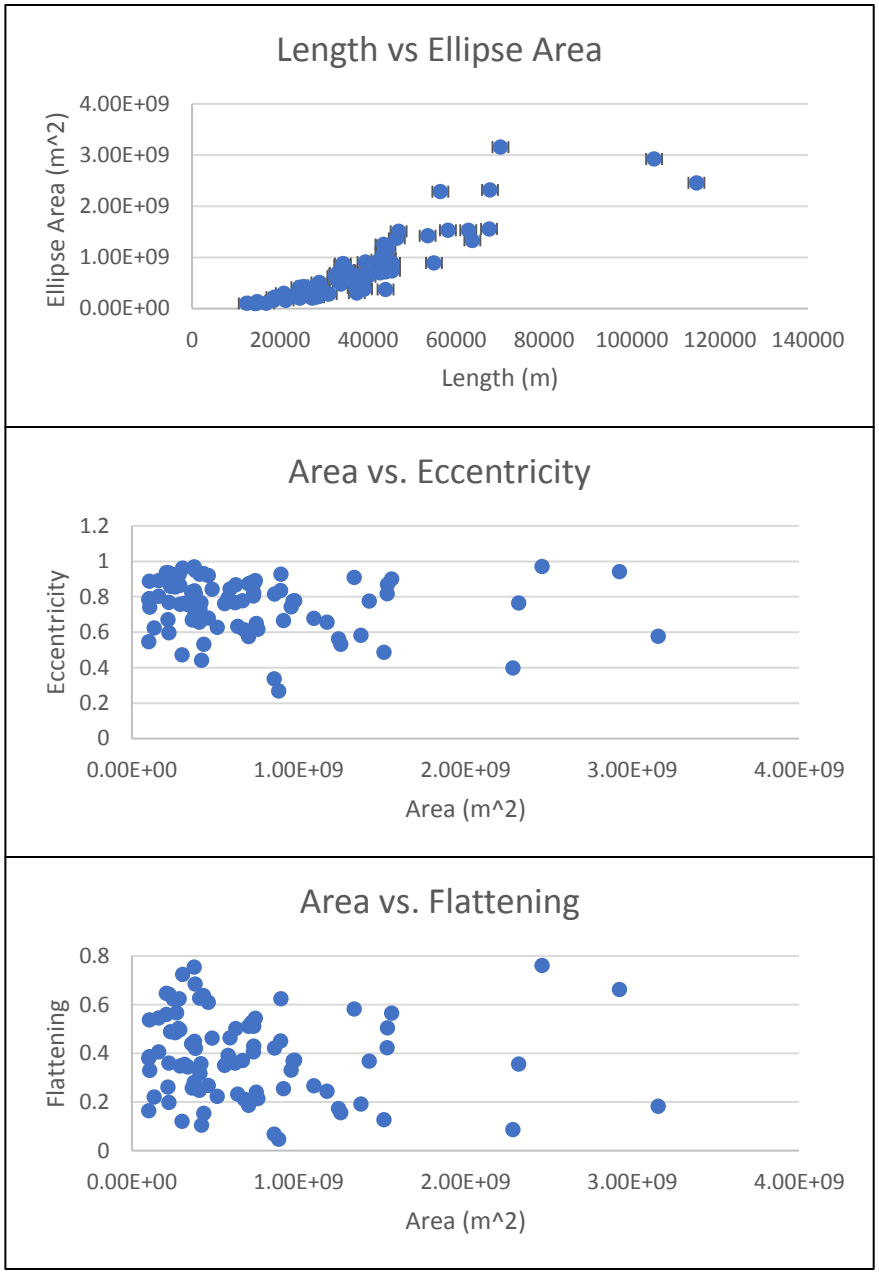
| Parameters | Image I Values | Image II Values | Image III Values | Combined Data |
|---|---|---|---|---|
| **Mean Width (km)** | 19.0 | 21.5 | 18.1 | 19.5 |
| **Width STDEV** | 8.54 | 9.74 | 7.82 | 8.70 |
| **Mean Length (km)** | 33.7 | 36.7 | 35.6 | 35.3 |
| **Length STDEV** | 15.4 | 16.9 | 16.0 | 16.1 |
| **Mean Area ($km^2$)** | 578 | 705 | 580 | 621 |
| **Mean Area STDEV** | 493 | 611 | 529 | 544 |
| **Mean Eccentricity** | 0.778 | 0.758 | 0.821 | 0.786 |
| **Eccentricity STDEV** | 0.120 | 0.152 | 0.012 | 0.095 |
| **Mean Flattening** | 0.406 | 0.391 | 0.463 | 0.420 |
| **Flattening STDEV** | 0.154 | 0.172 | 0.153 | 0.160 |

The results indicate that the area of the polygonal features that were identified varied with a high standard deviation, which was to be expected from the results of the mean width and length. This indicates a range of sizes of the polygonal features that was not observed in the shape statistics. The mean eccentricity and flattening for the cells have far smaller standard deviations as a percent of the value, and are close in value for the polygons in the different images. This implies that the overall shape of the cells is elliptical and does not vary widely across the images.

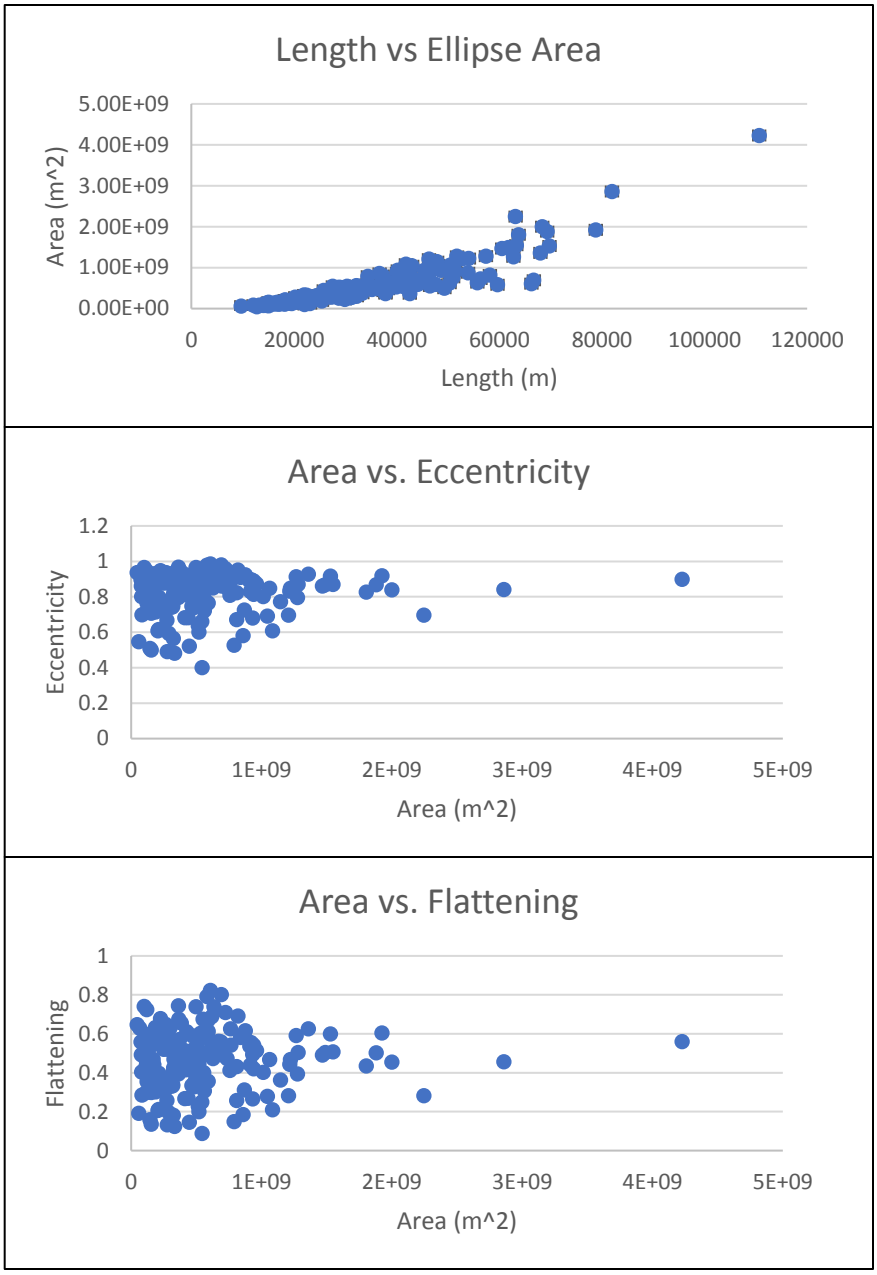
Calculations of size and shape characteristics of the cells visible in each of the three images yielded some interesting results. Figures 12-14 show the relationships between the size and shape characteristics of Images I, II, and III. According to the graphs, the size and shape characteristics of the polygonal features have similar trends. Area of the individual features increases with increasing length, and only a few of the cells are large enough to be considered outliers. The second graph shows that a majority of the features I measured have high eccentricity, which indicates that the features tend to be elliptical in shape. The third graph shows that although the features have a wide range of flattening factors, they are oblate in shape. This reinforces the idea that many of the individual cells are elliptical, rather than circular. The cells appear to increase in size with increasing elongation. This may indicate a preferred convection direction along the length of the cells. However, despite some variation, the size and the shape of the cells do not vary a great deal by orders of magnitude.




(Figure 12: a. Graph of Image I Length vs. Ellipse Area; b. Graph of Image I Area vs. Eccentricity; c. Graph of Image I Area vs. Flattening)




(Figure 13: a. Graph of Image II Length vs. Ellipse Area; b. Graph of Image II Area vs. Eccentricity; c. Graph of Image II Area vs. Flattening)




(Figure 14: a. Graph of Image III Length vs. Ellipse Area; b. Graph of Image III Area vs. Eccentricity; c. Graph of Image III Area vs. Flattening)

## Calculation of Critical Rayleigh Number and Minimum Temperature to Drive Convection

For each of the images, I used the average length of the cells to calculate the thickness according to a set aspect ratio. From there, I calculated the dimensionless wavenumber k (Eq-6), as well as the critical Rayleigh number (Eq-5). I was then able to back-calculate with the use of Equation 7 to determine the temperature difference required for the onset of convection. According to previous studies, the main constituent of the convecting material is nitrogen ice. Table III shows the material properties of nitrogen ice that I used in Equation 7:

**Table III: Material Properties of Nitrogen Ice**

| Constant | Value |
|---|---|
| **Density, ρ (kg/m$^3$) (Satorre)** | 850 |
| **Gravitational Acceleration, g (m/s$^2$) (McBride, et. al 2011)** | 0.7 |
| **Thermal Expansion Coefficient, $\alpha_v$ (1/K) (Heberlein, et. al 1970)** | 1.38 |
| **Viscosity, μ (Poise) (Forster 1963)** | 27800000 |
| **Thermal Diffusivity, κ (m$^2$/s)** | $6.12*10^{-7}$ |
| **Thermal Conductivity, λ (W/m*K) (Cook, et. al 1976)** | 0.7 |
| **Specific Heat Capacity, $c_p$ (J/(kg*K) (Trowbridge, et. al 2016)** | 1344.61 |
| **Surface Temperature, T (K) (Moore, et. al 2016)** | 40 |

The calculation of thermal diffusivity came from the formula:

$$\kappa = \frac{\lambda}{\rho c_p} \qquad \text{(Eq-9)}$$

In which $\kappa$ is the thermal diffusivity, $\lambda$ is the thermal conductivity, $\rho$ is the density, and $c_p$ is the specific heat capacity; all of which are physical properties of solid nitrogen (note that the symbol for thermal conductivity λ, is the same symbol used for length λ in Equations 5 and 6, but represent different values).

Tables IV shows the results calculated for the critical Rayleigh number, along with the same points for the wavenumber k on the stability curve for comparison (see Appendix I). Table V shows the results for the critical temperature difference required for the onset of convection.

**Table IV: Image I, II, and III Results for Critical Rayleigh Number**

| Aspect Ratio | Image I Thickness, b (km) | Image II Thickness, b (km) | Image III Thickness, b (km) | Wave number k | Critical Rayleigh number | Stability Curve |
|---|---|---|---|---|---|---|
| 0.2 | 6.73 | 7.34 | 7.11 | 1.26 | 950 | 857 |
| 0.4 | 13.5 | 14.7 | 14.2 | 2.51 | 671 | 672 |
| 0.6 | 20.2 | 22.0 | 21.3 | 3.77 | 983 | $1.00*10^{3}$ |
| 0.8 | 26.9 | 29.4 | 28.5 | 5.03 | $1.72*10^{3}$ | $1.75*10^{3}$ |
| 1 | 33.7 | 36.7 | 35.6 | 6.28 | $3.04*10^{3}$ | $3.16*10^{3}$ |
| 2 | 67.3 | 73.4 | 71.1 | 12.6 | $2.99*10^{4}$ | $1.69*10^{4}$ |
| 5 | 168 | 184 | 178 | 31.4 | $1.00*10^{6}$ | 414 |
| 10 | 337 | 367 | 356 | 62.8 | $1.57*10^{7}$ | 364 |

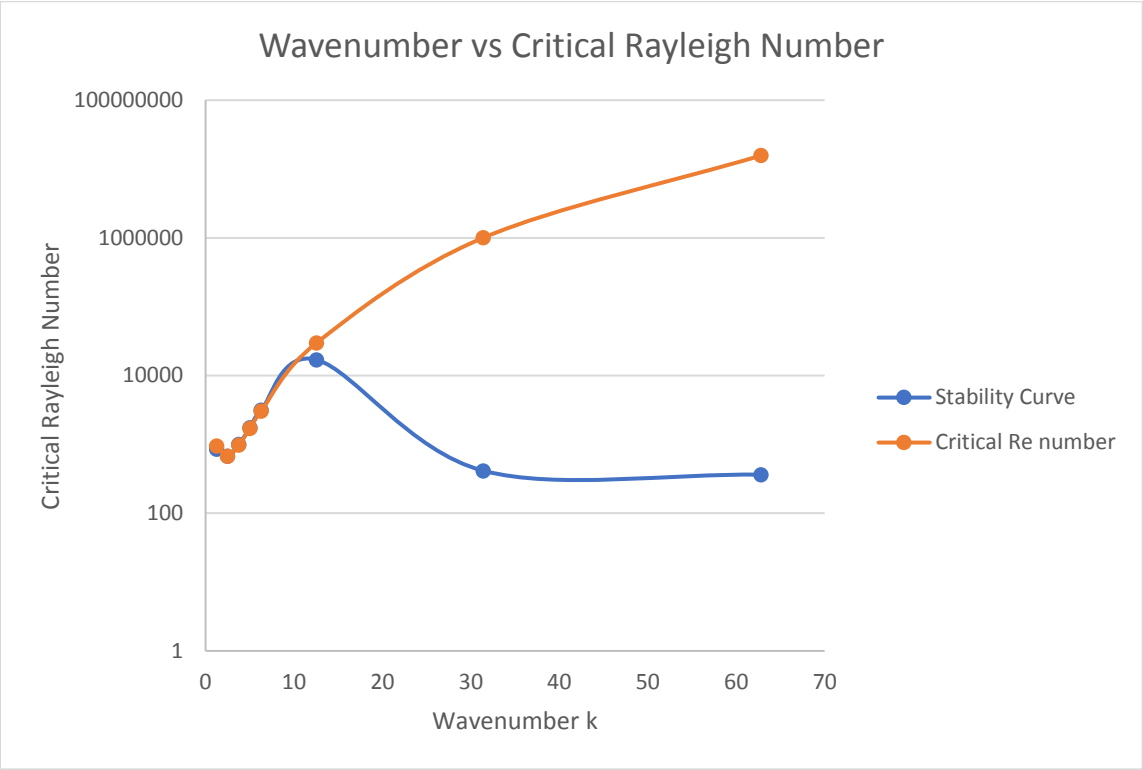
**Table V: Image I, II, and III Results for Critical Temperature Difference**

| Aspect Ratio | Image I ΔT (K) | Image II ΔT (K) | Image III ΔT (K) |
|---|---|---|---|
| 0.2 | $6.45*10^{-11}$ | $4.98*10^{-11}$ | $5.47*10^{-11}$ |
| 0.4 | $5.70*10^{-12}$ | $4.40*10^{-12}$ | $4.83*10^{-12}$ |
| 0.6 | $2.47*10^{-12}$ | $1.91*10^{-12}$ | $2.10*10^{-12}$ |
| 0.8 | $1.82*10^{-12}$ | $1.41*10^{-12}$ | $1.55*10^{-12}$ |
| 1 | $1.65*10^{-12}$ | $1.28*10^{-12}$ | $1.40*10^{-12}$ |
| 2 | $2.03*10^{-12}$ | $1.57*10^{-12}$ | $1.72*10^{-12}$ |
| 5 | $4.36*10^{-12}$ | $3.37*10^{-12}$ | $3.70*10^{-12}$ |
| 10 | $8.53*10^{-12}$ | $6.59*10^{-12}$ | $7.24*10^{-12}$ |

The results revealed that despite slight variations of calculated thickness due to varying lengths, the wavenumber k and the critical Rayleigh number (determined with Equations 5 and 6) were the same for all three images. The critical temperature difference for all three images,

calculated using the critical Rayleigh number (Eq-7), varied slightly for the three images but were all very small values.

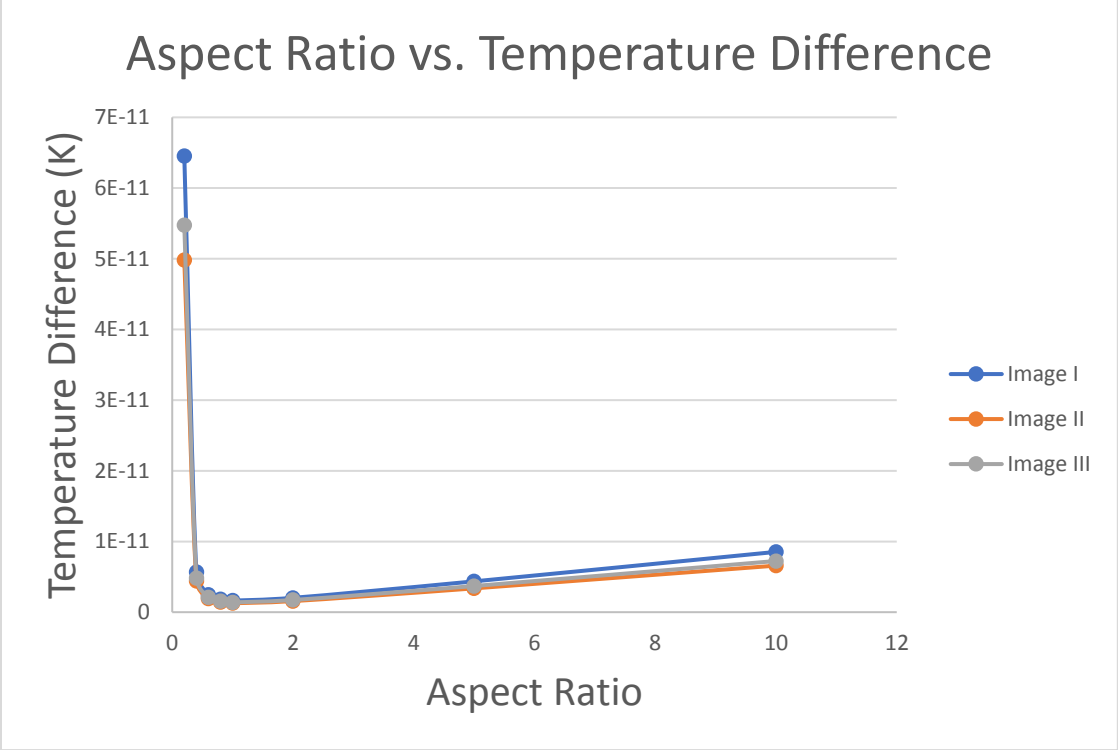
After taking measurements of the width and length of the cells, as well as solving for the thickness of the cells from specific aspect ratios, I was able to determine the critical Rayleigh number required for the onset of convection. Figure 15 shows the various values of the wavenumber k plotted against the calculated critical Rayleigh numbers and the stability curve (see Figure 4). My results showed that there appears to be a generally logarithmic growth for the critical Rayleigh number as the wavenumber (and thus, the thickness) of the cell increases.




(Figure 15: Graph of the wavenumber k versus the calculated critical Rayleigh number, plotted against the stability curve)

The stability of the convection cells themselves also vary as the thickness increases. When plotted in comparison to the stability curve, it appears that cells with a wavenumber above 12.6 (see Table IV) are unstable and do not support convection. In comparison with Figure 4, the function of the stability curve changes drastically as the wavenumber increases.

In addition to calculating the critical Rayleigh number required for the onset of convection, I was also able to calculate the required critical temperature difference. Figure 16 shows the relationship between the aspect ratio and the calculated temperature difference.




(Figure 16: Graph of relationship between aspect ratio and temperature difference for Images I, II, and III).

The graph shows a similar trend to Figure 15, although on a much smaller scale. The results yielded very small changes in temperature required for the onset of convection for the measured cells.

## Calculation of Peclet Number and Constraints on Velocity of Convection

The final calculations were to solve for the convection velocity, or rate of renewal, for the surface of SP. This required the use of the Peclet number (Eq-9), and were calculated two ways for the minimum and maximum rate of renewal. In order to perform the calculations, I needed to keep in mind that the crater retention age of SP is at most 10 million years – a number which factored into calculations for both rates. The results for the velocity for each of the images show

that the rate of renewal is a fast process on the scale of millions of years. Tables VI, V, and VI show the results of the minimum and maximum rates for Image I:

**Table VI: Image I Results for Velocity**

| **Peclet Number** | **Min. velocity, below mean length (mm/yr)** | **Min. velocity, mean length (mm/yr)** | **Min. velocity, above mean length (mm/yr)** |
|---|---|---|---|
| 1 | 1.82 | 3.37 | 4.91 |
| **Peclet Number** | **Thickness, b (km)** | **Velocity (mm/yr)** | **Max. velocity (m/yr)** |
| 1 | 6.73 | 2.87 | 12.9 |
| - | 13.5 | 1.43 | 6.46 |
| - | 20.2 | 0.96 | 4.31 |
| - | 26.9 | 0.72 | 3.23 |
| - | 33.7 | 0.57 | 2.58 |
| - | 67.3 | 0.29 | 1.29 |
| - | 168 | 0.12 | 0.52 |

**Table VII: Image II Results for Velocity**

| **Peclet Number** | **Min. velocity, below mean length (mm/yr)** | **Min. velocity, mean length (mm/yr)** | **Min. velocity, above mean length (mm/yr)** |
|---|---|---|---|
| 1 | 1.98 | 3.67 | 5.36 |
| **Peclet Number** | **Thickness, b (km)** | **Velocity (mm/yr)** | **Max. velocity (m/yr)** |
| 1 | 7.34 | 2.63 | 11.9 |
| - | 14.7 | 1.32 | 5.93 |
| - | 22.0 | 0.88 | 3.95 |
| - | 29.4 | 0.66 | 2.96 |
| - | 36.7 | 0.53 | 2.37 |
| - | 73.4 | 0.26 | 1.19 |
| - | 184 | 0.11 | 0.47 |

**Table VIII: Image III Results for Velocity**

| **Peclet Number** | **Min. velocity, below mean length (mm/yr)** | **Min. velocity, mean length (mm/yr)** | **Min. velocity, above mean length (mm/yr)** |
|---|---|---|---|
| 1 | 1.96 | 3.56 | 5.16 |
| **Peclet Number** | **Thickness, b (km)** | **Velocity (mm/yr)** | **Max. velocity (m/yr)** |
| 1 | 7.11 | 2.72 | 12.2 |
| - | 14.2 | 1.36 | 6.12 |
| - | 21.3 | 0.91 | 4.08 |
| - | 28.5 | 0.68 | 3.06 |
| - | 35.6 | 0.54 | 2.45 |
| - | 71.1 | 0.27 | 1.22 |
| - | 178 | 0.11 | 0.49 |

# Discussion

The measurements of the polygon sizes and shapes were used to constrain the wavenumber k and to determine the critical Rayleigh number. Figure 15 shows that the critical Rayleigh number follows, in part, the stability curve shown in Figure 4. However, it is apparent that the wavenumber – and thus, the aspect ratios – follow the trendline that marks the territory between stable and unstable convection cells. The calculations with aspect ratios between 0.2 and 1 were the points that stayed beneath or on top of the boundary of stability for the Rayleigh number. This implies that the polygonal features are consistent with convecting cells. The most stable convection cells are those with an approximate thickness between 6.73 – 36.7 kilometers, and for a realistic system, works in a connective regime.

Some previous workers, however, speculate that the thickness of the nitrogen ice layer is as small as 3 – 6 kilometers (McKinnon et. al, 2016), which is on the low end of my considerations. One other work surmised that there is a varying thickness of the convecting layer across Sputnik Planum as the nitrogen ice thickens in the center and thins out towards the edge of the plain (White, et. al 2017). This leads me to recommend further study of the physical characteristics of the nitrogen ice layer.

Calculations of the temperature change required to initiate convection suggested that very small, almost miniscule changes in temperature are required for the onset of convection for the measured cells. This indicates that convection is more than likely present across SP, and that very little change in heat is needed to start this process. Thus, any temperature perturbation, however trivial, would easily be enough to start convection in the plain. This would likely explain how it is possible for SP to have ongoing geologic activity at 5.9 billion kilometers from the Sun. These temperature changes could be generated by a very small internal temperature difference between the surface of Pluto and its interior. Another cause could be due to the fluctuation of heat provided by the faint radiation from the Sun. As Pluto rotates, there is a slight variation of temperature between night and day (Earle, et. al 2017). A third generator of temperature perturbation could be due to tidal heating. Pluto is orbited by five different moons, the largest of which is Charon. Interestingly, Charon is tidally locked to Pluto, on the opposite side of Sputnik Planum (Brozović, et. al, 2015). The gravitational interaction among these icy objects could be enough to generate at least the required amount of heat for the onset of convection.

White et. al (2017) and McKinnon et. al (2016) also concur with the idea of convection as one of the ongoing processes on Sputnik Planum; however, not as a widespread, complete process. Both papers state that the nitrogen ice layer convects in the sluggish lid regime; that convection on SP is a shallow process and does not convect to the bottom of the icy layer.

In addition to determining the stability of convection and the requirements for the onset of convection, I was able to calculate the minimum and maximum rates of renewal for the surface of SP. I used the estimated crater retention age of 10 million years as the limit of renewal (Moore, et. al 2016; McKinnon, et. al 2016; Grundy, et. al 2016), and the mean individual cell length to determine the minimum velocity for each of the images. My calculations yielded a renewal rate of at most 3.67 millimeters per year. With the approximated maximum thickness calculated from the smallest aspect ratio of 0.2, the total time of renewal for the ice to travel from surface to depth and back again is 4 million years. The maximum velocity was calculated according to the entire area of SP – approximately 870,000 $km^2$. This number, converted to meters, divided by the estimated crater retention age, and once more divided by calculated thickness of the cells yielded the maximum velocity. The maximum renewal rate at a thickness

calculated from an aspect ratio of 0.2 is 12.9 meters per year. The maximum turnover rate at this velocity with the greatest thickness (at an aspect ratio of 0.2) is 1,138 meters per year. The velocity calculated with a Peclet number of 1 yielded results closer to those of the minimum velocity. The greatest velocity calculated for a 0.2 aspect ratio was 2.87 millimeters per year, and a maximum turnover rate of approximately 5.1 million years. These results are far closer to the minimum rate of renewal, seem to be far more plausible than the maximum velocity calculated, and easily explains why the surface of SP is craterless. However, both the minimum and maximum rates of renewal for the convection cells suggest vigorous convection. White et. al (2017) and McKinnon et. al (2016) both estimate a renewal timescale of approximately 500,000 years; although it is important to note that the proposed convection in both these papers is shallow and not so extensive as what I proposed above.

# Conclusions

My initial hypotheses are as follows: first, that the polygonal features in Sputnik Planum are formed by convection cells with a characteristic length scale; second, that in order for surface convection to occur, the critical temperature difference required needed to be very small; and third, that the convection rate is higher than the minimum convection rate. My null hypothesis states that there is a random or wide distribution of convection stability, which means that first, there is no characteristic length scale of polygon size; and second, without this characteristic length scale, there cannot be a length scale used to constrain the wavenumber k, the critical Rayleigh number, and the minimum temperature difference required to drive convection.

I took measurements on three different images of Sputnik Planum with the SAOImage ds9 software. The resulting data and calculations support my first two hypotheses, but my calculated velocity of renewal was less than the mean minimum velocity for the cells. The calculations of size and shape characteristics did support my hypothesis in that there is a characteristic length scale to the formation of the cells. Most of the cells I measured were similar in size and shape proportions, and they had a length scale favoring an elliptical shape. My calculations for the critical Rayleigh number revealed that for aspect ratios between 0.2 and 1 there appears to be ongoing stable convection. The critical temperature difference calculated from these critical Rayleigh numbers also support my second hypothesis. They are very small – in fact, far smaller than expected. The results indicate that very little heat needs to be present to

commence convection. The renewal rates determined with the Peclet number do not support my initial hypothesis that the calculated rate itself would be higher than the minimum convection rate. My results show that the convection rate is only slightly smaller than the mean minimum convection rate, while the calculated maximum convection rate is far faster. These results are also at odds with the findings of other papers, which prompts the question of precisely how deep the convecting layer of the nitrogen ice actually is.

The results of this work further supports the idea that convection is the process that drives the formation of the polygonal features on Sputnik Planum. It also implies that the renewal rate of the nitrogen ice is a fast process on the geologic time scale, with a maximum of 5.1 million years for a 0.2 aspect ratio. Before the New Horizons spacecraft reached Pluto and Charon in 2015, it was not expected that Pluto would be so highly geologically active. This implies that there may yet be other icy worlds to discover at similar or greater distances from the Sun that have ongoing geologic activity. My modeling efforts for this work were limited by simply using Excel to calculate and graph the relationships among the size and shape characteristics, the critical Rayleigh number and the critical temperature difference. For future research, I would like to further explore these relationships, as well as study possible heat sources for convection on Sputnik Planum.

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# Appendix

## Appendix I: Equation and Table of Values for Stability Curve

$$y(x) = (a_1 * e^{\left(-\frac{x-b_1}{c_1}\right)^2}) + (a_2 * e^{\left(-\frac{x-b_2}{c_2}\right)^2}) + (a_3 * e^{\left(-\frac{x-b_3}{c_3}\right)^2})$$

| Constant | Value of Constant |
|---|---|
| **$a_1$** | $1.6601*10^4$ |
| **$a_2$** | $3.0128*10^{11}$ |
| **$a_3$** | $7.2381*10^{16}$ |
| **$b_1$** | 13.0088 |
| **$b_2$** | -12.8888 |
| **$b_3$** | $-1.5976*10^4$ |
| **$c_1$** | 4.9910 |
| **$c_2$** | 3.1128 |
| **$c_3$** | $2.7952*10^3$ |

The above equation is a Gaussian 3rd order fit equation, calculated using a data fit program and MATLAB. The variable x is represented by the dimensionless wavenumber k, and y(x) is represented by the critical Rayleigh number. The other constants are defined in the above table, provided by the data fit program and by MATLAB.

# Appendix II: Image I Raw Data (degrees)

| Cell Number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 1 | 0.0101889 | 0.0110729 | 0.0112827 | 0.0256731 | 0.0225959 | 0.0227445 |
| 2 | 0.00856655 | 0.0104153 | 0.0102081 | 0.0213586 | 0.0213584 | 0.0232489 |
| 3 | 0.0158937 | 0.0161068 | 0.0162228 | 0.0329787 | 0.0307616 | 0.0316036 |
| 4 | 0.00647016 | 0.00705868 | 0.00798878 | 0.0132545 | 0.013224 | 0.0140463 |
| 5 | 0.0117131 | 0.0129045 | 0.0132374 | 0.0187108 | 0.0184217 | 0.0186953 |
| 6 | 0.00710835 | 0.00753335 | 0.00758491 | 0.0127884 | 0.0119466 | 0.0129282 |
| 7 | 0.0138746 | 0.0136032 | 0.0146618 | 0.0198483 | 0.0211563 | 0.0227835 |
| 8 | 0.00711362 | 0.00853636 | 0.00783097 | 0.012031 | 0.0117757 | 0.0141323 |
| 9 | 0.00759309 | 0.00794404 | 0.00847549 | 0.0148437 | 0.0151138 | 0.0156001 |
| 10 | 0.0169661 | 0.0162812 | 0.0165483 | 0.0205219 | 0.0201273 | 0.021322 |
| 11 | 0.00797516 | 0.00889779 | 0.00923377 | 0.0126293 | 0.013308 | 0.0132323 |
| 12 | 0.0106578 | 0.0106648 | 0.0106577 | 0.011897 | 0.0118971 | 0.0114497 |
| 13 | 0.0189709 | 0.0193647 | 0.0198225 | 0.0290986 | 0.0289444 | 0.029698 |
| 14 | 0.0191499 | 0.0199159 | 0.0202309 | 0.0290247 | 0.0273996 | 0.0293856 |
| 15 | 0.0101386 | 0.0101098 | 0.0102383 | 0.0152272 | 0.016678 | 0.0152283 |
| 16 | 0.0104798 | 0.0115637 | 0.0117533 | 0.0130863 | 0.019701 | 0.0119678 |
| 17 | 0.00470635 | 0.00623742 | 0.00592658 | 0.0141246 | 0.0141238 | 0.0140907 |
| 18 | 0.00446544 | 0.00395572 | 0.00428282 | 0.00723703 | 0.00722973 | 0.00658976 |
| 19 | 0.00690017 | 0.00690028 | 0.00690031 | 0.0111812 | 0.0124952 | 0.0122012 |
| 20 | 0.00585231 | 0.00529161 | 0.00585243 | 0.0084505 | 0.00887572 | 0.00931664 |
| 21 | 0.0047288 | 0.00522413 | 0.00614759 | 0.010409 | 0.0108933 | 0.010977 |
| 22 | 0.0155063 | 0.0161696 | 0.0157159 | 0.0518028 | 0.0522853 | 0.0503828 |
| 23 | 0.00826328 | 0.00769832 | 0.00792965 | 0.0115877 | 0.0112338 | 0.0119693 |
| 24 | 0.0104067 | 0.0124775 | 0.0107845 | 0.0137783 | 0.0137396 | 0.0137399 |
| 25 | 0.0095559 | 0.0104364 | 0.00996559 | 0.0155705 | 0.0166361 | 0.0159264 |
| 26 | 0.0112496 | 0.0127434 | 0.0113778 | 0.0139711 | 0.0146716 | 0.0136799 |
| 27 | 0.00827632 | 0.00826432 | 0.00827642 | 0.015248 | 0.0151585 | 0.0153658 |
| 28 | 0.0123092 | 0.0104153 | 0.0118449 | 0.0303515 | 0.0303862 | 0.0298524 |
| 29 | 0.0159833 | 0.0159816 | 0.0158827 | 0.0303102 | 0.0291676 | 0.0274446 |
| 30 | 0.00911031 | 0.00957816 | 0.00901039 | 0.0131899 | 0.0111457 | 0.0117144 |
| 31 | 0.0289056 | 0.0281362 | 0.0299042 | 0.0448371 | 0.0446639 | 0.0449494 |
| 32 | 0.0159802 | 0.0163336 | 0.0157462 | 0.021413 | 0.0209034 | 0.0208014 |
| 33 | 0.00847492 | 0.00999445 | 0.00919932 | 0.012752 | 0.012518 | 0.012752 |
| 34 | 0.00934716 | 0.0102078 | 0.0100426 | 0.0144386 | 0.0157748 | 0.0156908 |
| 35 | 0.00540322 | 0.00536154 | 0.00603175 | 0.0094753 | 0.00940402 | 0.0103904 |
| 36 | 0.0268091 | 0.0266785 | 0.0245431 | 0.0585973 | 0.0605697 | 0.0603698 |
| 37 | 0.015285 | 0.0147006 | 0.0143448 | 0.030896 | 0.0303347 | 0.0303311 |
| 38 | 0.017485 | 0.0170879 | 0.0180189 | 0.0553062 | 0.0549914 | 0.0571139 |
| 39 | 0.00827475 | 0.0125446 | 0.00944092 | 0.0136406 | 0.0139339 | 0.0139976 |

| Cell Number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 40 | 0.0151771 | 0.0154108 | 0.0143264 | 0.0172194 | 0.0188791 | 0.0181582 |
| 41 | 0.00636988 | 0.00602648 | 0.00643949 | 0.00873522 | 0.00971988 | 0.0090501 |
| 42 | 0.00381775 | 0.00446721 | 0.00407347 | 0.00578352 | 0.00764002 | 0.00659954 |
| 43 | 0.0155395 | 0.0165729 | 0.0171644 | 0.0207615 | 0.0206377 | 0.021153 |
| 44 | 0.0123153 | 0.0121413 | 0.0119831 | 0.01218796 | 0.019975 | 0.0193582 |
| 45 | 0.00689822 | 0.00847534 | 0.00763967 | 0.021156 | 0.0206998 | 0.0213629 |
| 46 | 0.0136433 | 0.0127151 | 0.0136687 | 0.0182509 | 0.0182858 | 0.01959 |
| 47 | 0.0133458 | 0.0142885 | 0.0137763 | 0.0185587 | 0.019432 | 0.0190112 |
| 48 | 0.0142273 | 0.0148758 | 0.0153897 | 0.0220945 | 0.0230109 | 0.0231132 |
| 49 | 0.00873729 | 0.00881407 | 0.00910226 | 0.0142558 | 0.0144359 | 0.0139938 |
| 50 | 0.0159258 | 0.0163013 | 0.0163864 | 0.0216084 | 0.0211518 | 0.0211084 |
| 51 | 0.0189461 | 0.0198995 | 0.02132 | 0.0423558 | 0.0428214 | 0.0423554 |
| 52 | 0.0196121 | 0.0196965 | 0.0193359 | 0.0422348 | 0.0424347 | 0.0416121 |
| 53 | 0.0148801 | 0.0148043 | 0.0159223 | 0.0213008 | 0.019541 | 0.0199787 |
| 54 | 0.0151685 | 0.01576 | 0.0155862 | 0.0511784 | 0.0507377 | 0.0540712 |
| 55 | 0.00360639 | 0.00334912 | 0.00407392 | 0.0326738 | 0.0314447 | 0.0347899 |
| 56 | 0.0121325 | 0.0127988 | 0.0114083 | 0.0485796 | 0.0484151 | 0.0489962 |
| 57 | 0.0331912 | 0.0331911 | 0.0328272 | 0.0402945 | 0.0403532 | 0.040782 |
| 58 | 0.014509 | 0.0174862 | 0.016758 | 0.0275564 | 0.0286162 | 0.0285376 |
| 59 | 0.0150833 | 0.016735 | 0.0174021 | 0.0290163 | 0.0278186 | 0.0278188 |
| 60 | 0.0315839 | 0.0330066 | 0.0339161 | 0.0394531 | 0.0412154 | 0.0407637 |
| 61 | 0.0391516 | 0.0378342 | 0.0369476 | 0.0455035 | 0.0457296 | 0.0438806 |
| 62 | 0.0159196 | 0.0162302 | 0.0165687 | 0.0393503 | 0.0412613 | 0.0412602 |
| 63 | 0.00710132 | 0.00710135 | 0.00703862 | 0.0130042 | 0.0121285 | 0.0119525 |
| 64 | 0.0123155 | 0.012798 | 0.0132714 | 0.0184739 | 0.0180334 | 0.0189224 |
| 65 | 0.0163525 | 0.01990411 | 0.0180986 | 0.0274374 | 0.0291585 | 0.0287129 |
| 66 | 0.0110376 | 0.0106342 | 0.0122116 | 0.022995 | 0.0224424 | 0.022128 |
| 67 | 0.0103839 | 0.0120722 | 0.0134034 | 0.0164219 | 0.0157443 | 0.0156653 |
| 68 | 0.0171429 | 0.0150925 | 0.0161457 | 0.0328015 | 0.0308153 | 0.0314654 |
| 69 | 0.0106543 | 0.0122148 | 0.0111697 | 0.0224784 | 0.021748 | 0.0210238 |
| 70 | 0.0140286 | 0.015229 | 0.0149965 | 0.0235408 | 0.0228468 | 0.0227141 |
| 71 | 0.0130709 | 0.00142079 | 0.0131739 | 0.0209911 | 0.0221515 | 0.0210186 |
| 72 | 0.0177654 | 0.0185288 | 0.0187893 | 0.0313001 | 0.0306067 | 0.0304619 |
| 73 | 0.0101693 | 0.0104358 | 0.00946113 | 0.0126986 | 0.0142421 | 0.0132834 |
| 74 | 0.00648145 | 0.00524083 | 0.00727882 | 0.0118164 | 0.0121921 | 0.0114984 |
| 75 | 0.0148226 | 0.0156083 | 0.0148227 | 0.0349605 | 0.036411 | 0.0355645 |
| 76 | 0.0128183 | 0.0128184 | 0.0121462 | 0.0170392 | 0.0179521 | 0.0172913 |
| 77 | 0.0134786 | 0.0137395 | 0.0110399 | 0.018134 | 0.0186185 | 0.0191062 |
| 78 | 0.00953119 | 0.00814114 | 0.00845255 | 0.0257672 | 0.0259937 | 0.0274289 |
| 79 | 0.0108633 | 0.0125116 | 0.0112149 | 0.022404 | 0.0227306 | 0.0241291 |
| 80 | 0.0193264 | 0.0184481 | 0.0203763 | 0.0293083 | 0.0286428 | 0.0298819 |
| 81 | 0.0215847 | 0.0228929 | 0.0233881 | 0.0290358 | 0.0318122 | 0.0297852 |
| 82 | 0.0135636 | 0.01297 | 0.013253 | 0.0325467 | 0.0354554 | 0.033877 |

| Cell number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 83 | 0.0172505 | 0.017836 | 0.0168681 | 0.0254622 | 0.0249235 | 0.0254626 |
| 84 | 0.0193372 | 0.0195117 | 0.0192882 | 0.0340864 | 0.0361303 | 0.0324281 |
| 85 | 0.0187801 | 0.0184371 | 0.0180437 | 0.0368601 | 0.037955 | 0.0388352 |
| 86 | 0.0236956 | 0.021816 | 0.0227475 | 0.0298416 | 0.0282849 | 0.0287536 |
| 87 | 0.0135705 | 0.0138162 | 0.0136449 | 0.0339773 | 0.036455 | 0.0322412 |
| 88 | 0.0123212 | 0.0108165 | 0.0112642 | 0.0140916 | 0.0157759 | 0.0151738 |
| 89 | 0.00996291 | 0.00915302 | 0.00934663 | 0.0122926 | 0.0125187 | 0.0127146 |
| 90 | 0.00664843 | 0.00710684 | 0.00664998 | 0.0143897 | 0.0170145 | 0.0156246 |
| 91 | 0.0147478 | 0.0159263 | 0.0155496 | 0.0229995 | 0.0238057 | 0.0230007 |
| 92 | 0.0246407 | 0.027969 | 0.0298477 | 0.037458 | 0.0377167 | 0.0385555 |
| 93 | 0.0154101 | 0.0164033 | 0.0157636 | 0.0293019 | 0.0309139 | 0.0291784 |
| 94 | 0.0142016 | 0.014428 | 0.0144987 | 0.0385409 | 0.0385406 | 0.0372011 |
| 95 | 0.010727 | 0.0123834 | 0.0110459 | 0.0217737 | 0.0202716 | 0.0204333 |
| 96 | 0.0117513 | 0.0133972 | 0.0134477 | 0.0264329 | 0.0276694 | 0.0260529 |
| 97 | 0.00976052 | 0.0104816 | 0.0102003 | 0.0178121 | 0.018856 | 0.0181368 |
| 98 | 0.0121545 | 0.011044 | 0.0110127 | 0.0303087 | 0.0315351 | 0.0319469 |
| 99 | 0.0154237 | 0.0152345 | 0.0162897 | 0.0225499 | 0.0233893 | 0.0225353 |
| 100 | 0.0169449 | 0.0184709 | 0.018035 | 0.030305 | 0.0302458 | 0.0304634 |
| 101 | 0.00872177 | 0.00775733 | 0.00836822 | 0.0120561 | 0.0124324 | 0.0118415 |
| 102 | 0.00676919 | 0.0057718 | 0.0068188 | 0.0177638 | 0.0165754 | 0.0166338 |
| 103 | 0.0148001 | 0.0152934 | 0.0146721 | 0.0269541 | 0.0274373 | 0.0228877 |
| 104 | 0.0209626 | 0.0212674 | 0.0211297 | 0.0387296 | 0.0388508 | 0.0373772 |
| 105 | 0.00722642 | 0.00657729 | 0.00763417 | 0.014205 | 0.0155728 | 0.0161276 |
| 106 | 0.0131028 | 0.012885 | 0.0119981 | 0.031752 | 0.0339227 | 0.0316315 |
| 107 | 0.0157423 | 0.0163922 | 0.0144331 | 0.0202672 | 0.0235564 | 0.0207977 |
| 108 | 0.015877 | 0.016395 | 0.0157461 | 0.0305121 | 0.0282193 | 0.0312057 |
| 109 | 0.0253829 | 0.0253258 | 0.0251629 | 0.0384056 | 0.0383154 | 0.0386564 |
| 110 | 0.0152892 | 0.0175632 | 0.019558 | 0.0227122 | 0.0268183 | 0.0261584 |
| 111 | 0.020337 | 0.0194347 | 0.0203373 | 0.0279557 | 0.0303148 | 0.0299159 |
| 112 | 0.011537 | 0.0110337 | 0.0118672 | 0.0246815 | 0.0238893 | 0.0250815 |
| 113 | 0.00436552 | 0.00552097 | 0.00529238 | 0.0237415 | 0.0231092 | 0.0226417 |
| 114 | 0.00904771 | 0.00937622 | 0.00904766 | 0.0147083 | 0.0141042 | 0.0148461 |
| 115 | 0.0175076 | 0.0165046 | 0.017503 | 0.0279201 | 0.0299272 | 0.0299281 |
| 116 | 0.00863525 | 0.00903962 | 0.00956978 | 0.0146559 | 0.0146562 | 0.0146267 |
| 117 | 0.0166408 | 0.0164601 | 0.0169335 | 0.0181088 | 0.0183301 | 0.0183499 |
| 118 | 0.0175006 | 0.0176696 | 0.0178037 | 0.0271362 | 0.0290702 | 0.025675 |

# Appendix III: Image I Raw Data (Width, meters)

| Cell number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 1 | 14207 | 15440 | 15733 | 15127 | 809 |
| 2 | 11945 | 14523 | 14234 | 13567 | 1412 |
| 3 | 22162 | 22459 | 22621 | 22414 | 233 |
| 4 | 9022 | 9843 | 11140 | 10001 | 1068 |
| 5 | 16333 | 17994 | 18458 | 17595 | 1118 |
| 6 | 9912 | 10504 | 10576 | 10331 | 365 |
| 7 | 19347 | 18968 | 20444 | 19586 | 767 |
| 8 | 9919 | 11903 | 10919 | 10914 | 992 |
| 9 | 10588 | 11077 | 11818 | 11161 | 619 |
| 10 | 23657 | 22702 | 23075 | 23145 | 481 |
| 11 | 11121 | 12407 | 12876 | 12134 | 909 |
| 12 | 14861 | 14871 | 14861 | 14864 | 6 |
| 13 | 26453 | 27002 | 27640 | 27032 | 594 |
| 14 | 26703 | 27771 | 28210 | 27561 | 775 |
| 15 | 14137 | 14097 | 14276 | 14170 | 94 |
| 16 | 14613 | 16124 | 16389 | 15709 | 958 |
| 17 | 6563 | 8697 | 8264 | 7841 | 1128 |
| 18 | 6227 | 5516 | 5972 | 5905 | 360 |
| 19 | 9622 | 9622 | 9622 | 9622 | 0 |
| 20 | 8160 | 7379 | 8161 | 7900 | 451 |
| 21 | 6594 | 7285 | 8572 | 7484 | 1004 |
| 22 | 21622 | 22547 | 21914 | 22028 | 473 |
| 23 | 11522 | 10735 | 11057 | 11105 | 396 |
| 24 | 14511 | 17399 | 15038 | 15649 | 1538 |
| 25 | 13325 | 14552 | 13896 | 13924 | 614 |
| 26 | 15686 | 17769 | 15865 | 16440 | 1154 |
| 27 | 11540 | 11524 | 11541 | 11535 | 10 |
| 28 | 17164 | 14523 | 16517 | 16068 | 1376 |
| 29 | 22287 | 22285 | 22147 | 22240 | 80 |
| 30 | 12703 | 13356 | 12564 | 12874 | 423 |
| 31 | 40306 | 39233 | 41698 | 40412 | 1236 |
| 32 | 22283 | 22776 | 21956 | 22338 | 412 |
| 33 | 11817 | 13936 | 12828 | 12860 | 1060 |
| 34 | 13034 | 14234 | 14003 | 13757 | 637 |
| 35 | 7534 | 7476 | 8411 | 7807 | 524 |
| 36 | 37383 | 37200 | 34223 | 36269 | 1774 |
| 37 | 21313 | 20498 | 20002 | 20605 | 662 |
| 38 | 24381 | 23827 | 25126 | 24445 | 651 |
| 39 | 11538 | 17492 | 13164 | 14065 | 3077 |
| 40 | 21163 | 21489 | 19977 | 20876 | 796 |
| 41 | 8882 | 8403 | 8979 | 8755 | 308 |

| Cell Number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 42 | 5323 | 6229 | 5680 | 5744 | 456 |
| 43 | 21668 | 23109 | 23934 | 22904 | 1147 |
| 44 | 16995 | 16930 | 16709 | 16878 | 150 |
| 45 | 9619 | 11818 | 10653 | 10697 | 1100 |
| 46 | 19024 | 17730 | 19060 | 18605 | 758 |
| 47 | 18609 | 19924 | 19210 | 19248 | 658 |
| 48 | 19839 | 20743 | 21459 | 20680 | 812 |
| 49 | 12183 | 12290 | 12692 | 12389 | 268 |
| 50 | 22207 | 22730 | 22849 | 22596 | 342 |
| 51 | 26418 | 27748 | 29729 | 27965 | 1666 |
| 52 | 27347 | 27465 | 26962 | 27258 | 263 |
| 53 | 20749 | 20643 | 22202 | 21198 | 871 |
| 54 | 21151 | 21976 | 21733 | 21620 | 424 |
| 55 | 5029 | 4670 | 5681 | 5126 | 512 |
| 56 | 16918 | 17847 | 15908 | 16891 | 970 |
| 57 | 46282 | 46282 | 45774 | 46113 | 293 |
| 58 | 20231 | 24383 | 23367 | 22660 | 2164 |
| 59 | 21032 | 23335 | 24265 | 22878 | 1665 |
| 60 | 44041 | 46024 | 47293 | 45786 | 1639 |
| 61 | 54593 | 52756 | 51520 | 52956 | 1546 |
| 62 | 22198 | 22631 | 23103 | 22644 | 453 |
| 63 | 9902 | 9902 | 9815 | 9873 | 50 |
| 64 | 17173 | 17846 | 18506 | 17841 | 666 |
| 65 | 22802 | 27754 | 25237 | 25264 | 2476 |
| 66 | 15391 | 14828 | 17028 | 15749 | 1143 |
| 67 | 14479 | 16833 | 18690 | 16667 | 2110 |
| 68 | 23904 | 21045 | 22514 | 22487 | 1430 |
| 69 | 14856 | 17032 | 15575 | 15821 | 1109 |
| 70 | 19561 | 21235 | 20911 | 20569 | 888 |
| 71 | 18226 | 1981 | 18370 | 12859 | 9421 |
| 72 | 24772 | 25837 | 26200 | 25603 | 742 |
| 73 | 14180 | 14552 | 13193 | 13975 | 702 |
| 74 | 9038 | 7308 | 10150 | 8832 | 1432 |
| 75 | 20669 | 21764 | 20669 | 21034 | 632 |
| 76 | 17874 | 17874 | 16937 | 17561 | 541 |
| 77 | 18795 | 19158 | 15394 | 17782 | 2076 |
| 78 | 13290 | 11352 | 11786 | 12143 | 1017 |
| 79 | 15148 | 17446 | 15638 | 16077 | 1211 |
| 80 | 26949 | 25724 | 28413 | 27028 | 1346 |
| 81 | 30098 | 31922 | 32612 | 31544 | 1299 |
| 82 | 18913 | 18085 | 18480 | 18493 | 414 |
| 83 | 24054 | 24870 | 23521 | 24148 | 680 |
| 84 | 26964 | 27207 | 26895 | 27022 | 164 |
| 85 | 26187 | 25709 | 25160 | 25685 | 514 |

| Cell Number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 86 | 33041 | 30420 | 31719 | 31727 | 1310 |
| 87 | 18923 | 19265 | 19026 | 19071 | 176 |
| 88 | 17181 | 15083 | 15707 | 15990 | 1077 |
| 89 | 13892 | 12763 | 13033 | 13229 | 590 |
| 90 | 9271 | 9910 | 9273 | 9484 | 368 |
| 91 | 20564 | 22208 | 21682 | 21485 | 839 |
| 92 | 34359 | 39000 | 41620 | 38326 | 3677 |
| 93 | 21488 | 22873 | 21981 | 22114 | 702 |
| 94 | 19803 | 20118 | 20217 | 20046 | 216 |
| 95 | 14958 | 17267 | 15402 | 15876 | 1225 |
| 96 | 16386 | 18681 | 18751 | 17939 | 1346 |
| 97 | 13610 | 14616 | 14223 | 14150 | 507 |
| 98 | 16948 | 15400 | 15356 | 15901 | 907 |
| 99 | 21507 | 21243 | 22714 | 21821 | 785 |
| 100 | 23628 | 25756 | 25148 | 24844 | 1096 |
| 101 | 12162 | 10817 | 11669 | 11549 | 680 |
| 102 | 9439 | 8048 | 9508 | 8998 | 824 |
| 103 | 20637 | 21325 | 20459 | 20807 | 457 |
| 104 | 29230 | 29655 | 29463 | 29450 | 213 |
| 105 | 10077 | 9171 | 10645 | 9964 | 743 |
| 106 | 18271 | 17967 | 16730 | 17656 | 816 |
| 107 | 21951 | 22857 | 20125 | 21645 | 1391 |
| 108 | 22139 | 22861 | 21956 | 22319 | 478 |
| 109 | 35394 | 35314 | 35087 | 35265 | 159 |
| 110 | 21319 | 24490 | 27272 | 24360 | 2978 |
| 111 | 28358 | 27100 | 28358 | 27939 | 727 |
| 112 | 16087 | 15385 | 16548 | 16007 | 585 |
| 113 | 6087 | 7698 | 7380 | 7055 | 853 |
| 114 | 12616 | 13074 | 12616 | 12769 | 264 |
| 115 | 24413 | 23014 | 24406 | 23944 | 806 |
| 116 | 12041 | 12605 | 13344 | 12663 | 654 |
| 117 | 23204 | 22952 | 23612 | 23256 | 333 |
| 118 | 24403 | 24638 | 24825 | 24622 | 212 |

# Appendix IV: Image I Raw Data (Length, meters)

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 1 | 35799 | 31508 | 31715 | 33007 | 2420 |
| 2 | 29782 | 29782 | 32418 | 30661 | 1522 |
| 3 | 45985 | 42894 | 44068 | 44316 | 1561 |
| 4 | 18482 | 18440 | 19586 | 18836 | 650 |
| 5 | 26090 | 25687 | 26069 | 25949 | 227 |
| 6 | 17832 | 16658 | 18027 | 17506 | 740 |
| 7 | 27676 | 29500 | 31769 | 29649 | 2050 |
| 8 | 16776 | 16420 | 19706 | 17634 | 1803 |
| 9 | 20698 | 21075 | 21753 | 21175 | 534 |
| 10 | 28616 | 28065 | 29731 | 28804 | 849 |
| 11 | 17610 | 18557 | 18451 | 18206 | 519 |
| 12 | 16589 | 16589 | 15965 | 16381 | 360 |
| 13 | 40575 | 40360 | 41411 | 40782 | 555 |
| 14 | 40472 | 38206 | 40975 | 39884 | 1475 |
| 15 | 21233 | 23256 | 21234 | 21908 | 1168 |
| 16 | 18248 | 27471 | 16688 | 20802 | 5828 |
| 17 | 19695 | 19694 | 19648 | 19679 | 27 |
| 18 | 10091 | 10081 | 9189 | 9787 | 518 |
| 19 | 15591 | 17423 | 17013 | 16676 | 962 |
| 20 | 11783 | 12376 | 12991 | 12384 | 604 |
| 21 | 14514 | 15190 | 15306 | 15003 | 428 |
| 22 | 72234 | 72907 | 70254 | 71798 | 1379 |
| 23 | 16158 | 15664 | 16690 | 16171 | 513 |
| 24 | 19212 | 19158 | 19159 | 19177 | 31 |
| 25 | 21711 | 23197 | 22208 | 22372 | 756 |
| 26 | 19481 | 20458 | 19075 | 19672 | 711 |
| 27 | 21262 | 21137 | 21426 | 21275 | 145 |
| 28 | 42322 | 42370 | 41626 | 42106 | 416 |
| 29 | 42264 | 40671 | 38269 | 40401 | 2012 |
| 30 | 18392 | 15542 | 16335 | 16756 | 1471 |
| 31 | 62521 | 62279 | 62677 | 62492 | 201 |
| 32 | 29858 | 29148 | 29005 | 29337 | 457 |
| 33 | 17781 | 17455 | 17781 | 17673 | 188 |
| 34 | 20133 | 21996 | 21879 | 21336 | 1044 |
| 35 | 13212 | 13113 | 14488 | 13605 | 767 |
| 36 | 81708 | 84458 | 84180 | 83449 | 1514 |
| 37 | 43081 | 42299 | 42294 | 42558 | 453 |
| 38 | 77119 | 76680 | 79640 | 77813 | 1597 |
| 39 | 19020 | 19429 | 19518 | 19323 | 266 |
| 40 | 24011 | 26325 | 25320 | 25218 | 1160 |
| 41 | 12180 | 13553 | 12619 | 12784 | 701 |

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 42 | 8065 | 10653 | 9202 | 9307 | 1297 |
| 43 | 28950 | 28777 | 29496 | 29074 | 375 |
| 44 | 17172 | 27853 | 26993 | 20442 | 5416 |
| 45 | 29500 | 28864 | 29788 | 29384 | 473 |
| 46 | 25449 | 25498 | 27316 | 26088 | 1064 |
| 47 | 25878 | 27096 | 26509 | 26494 | 609 |
| 48 | 30809 | 32086 | 32229 | 31708 | 782 |
| 49 | 19878 | 20129 | 19513 | 19840 | 310 |
| 50 | 30131 | 29494 | 29434 | 29686 | 386 |
| 51 | 59061 | 59710 | 59060 | 59277 | 375 |
| 52 | 58892 | 59171 | 58024 | 58696 | 598 |
| 53 | 29702 | 27248 | 27858 | 28269 | 1278 |
| 54 | 71363 | 70749 | 75397 | 72503 | 2525 |
| 55 | 45560 | 43846 | 48511 | 45973 | 2359 |
| 56 | 67739 | 67510 | 68320 | 67856 | 418 |
| 57 | 56187 | 56268 | 56866 | 56440 | 371 |
| 58 | 38425 | 39902 | 39793 | 39373 | 823 |
| 59 | 40460 | 38790 | 38790 | 39347 | 964 |
| 60 | 55013 | 57471 | 56841 | 56442 | 1276 |
| 61 | 63450 | 63765 | 61187 | 62801 | 1406 |
| 62 | 54870 | 57535 | 57533 | 56646 | 1538 |
| 63 | 18133 | 16912 | 16667 | 17237 | 785 |
| 64 | 25760 | 25146 | 26385 | 25764 | 620 |
| 65 | 38259 | 40659 | 40037 | 39651 | 1246 |
| 66 | 32064 | 31294 | 30855 | 31404 | 612 |
| 67 | 22899 | 21954 | 21844 | 22232 | 580 |
| 68 | 45738 | 42969 | 43875 | 44194 | 1412 |
| 69 | 31344 | 30325 | 29316 | 30328 | 1014 |
| 70 | 32825 | 31858 | 31672 | 32118 | 619 |
| 71 | 29270 | 30888 | 29308 | 29822 | 923 |
| 72 | 43645 | 42678 | 42476 | 42933 | 625 |
| 73 | 17707 | 19859 | 18522 | 18696 | 1087 |
| 74 | 16477 | 17001 | 16033 | 16504 | 484 |
| 75 | 48749 | 50771 | 49591 | 49704 | 1016 |
| 76 | 23759 | 25032 | 24111 | 24301 | 657 |
| 77 | 25286 | 25962 | 26642 | 25963 | 678 |
| 78 | 35930 | 36246 | 38247 | 36807 | 1257 |
| 79 | 31240 | 31695 | 33646 | 32194 | 1278 |
| 80 | 40867 | 39939 | 41667 | 40825 | 865 |
| 81 | 40487 | 44359 | 41532 | 42126 | 2003 |
| 82 | 45383 | 49439 | 47238 | 47353 | 2030 |
| 83 | 35504 | 34753 | 35505 | 35254 | 434 |
| 84 | 47530 | 50380 | 45218 | 47709 | 2586 |

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 85 | 51398 | 52924 | 54152 | 52825 | 1380 |
| 86 | 41611 | 39440 | 40094 | 40382 | 1114 |
| 87 | 47378 | 50833 | 44957 | 47723 | 2953 |
| 88 | 19649 | 21998 | 21158 | 20935 | 1190 |
| 89 | 17141 | 17456 | 17729 | 17442 | 294 |
| 90 | 20065 | 23725 | 21787 | 21859 | 1831 |
| 91 | 32070 | 33195 | 32072 | 32446 | 649 |
| 92 | 52231 | 52592 | 53762 | 52862 | 800 |
| 93 | 40859 | 43106 | 40686 | 41550 | 1350 |
| 94 | 53741 | 53741 | 51873 | 53118 | 1078 |
| 95 | 30361 | 28267 | 28492 | 29040 | 1150 |
| 96 | 36858 | 38582 | 36328 | 37256 | 1179 |
| 97 | 24837 | 26293 | 25290 | 25473 | 745 |
| 98 | 42262 | 43972 | 44547 | 43594 | 1188 |
| 99 | 31444 | 32614 | 31423 | 31827 | 682 |
| 100 | 42257 | 42175 | 42478 | 42303 | 157 |
| 101 | 16811 | 17336 | 16512 | 16886 | 417 |
| 102 | 24770 | 23113 | 23194 | 23692 | 934 |
| 103 | 37585 | 38259 | 31915 | 35919 | 3485 |
| 104 | 54004 | 54173 | 52119 | 53432 | 1141 |
| 105 | 19807 | 21715 | 22488 | 21337 | 1380 |
| 106 | 44275 | 47302 | 44107 | 45228 | 1798 |
| 107 | 28261 | 32847 | 29000 | 30036 | 2462 |
| 108 | 42546 | 39349 | 43513 | 41803 | 2179 |
| 109 | 53553 | 53427 | 53902 | 53627 | 246 |
| 110 | 31670 | 37395 | 36475 | 35180 | 3075 |
| 111 | 38981 | 42271 | 41715 | 40989 | 1761 |
| 112 | 34416 | 33311 | 34974 | 34234 | 846 |
| 113 | 33105 | 32223 | 31572 | 32300 | 770 |
| 114 | 20509 | 19667 | 20701 | 20292 | 550 |
| 115 | 38932 | 41730 | 41732 | 40798 | 1616 |
| 116 | 20436 | 20437 | 20395 | 20423 | 24 |
| 117 | 25251 | 25559 | 25587 | 25466 | 187 |
| 118 | 37839 | 40535 | 35801 | 38058 | 2375 |

# Appendix V: Image I Ellipse Area Calculations

| Cell number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 1 | 3.99E+08 | 3.82E+08 | 3.92E+08 | 3.91E+08 | 8.71E+06 |
| 2 | 2.79E+08 | 3.40E+08 | 3.62E+08 | 3.27E+08 | 4.29E+07 |
| 3 | 8.00E+08 | 7.57E+08 | 7.83E+08 | 7.80E+08 | 2.20E+07 |
| 4 | 1.31E+08 | 1.43E+08 | 1.71E+08 | 1.48E+08 | 2.08E+07 |
| 5 | 3.35E+08 | 3.63E+08 | 3.78E+08 | 3.59E+08 | 2.20E+07 |
| 6 | 1.39E+08 | 1.37E+08 | 1.50E+08 | 1.42E+08 | 6.74E+06 |
| 7 | 4.21E+08 | 4.39E+08 | 5.10E+08 | 4.57E+08 | 4.72E+07 |
| 8 | 1.31E+08 | 1.54E+08 | 1.69E+08 | 1.51E+08 | 1.93E+07 |
| 9 | 1.72E+08 | 1.83E+08 | 2.02E+08 | 1.86E+08 | 1.50E+07 |
| 10 | 5.32E+08 | 5.00E+08 | 5.39E+08 | 5.24E+08 | 2.04E+07 |
| 11 | 1.54E+08 | 1.81E+08 | 1.87E+08 | 1.74E+08 | 1.75E+07 |
| 12 | 1.94E+08 | 1.94E+08 | 1.86E+08 | 1.91E+08 | 4.24E+06 |
| 13 | 8.43E+08 | 8.56E+08 | 8.99E+08 | 8.66E+08 | 2.93E+07 |
| 14 | 8.49E+08 | 8.33E+08 | 9.08E+08 | 8.63E+08 | 3.93E+07 |
| 15 | 2.36E+08 | 2.57E+08 | 2.38E+08 | 2.44E+08 | 1.19E+07 |
| 16 | 2.09E+08 | 3.48E+08 | 2.15E+08 | 2.57E+08 | 7.84E+07 |
| 17 | 1.02E+08 | 1.35E+08 | 1.28E+08 | 1.21E+08 | 1.74E+07 |
| 18 | 4.94E+07 | 4.37E+07 | 4.31E+07 | 4.54E+07 | 3.46E+06 |
| 19 | 1.18E+08 | 1.32E+08 | 1.29E+08 | 1.26E+08 | 7.27E+06 |
| 20 | 7.55E+07 | 7.17E+07 | 8.33E+07 | 7.68E+07 | 5.88E+06 |
| 21 | 7.52E+07 | 8.69E+07 | 1.03E+08 | 8.84E+07 | 1.40E+07 |
| 22 | 1.23E+09 | 1.29E+09 | 1.21E+09 | 1.24E+09 | 4.31E+07 |
| 23 | 1.46E+08 | 1.32E+08 | 1.45E+08 | 1.41E+08 | 7.83E+06 |
| 24 | 2.19E+08 | 2.62E+08 | 2.26E+08 | 2.36E+08 | 2.29E+07 |
| 25 | 2.27E+08 | 2.65E+08 | 2.42E+08 | 2.45E+08 | 1.91E+07 |
| 26 | 2.40E+08 | 2.86E+08 | 2.38E+08 | 2.54E+08 | 2.70E+07 |
| 27 | 1.93E+08 | 1.91E+08 | 1.94E+08 | 1.93E+08 | 1.45E+06 |
| 28 | 5.71E+08 | 4.83E+08 | 5.40E+08 | 5.31E+08 | 4.43E+07 |
| 29 | 7.40E+08 | 7.12E+08 | 6.66E+08 | 7.06E+08 | 3.75E+07 |
| 30 | 1.84E+08 | 1.63E+08 | 1.61E+08 | 1.69E+08 | 1.24E+07 |
| 31 | 1.98E+09 | 1.92E+09 | 2.05E+09 | 1.98E+09 | 6.69E+07 |
| 32 | 5.23E+08 | 5.21E+08 | 5.00E+08 | 5.15E+08 | 1.26E+07 |
| 33 | 1.65E+08 | 1.91E+08 | 1.79E+08 | 1.78E+08 | 1.30E+07 |
| 34 | 2.06E+08 | 2.46E+08 | 2.41E+08 | 2.31E+08 | 2.16E+07 |
| 35 | 7.82E+07 | 7.70E+07 | 9.57E+07 | 8.36E+07 | 1.05E+07 |
| 36 | 2.40E+09 | 2.47E+09 | 2.26E+09 | 2.38E+09 | 1.04E+08 |
| 37 | 7.21E+08 | 6.81E+08 | 6.64E+08 | 6.89E+08 | 2.92E+07 |
| 38 | 1.48E+09 | 1.43E+09 | 1.57E+09 | 1.49E+09 | 7.00E+07 |
| 39 | 1.72E+08 | 2.67E+08 | 2.02E+08 | 2.14E+08 | 4.84E+07 |
| 40 | 3.99E+08 | 4.44E+08 | 3.97E+08 | 4.14E+08 | 2.66E+07 |
| 41 | 8.50E+07 | 8.95E+07 | 8.90E+07 | 8.78E+07 | 2.47E+06 |

| Cell Number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 42 | 3.37E+07 | 5.21E+07 | 4.11E+07 | 4.23E+07 | 9.26E+06 |
| 43 | 4.93E+08 | 5.22E+08 | 5.54E+08 | 5.23E+08 | 3.09E+07 |
| 44 | 2.29E+08 | 3.70E+08 | 3.54E+08 | 3.18E+08 | 7.73E+07 |
| 45 | 2.23E+08 | 2.68E+08 | 2.49E+08 | 2.47E+08 | 2.26E+07 |
| 46 | 3.80E+08 | 3.55E+08 | 4.09E+08 | 3.81E+08 | 2.69E+07 |
| 47 | 3.78E+08 | 4.24E+08 | 4.00E+08 | 4.01E+08 | 2.29E+07 |
| 48 | 4.80E+08 | 5.23E+08 | 5.43E+08 | 5.15E+08 | 3.22E+07 |
| 49 | 1.90E+08 | 1.94E+08 | 1.95E+08 | 1.93E+08 | 2.43E+06 |
| 50 | 5.26E+08 | 5.27E+08 | 5.28E+08 | 5.27E+08 | 1.36E+06 |
| 51 | 1.23E+09 | 1.30E+09 | 1.38E+09 | 1.30E+09 | 7.68E+07 |
| 52 | 1.26E+09 | 1.28E+09 | 1.23E+09 | 1.26E+09 | 2.49E+07 |
| 53 | 4.84E+08 | 4.42E+08 | 4.86E+08 | 4.71E+08 | 2.49E+07 |
| 54 | 1.19E+09 | 1.22E+09 | 1.29E+09 | 1.23E+09 | 5.15E+07 |
| 55 | 1.80E+08 | 1.61E+08 | 2.16E+08 | 1.86E+08 | 2.83E+07 |
| 56 | 9.00E+08 | 9.46E+08 | 8.54E+08 | 9.00E+08 | 4.63E+07 |
| 57 | 2.04E+09 | 2.05E+09 | 2.04E+09 | 2.04E+09 | 1.52E+06 |
| 58 | 6.11E+08 | 7.64E+08 | 7.30E+08 | 7.02E+08 | 8.07E+07 |
| 59 | 6.68E+08 | 7.11E+08 | 7.39E+08 | 7.06E+08 | 3.57E+07 |
| 60 | 1.90E+09 | 2.08E+09 | 2.11E+09 | 2.03E+09 | 1.12E+08 |
| 61 | 2.72E+09 | 2.64E+09 | 2.48E+09 | 2.61E+09 | 1.25E+08 |
| 62 | 9.57E+08 | 1.02E+09 | 1.04E+09 | 1.01E+09 | 4.55E+07 |
| 63 | 1.41E+08 | 1.32E+08 | 1.28E+08 | 1.34E+08 | 6.54E+06 |
| 64 | 3.47E+08 | 3.52E+08 | 3.83E+08 | 3.61E+08 | 1.95E+07 |
| 65 | 6.85E+08 | 8.86E+08 | 7.94E+08 | 7.88E+08 | 1.01E+08 |
| 66 | 3.88E+08 | 3.64E+08 | 4.13E+08 | 3.88E+08 | 2.41E+07 |
| 67 | 2.60E+08 | 2.90E+08 | 3.21E+08 | 2.90E+08 | 3.01E+07 |
| 68 | 8.59E+08 | 7.10E+08 | 7.76E+08 | 7.82E+08 | 7.44E+07 |
| 69 | 3.66E+08 | 4.06E+08 | 3.59E+08 | 3.77E+08 | 2.54E+07 |
| 70 | 5.04E+08 | 5.31E+08 | 5.20E+08 | 5.19E+08 | 1.36E+07 |
| 71 | 4.19E+08 | 4.81E+07 | 4.23E+08 | 2.97E+08 | 2.15E+08 |
| 72 | 8.49E+08 | 8.66E+08 | 8.74E+08 | 8.63E+08 | 1.27E+07 |
| 73 | 1.97E+08 | 2.27E+08 | 1.92E+08 | 2.05E+08 | 1.89E+07 |
| 74 | 1.17E+08 | 9.76E+07 | 1.28E+08 | 1.14E+08 | 1.53E+07 |
| 75 | 7.91E+08 | 8.68E+08 | 8.05E+08 | 8.21E+08 | 4.08E+07 |
| 76 | 3.34E+08 | 3.51E+08 | 3.21E+08 | 3.35E+08 | 1.54E+07 |
| 77 | 3.73E+08 | 3.91E+08 | 3.22E+08 | 3.62E+08 | 3.56E+07 |
| 78 | 3.75E+08 | 3.23E+08 | 3.54E+08 | 3.51E+08 | 2.61E+07 |
| 79 | 3.72E+08 | 4.34E+08 | 4.13E+08 | 4.06E+08 | 3.19E+07 |
| 80 | 8.65E+08 | 8.07E+08 | 9.30E+08 | 8.67E+08 | 6.15E+07 |
| 81 | 9.57E+08 | 1.11E+09 | 1.06E+09 | 1.04E+09 | 7.93E+07 |
| 82 | 6.74E+08 | 7.02E+08 | 6.86E+08 | 6.87E+08 | 1.41E+07 |
| 83 | 6.71E+08 | 6.79E+08 | 6.56E+08 | 6.68E+08 | 1.16E+07 |
| 84 | 1.01E+09 | 1.08E+09 | 9.55E+08 | 1.01E+09 | 6.09E+07 |

| Cell Number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 85 | 1.06E+09 | 1.07E+09 | 1.07E+09 | 1.07E+09 | 7.11E+06 |
| 86 | 1.08E+09 | 9.42E+08 | 9.99E+08 | 1.01E+09 | 6.91E+07 |
| 87 | 7.04E+08 | 7.69E+08 | 6.72E+08 | 7.15E+08 | 4.96E+07 |
| 88 | 2.65E+08 | 2.61E+08 | 2.61E+08 | 2.62E+08 | 2.52E+06 |
| 89 | 1.87E+08 | 1.75E+08 | 1.81E+08 | 1.81E+08 | 6.03E+06 |
| 90 | 1.46E+08 | 1.85E+08 | 1.59E+08 | 1.63E+08 | 1.97E+07 |
| 91 | 5.18E+08 | 5.79E+08 | 5.46E+08 | 5.48E+08 | 3.05E+07 |
| 92 | 1.41E+09 | 1.61E+09 | 1.76E+09 | 1.59E+09 | 1.75E+08 |
| 93 | 6.90E+08 | 7.74E+08 | 7.02E+08 | 7.22E+08 | 4.57E+07 |
| 94 | 8.36E+08 | 8.49E+08 | 8.24E+08 | 8.36E+08 | 1.28E+07 |
| 95 | 3.57E+08 | 3.83E+08 | 3.45E+08 | 3.62E+08 | 1.98E+07 |
| 96 | 4.74E+08 | 5.66E+08 | 5.35E+08 | 5.25E+08 | 4.67E+07 |
| 97 | 2.65E+08 | 3.02E+08 | 2.83E+08 | 2.83E+08 | 1.82E+07 |
| 98 | 5.63E+08 | 5.32E+08 | 5.37E+08 | 5.44E+08 | 1.64E+07 |
| 99 | 5.31E+08 | 5.44E+08 | 5.61E+08 | 5.45E+08 | 1.48E+07 |
| 100 | 7.84E+08 | 8.53E+08 | 8.39E+08 | 8.25E+08 | 3.64E+07 |
| 101 | 1.61E+08 | 1.47E+08 | 1.51E+08 | 1.53E+08 | 6.82E+06 |
| 102 | 1.84E+08 | 1.46E+08 | 1.73E+08 | 1.68E+08 | 1.94E+07 |
| 103 | 6.09E+08 | 6.41E+08 | 5.13E+08 | 5.88E+08 | 6.67E+07 |
| 104 | 1.24E+09 | 1.26E+09 | 1.21E+09 | 1.24E+09 | 2.81E+07 |
| 105 | 1.57E+08 | 1.56E+08 | 1.88E+08 | 1.67E+08 | 1.81E+07 |
| 106 | 6.35E+08 | 6.67E+08 | 5.80E+08 | 6.27E+08 | 4.45E+07 |
| 107 | 4.87E+08 | 5.90E+08 | 4.58E+08 | 5.12E+08 | 6.90E+07 |
| 108 | 7.40E+08 | 7.07E+08 | 7.50E+08 | 7.32E+08 | 2.29E+07 |
| 109 | 1.49E+09 | 1.48E+09 | 1.49E+09 | 1.49E+09 | 3.42E+06 |
| 110 | 5.30E+08 | 7.19E+08 | 7.81E+08 | 6.77E+08 | 1.31E+08 |
| 111 | 8.68E+08 | 9.00E+08 | 9.29E+08 | 8.99E+08 | 3.05E+07 |
| 112 | 4.35E+08 | 4.03E+08 | 4.55E+08 | 4.31E+08 | 2.63E+07 |
| 113 | 1.58E+08 | 1.95E+08 | 1.83E+08 | 1.79E+08 | 1.87E+07 |
| 114 | 2.03E+08 | 2.02E+08 | 2.05E+08 | 2.03E+08 | 1.60E+06 |
| 115 | 7.46E+08 | 7.54E+08 | 8.00E+08 | 7.67E+08 | 2.89E+07 |
| 116 | 1.93E+08 | 2.02E+08 | 2.14E+08 | 2.03E+08 | 1.03E+07 |
| 117 | 4.60E+08 | 4.61E+08 | 4.75E+08 | 4.65E+08 | 8.11E+06 |
| 118 | 7.25E+08 | 7.84E+08 | 6.98E+08 | 7.36E+08 | 4.42E+07 |

# Appendix VI: Image I Eccentricity Calculations

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 1 | 0.917874549 | 0.871699822 | 0.868286657 | 0.885953676 | 0.027696914 |
| 2 | 0.916042157 | 0.873042458 | 0.89844854 | 0.895844385 | 0.021617811 |
| 3 | 0.876205138 | 0.851963706 | 0.858196531 | 0.862121792 | 0.012588388 |
| 4 | 0.872760769 | 0.845624663 | 0.822513065 | 0.846966166 | 0.025150699 |
| 5 | 0.779817087 | 0.713647121 | 0.706151963 | 0.733205391 | 0.040540499 |
| 6 | 0.831286906 | 0.776119976 | 0.809808006 | 0.805738296 | 0.027807722 |
| 7 | 0.715090236 | 0.765878121 | 0.765423321 | 0.748797226 | 0.029191995 |
| 8 | 0.80647059 | 0.688840257 | 0.832437747 | 0.775916198 | 0.076519526 |
| 9 | 0.859261724 | 0.850722559 | 0.83954047 | 0.849841584 | 0.009890099 |
| 10 | 0.56259677 | 0.587930733 | 0.630592786 | 0.593706763 | 0.034364028 |
| 11 | 0.775391545 | 0.743618109 | 0.716272695 | 0.745094116 | 0.02958705 |
| 12 | 0.444378186 | 0.443205303 | 0.36545787 | 0.417680453 | 0.045229886 |
| 13 | 0.758259964 | 0.743234534 | 0.744637423 | 0.74871064 | 0.008299651 |
| 14 | 0.751459324 | 0.686776907 | 0.725271418 | 0.721169216 | 0.032535747 |
| 15 | 0.746110906 | 0.795330687 | 0.740260086 | 0.760567226 | 0.030247838 |
| 16 | 0.598902122 | 0.809615897 | 0.188480636 | 0.532332885 | 0.315873156 |
| 17 | 0.942855339 | 0.897199844 | 0.907245147 | 0.915766777 | 0.023991034 |
| 18 | 0.786942297 | 0.837036994 | 0.760002215 | 0.794660502 | 0.03909306 |
| 19 | 0.786867099 | 0.833688854 | 0.824718431 | 0.815091462 | 0.024851118 |
| 20 | 0.721379394 | 0.802843836 | 0.778076447 | 0.767433226 | 0.041762094 |
| 21 | 0.890849185 | 0.877502116 | 0.828463665 | 0.865604989 | 0.032850335 |
| 22 | 0.954148637 | 0.950978476 | 0.950105137 | 0.951744083 | 0.002127696 |
| 23 | 0.701054331 | 0.728277897 | 0.749062746 | 0.726131658 | 0.024076061 |
| 24 | 0.655383394 | 0.41866352 | 0.61961762 | 0.564554845 | 0.127604884 |
| 25 | 0.789525119 | 0.778749889 | 0.78004155 | 0.782772186 | 0.005883764 |
| 26 | 0.59299651 | 0.495555942 | 0.555200404 | 0.547917619 | 0.049126829 |
| 27 | 0.839874468 | 0.838310049 | 0.842544949 | 0.840243156 | 0.002141388 |
| 28 | 0.914070685 | 0.939421494 | 0.917912805 | 0.923801661 | 0.0136629 |
| 29 | 0.849664208 | 0.836528752 | 0.815527321 | 0.83390676 | 0.017218824 |
| 30 | 0.723138083 | 0.51137241 | 0.639041654 | 0.624517382 | 0.106627346 |
| 31 | 0.764452218 | 0.776632507 | 0.746588747 | 0.762557824 | 0.015111202 |
| 32 | 0.665626587 | 0.624049459 | 0.653440488 | 0.647705511 | 0.021373626 |
| 33 | 0.747203461 | 0.602119083 | 0.6925164 | 0.680612982 | 0.073270988 |
| 34 | 0.762173329 | 0.762409069 | 0.768349005 | 0.764310468 | 0.003499461 |
| 35 | 0.821476319 | 0.821552568 | 0.814251822 | 0.81909357 | 0.00419325 |
| 36 | 0.889202303 | 0.897772496 | 0.913630333 | 0.900201711 | 0.012393868 |
| 37 | 0.869050021 | 0.874728488 | 0.881094471 | 0.87495766 | 0.006025494 |
| 38 | 0.948709556 | 0.950495717 | 0.948928701 | 0.949377992 | 0.000974161 |
| 39 | 0.794986944 | 0.435283314 | 0.73830495 | 0.656191736 | 0.19340013 |
| 40 | 0.47237924 | 0.577643849 | 0.614422888 | 0.554815326 | 0.073722151 |
| 41 | 0.684281413 | 0.784589258 | 0.702647624 | 0.723839432 | 0.053406324 |

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 42 | 0.751170374 | 0.811241079 | 0.7867785 | 0.783063318 | 0.03020719 |
| 43 | 0.663161039 | 0.595925041 | 0.584435102 | 0.614507061 | 0.042525426 |
| 44 | 0.143433093 | 0.794071181 | 0.785375753 | 0.574293342 | 0.37316125 |
| 45 | 0.945347535 | 0.912336747 | 0.933869531 | 0.930517938 | 0.016758667 |
| 46 | 0.664215427 | 0.718667612 | 0.716352422 | 0.699745153 | 0.030791413 |
| 47 | 0.694893291 | 0.677733379 | 0.68912629 | 0.687250986 | 0.008732309 |
| 48 | 0.765084848 | 0.762941493 | 0.746094299 | 0.758040213 | 0.010400824 |
| 49 | 0.790165372 | 0.791965364 | 0.759549518 | 0.780560085 | 0.018217929 |
| 50 | 0.675872098 | 0.637220606 | 0.630366608 | 0.647819771 | 0.024534549 |
| 51 | 0.894379851 | 0.88546335 | 0.864077001 | 0.881306734 | 0.015573175 |
| 52 | 0.885647189 | 0.885751262 | 0.88548387 | 0.88562744 | 0.000134786 |
| 53 | 0.715541719 | 0.652716835 | 0.604027118 | 0.657428558 | 0.055906411 |
| 54 | 0.955068615 | 0.95053511 | 0.95755421 | 0.954385978 | 0.003558994 |
| 55 | 0.993889948 | 0.994311819 | 0.993120052 | 0.99377394 | 0.000604293 |
| 56 | 0.96831171 | 0.964425298 | 0.972514938 | 0.968417315 | 0.004045854 |
| 57 | 0.567003497 | 0.568743874 | 0.593351675 | 0.576366349 | 0.014735441 |
| 58 | 0.850162652 | 0.791584698 | 0.809423552 | 0.817056967 | 0.030025755 |
| 59 | 0.854274835 | 0.798815634 | 0.780182654 | 0.811091041 | 0.038541238 |
| 60 | 0.599275435 | 0.598889442 | 0.554749834 | 0.584304903 | 0.025596169 |
| 61 | 0.50960491 | 0.561692691 | 0.539472749 | 0.53692345 | 0.026137299 |
| 62 | 0.914510984 | 0.919388111 | 0.915830024 | 0.916576373 | 0.00252277 |
| 63 | 0.837733712 | 0.810665663 | 0.808218543 | 0.818872639 | 0.016379931 |
| 64 | 0.745376975 | 0.704521 | 0.712807988 | 0.720901988 | 0.021597159 |
| 65 | 0.802989589 | 0.730775617 | 0.77632738 | 0.770030862 | 0.036516422 |
| 66 | 0.877268491 | 0.880608724 | 0.833935522 | 0.863937579 | 0.026036164 |
| 67 | 0.774707105 | 0.641926252 | 0.517619693 | 0.644751017 | 0.128566982 |
| 68 | 0.852562378 | 0.871850032 | 0.85831358 | 0.860908663 | 0.009902234 |
| 69 | 0.8805359 | 0.827373817 | 0.847191061 | 0.85170026 | 0.026866362 |
| 70 | 0.803038562 | 0.745442113 | 0.751064652 | 0.766515109 | 0.031754924 |
| 71 | 0.78247046 | 0.997940931 | 0.779201562 | 0.853204318 | 0.12535624 |
| 72 | 0.823316293 | 0.795933716 | 0.78710963 | 0.802119879 | 0.018879409 |
| 73 | 0.598904356 | 0.680505403 | 0.701923713 | 0.660444491 | 0.054360621 |
| 74 | 0.836141973 | 0.902898135 | 0.774128128 | 0.837722745 | 0.064399556 |
| 75 | 0.905670925 | 0.903461189 | 0.909005747 | 0.906045954 | 0.002791239 |
| 76 | 0.658840144 | 0.700111583 | 0.711737303 | 0.690229676 | 0.027798676 |
| 77 | 0.668982874 | 0.67485669 | 0.816165879 | 0.720001814 | 0.083332292 |
| 78 | 0.929073079 | 0.949688294 | 0.951333835 | 0.943365069 | 0.012404543 |
| 79 | 0.874579494 | 0.834881442 | 0.885422352 | 0.864961096 | 0.026607914 |
| 80 | 0.75177712 | 0.76496269 | 0.731450648 | 0.749396819 | 0.016882346 |
| 81 | 0.66886677 | 0.694361441 | 0.619209859 | 0.66081269 | 0.038217682 |
| 82 | 0.909024488 | 0.93068889 | 0.920301707 | 0.920005029 | 0.010835248 |
| 83 | 0.735527861 | 0.698479748 | 0.749092223 | 0.727699944 | 0.026198528 |
| 84 | 0.823511513 | 0.841641264 | 0.803874502 | 0.823009093 | 0.018888393 |

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 85 | 0.860472607 | 0.874091076 | 0.885508967 | 0.87335755 | 0.012534288 |
| 86 | 0.607857817 | 0.636477917 | 0.611663141 | 0.618666292 | 0.01554222 |
| 87 | 0.916777202 | 0.925399429 | 0.90603015 | 0.916068927 | 0.009704045 |
| 88 | 0.485269076 | 0.727946048 | 0.670017441 | 0.627744189 | 0.126741071 |
| 89 | 0.585765911 | 0.682219094 | 0.677947818 | 0.648644275 | 0.054496123 |
| 90 | 0.886865857 | 0.908588157 | 0.904906877 | 0.900120297 | 0.011625321 |
| 91 | 0.767354897 | 0.743251568 | 0.736856682 | 0.749154382 | 0.01608315 |
| 92 | 0.75317336 | 0.670892311 | 0.633003487 | 0.68568972 | 0.061436325 |
| 93 | 0.850541542 | 0.847614562 | 0.841505246 | 0.846553783 | 0.004610596 |
| 94 | 0.929635175 | 0.92728407 | 0.920925583 | 0.925948276 | 0.00450583 |
| 95 | 0.870222692 | 0.791727581 | 0.84129052 | 0.834413598 | 0.039696847 |
| 96 | 0.895743634 | 0.874963821 | 0.856486745 | 0.8757314 | 0.019639698 |
| 97 | 0.836497121 | 0.83126515 | 0.826859173 | 0.831540481 | 0.004824869 |
| 98 | 0.916067784 | 0.936670115 | 0.938705966 | 0.930481288 | 0.012523897 |
| 99 | 0.729499958 | 0.758781852 | 0.69100227 | 0.726428027 | 0.033994051 |
| 100 | 0.829069648 | 0.791867415 | 0.805921881 | 0.808952982 | 0.018785425 |
| 101 | 0.690395515 | 0.781455659 | 0.707527505 | 0.72645956 | 0.048392194 |
| 102 | 0.924547611 | 0.937414763 | 0.912114113 | 0.924692162 | 0.012650945 |
| 103 | 0.835766322 | 0.830247785 | 0.767501316 | 0.811171807 | 0.037920277 |
| 104 | 0.840858342 | 0.836863163 | 0.824878639 | 0.834200048 | 0.008316061 |
| 105 | 0.860929852 | 0.906429304 | 0.880868758 | 0.882742638 | 0.022807534 |
| 106 | 0.910884856 | 0.925054606 | 0.925270226 | 0.920403229 | 0.008243858 |
| 107 | 0.629824119 | 0.718167447 | 0.719998352 | 0.689329973 | 0.051541711 |
| 108 | 0.85395252 | 0.813914017 | 0.863358807 | 0.843741781 | 0.02625626 |
| 109 | 0.750459337 | 0.750401532 | 0.759131347 | 0.753330739 | 0.005023557 |
| 110 | 0.739486632 | 0.755718937 | 0.664064047 | 0.719756538 | 0.048909224 |
| 111 | 0.686136959 | 0.767460621 | 0.733382954 | 0.728993511 | 0.040839134 |
| 112 | 0.884027381 | 0.886948747 | 0.880984278 | 0.883986802 | 0.002982441 |
| 113 | 0.982949228 | 0.971042237 | 0.97229798 | 0.975429815 | 0.006542202 |
| 114 | 0.788415441 | 0.747037304 | 0.792839815 | 0.77609752 | 0.025263925 |
| 115 | 0.778970329 | 0.834180438 | 0.811152296 | 0.808101021 | 0.027731241 |
| 116 | 0.807987542 | 0.787137247 | 0.75626288 | 0.78379589 | 0.026023713 |
| 117 | 0.394410314 | 0.440032177 | 0.385251621 | 0.406564704 | 0.029343214 |
| 118 | 0.764252521 | 0.794070867 | 0.720528326 | 0.759617238 | 0.036989738 |

# Appendix VII: Image I Flattening Calculations

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 1 | 0.603129351 | 0.509959776 | 0.503937221 | 0.539008783 | 0.055611629 |
| 2 | 0.598918004 | 0.512355799 | 0.560921167 | 0.557398323 | 0.043388497 |
| 3 | 0.518061668 | 0.476399156 | 0.486678742 | 0.493713189 | 0.021703774 |
| 4 | 0.511851826 | 0.466222022 | 0.431253784 | 0.469775877 | 0.040416376 |
| 5 | 0.373992564 | 0.299494621 | 0.291939689 | 0.321808958 | 0.045349926 |
| 6 | 0.444156425 | 0.36941473 | 0.413305025 | 0.408958727 | 0.037559925 |
| 7 | 0.300967845 | 0.357014227 | 0.356472891 | 0.338151654 | 0.032203261 |
| 8 | 0.408725793 | 0.275086833 | 0.445881423 | 0.376564683 | 0.089824555 |
| 9 | 0.488463795 | 0.474385001 | 0.456702844 | 0.47318388 | 0.015914507 |
| 10 | 0.17326856 | 0.191088723 | 0.223886131 | 0.196081138 | 0.025675431 |
| 11 | 0.368519239 | 0.331395403 | 0.302179517 | 0.334031386 | 0.033248323 |
| 12 | 0.104160713 | 0.103579865 | 0.069172118 | 0.092304232 | 0.020035103 |
| 13 | 0.34804768 | 0.330969038 | 0.332530818 | 0.337182512 | 0.009441859 |
| 14 | 0.340220579 | 0.273131731 | 0.311536951 | 0.30829642 | 0.033661612 |
| 15 | 0.334178315 | 0.393824202 | 0.327679389 | 0.351893969 | 0.036457748 |
| 16 | 0.199177767 | 0.413039951 | 0.017923094 | 0.210046937 | 0.197782549 |
| 17 | 0.666797645 | 0.558375227 | 0.579397761 | 0.601523544 | 0.057497982 |
| 18 | 0.382973403 | 0.452853703 | 0.350079518 | 0.395302208 | 0.052484597 |
| 19 | 0.38287751 | 0.447765543 | 0.434456448 | 0.421699834 | 0.034273352 |
| 20 | 0.307459914 | 0.403810621 | 0.371830403 | 0.361033646 | 0.049074353 |
| 21 | 0.545700837 | 0.520427236 | 0.439957184 | 0.502028419 | 0.055220624 |
| 22 | 0.700666778 | 0.690742924 | 0.688070153 | 0.693159952 | 0.006637037 |
| 23 | 0.286892137 | 0.314718084 | 0.337500941 | 0.313037054 | 0.025346246 |
| 24 | 0.24470363 | 0.09185857 | 0.215096181 | 0.183886127 | 0.081061419 |
| 25 | 0.386281753 | 0.372665471 | 0.37427228 | 0.377739835 | 0.007441017 |
| 26 | 0.194794971 | 0.131423977 | 0.168283395 | 0.164834114 | 0.031825994 |
| 27 | 0.45721931 | 0.454806217 | 0.461373963 | 0.45779983 | 0.003322134 |
| 28 | 0.594445093 | 0.657235858 | 0.603217839 | 0.618299597 | 0.034003891 |
| 29 | 0.472675874 | 0.45207697 | 0.421281425 | 0.44867809 | 0.025865259 |
| 30 | 0.309296509 | 0.140640786 | 0.230827871 | 0.226921722 | 0.084395685 |
| 31 | 0.355319609 | 0.370046074 | 0.334714164 | 0.353359949 | 0.017747286 |
| 32 | 0.253715037 | 0.218615157 | 0.243022108 | 0.238450767 | 0.017990922 |
| 33 | 0.335404644 | 0.201593706 | 0.278597868 | 0.271865406 | 0.067159037 |
| 34 | 0.352626988 | 0.352904635 | 0.359968901 | 0.355166841 | 0.004161022 |
| 35 | 0.42975737 | 0.429867228 | 0.419488182 | 0.426370927 | 0.005960885 |
| 36 | 0.542485777 | 0.559540529 | 0.593454043 | 0.565160117 | 0.025944669 |
| 37 | 0.505275773 | 0.515386678 | 0.527059693 | 0.515907381 | 0.010901291 |
| 38 | 0.683851019 | 0.689262343 | 0.684509399 | 0.685874253 | 0.00295258 |
| 39 | 0.39337346 | 0.099706472 | 0.32553295 | 0.272870961 | 0.153753175 |
| 40 | 0.118604599 | 0.18371109 | 0.211023122 | 0.171112937 | 0.047479795 |
| 41 | 0.270781962 | 0.379984116 | 0.288462007 | 0.313076028 | 0.058614547 |

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 42 | 0.339891623 | 0.41528818 | 0.382764557 | 0.379314787 | 0.037816476 |
| 43 | 0.251523256 | 0.196959936 | 0.188559546 | 0.212347579 | 0.034186136 |
| 44 | 0.010339984 | 0.392175223 | 0.380980673 | 0.261165293 | 0.217293192 |
| 45 | 0.67393553 | 0.590559333 | 0.642386103 | 0.635626989 | 0.042097052 |
| 46 | 0.252458786 | 0.304646231 | 0.302261361 | 0.286455459 | 0.029466121 |
| 47 | 0.280887134 | 0.264692263 | 0.275358739 | 0.273646046 | 0.008232159 |
| 48 | 0.35607052 | 0.353532461 | 0.334159706 | 0.347920896 | 0.011984915 |
| 49 | 0.387106303 | 0.389433983 | 0.349550517 | 0.375363601 | 0.022385062 |
| 50 | 0.262981067 | 0.229318549 | 0.223702416 | 0.238667344 | 0.021242718 |
| 51 | 0.552691737 | 0.535290783 | 0.496640351 | 0.528207624 | 0.028689159 |
| 52 | 0.535641241 | 0.535839789 | 0.535329884 | 0.535603638 | 0.000257024 |
| 53 | 0.301429997 | 0.242398038 | 0.203036237 | 0.248954757 | 0.049523489 |
| 54 | 0.703615215 | 0.689382864 | 0.711746754 | 0.701581611 | 0.011319786 |
| 55 | 0.889624412 | 0.893491752 | 0.882899351 | 0.888671838 | 0.005360064 |
| 56 | 0.750255265 | 0.735644473 | 0.767159507 | 0.751019748 | 0.01577142 |
| 57 | 0.176284616 | 0.177485316 | 0.195056655 | 0.182942195 | 0.010508592 |
| 58 | 0.473479852 | 0.388940538 | 0.412774733 | 0.425065041 | 0.043589135 |
| 59 | 0.480178391 | 0.398424084 | 0.374448222 | 0.417683565 | 0.05543386 |
| 60 | 0.199457088 | 0.199168284 | 0.167982799 | 0.188869391 | 0.018088895 |
| 61 | 0.139591472 | 0.17265405 | 0.15799694 | 0.156747487 | 0.016566664 |
| 62 | 0.59543893 | 0.606648375 | 0.598433856 | 0.60017372 | 0.005803728 |
| 63 | 0.453921043 | 0.414490664 | 0.411117341 | 0.426509682 | 0.023798778 |
| 64 | 0.333356793 | 0.290316859 | 0.298640768 | 0.30743814 | 0.022828804 |
| 65 | 0.404006947 | 0.317382246 | 0.369670087 | 0.363686427 | 0.043621243 |
| 66 | 0.520000005 | 0.526155853 | 0.44813811 | 0.498097989 | 0.043375866 |
| 67 | 0.367679747 | 0.233233617 | 0.144389193 | 0.248434186 | 0.112418686 |
| 68 | 0.477374521 | 0.510227072 | 0.486874481 | 0.491492024 | 0.016906029 |
| 69 | 0.52602054 | 0.438348358 | 0.468711655 | 0.477693518 | 0.044520874 |
| 70 | 0.404072934 | 0.333429632 | 0.339771336 | 0.359091301 | 0.039084074 |
| 71 | 0.377312294 | 0.935860326 | 0.373226575 | 0.562133065 | 0.323663749 |
| 72 | 0.432417158 | 0.394616221 | 0.383186875 | 0.403406751 | 0.025765486 |
| 73 | 0.199179438 | 0.267256937 | 0.287747867 | 0.251394748 | 0.046365919 |
| 74 | 0.451486918 | 0.570145423 | 0.366971058 | 0.4628678 | 0.102064191 |
| 75 | 0.57601866 | 0.571330104 | 0.583216421 | 0.576855062 | 0.005987137 |
| 76 | 0.247717031 | 0.285966547 | 0.297554264 | 0.277079281 | 0.026080166 |
| 77 | 0.256722182 | 0.262051189 | 0.422182332 | 0.313651901 | 0.09402787 |
| 78 | 0.630103781 | 0.686803346 | 0.691837811 | 0.669581646 | 0.034281377 |
| 79 | 0.515117841 | 0.449570188 | 0.535212674 | 0.499966901 | 0.044786405 |
| 80 | 0.34058271 | 0.355925406 | 0.318105617 | 0.338204578 | 0.019021718 |
| 81 | 0.2566177 | 0.280373576 | 0.214774459 | 0.250588578 | 0.033212555 |
| 82 | 0.583257298 | 0.634188314 | 0.608790635 | 0.608745416 | 0.025465538 |
| 83 | 0.322505524 | 0.284370178 | 0.337534272 | 0.314803325 | 0.027406169 |
| 84 | 0.432700443 | 0.45996298 | 0.405201055 | 0.432621493 | 0.027381048 |

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 85 | 0.490503294 | 0.514237927 | 0.535377713 | 0.513372978 | 0.022449709 |
| 86 | 0.205954111 | 0.228705075 | 0.208881677 | 0.214513621 | 0.012377023 |
| 87 | 0.600600999 | 0.621006732 | 0.576786853 | 0.599464861 | 0.022131821 |
| 88 | 0.125635131 | 0.314365585 | 0.257654644 | 0.232551787 | 0.096837034 |
| 89 | 0.189519712 | 0.268852198 | 0.26488997 | 0.241087294 | 0.044702756 |
| 90 | 0.537972996 | 0.582306858 | 0.574390387 | 0.56489008 | 0.023644549 |
| 91 | 0.35877737 | 0.330987962 | 0.323951015 | 0.337905449 | 0.018414871 |
| 92 | 0.342177919 | 0.25844521 | 0.225851058 | 0.275491396 | 0.060007616 |
| 93 | 0.474092132 | 0.469387566 | 0.459751057 | 0.467743585 | 0.007310514 |
| 94 | 0.631518736 | 0.625641543 | 0.610261536 | 0.622473939 | 0.010976904 |
| 95 | 0.50734143 | 0.389125677 | 0.45941674 | 0.451961283 | 0.059459473 |
| 96 | 0.555429036 | 0.515811698 | 0.483830981 | 0.518357238 | 0.03586684 |
| 97 | 0.45202868 | 0.44412389 | 0.437590978 | 0.444581183 | 0.007229706 |
| 98 | 0.598976539 | 0.64978707 | 0.655281115 | 0.634681575 | 0.031043249 |
| 99 | 0.316019144 | 0.348655159 | 0.277147413 | 0.313940572 | 0.035799159 |
| 100 | 0.440854653 | 0.389306954 | 0.407978107 | 0.412713238 | 0.026098035 |
| 101 | 0.27656788 | 0.376039222 | 0.293314193 | 0.315307098 | 0.05325789 |
| 102 | 0.618933452 | 0.651785178 | 0.590063608 | 0.620260746 | 0.030882185 |
| 103 | 0.45091471 | 0.442605512 | 0.35895263 | 0.417490951 | 0.050865626 |
| 104 | 0.458744747 | 0.452587864 | 0.434690146 | 0.448674252 | 0.012495729 |
| 105 | 0.491276313 | 0.57764243 | 0.526639428 | 0.531852724 | 0.043418434 |
| 106 | 0.587339389 | 0.620165857 | 0.620691408 | 0.609398885 | 0.019105891 |
| 107 | 0.22326222 | 0.304129668 | 0.306024228 | 0.277805372 | 0.047245253 |
| 108 | 0.479649066 | 0.419014654 | 0.495409502 | 0.464691074 | 0.040334221 |
| 109 | 0.339083377 | 0.339017746 | 0.349062524 | 0.342387882 | 0.005780503 |
| 110 | 0.326828758 | 0.34510391 | 0.252324307 | 0.308085658 | 0.04914765 |
| 111 | 0.272527613 | 0.358903911 | 0.320184258 | 0.317205261 | 0.043265136 |
| 112 | 0.532564882 | 0.53813214 | 0.52685446 | 0.532517161 | 0.005638991 |
| 113 | 0.816122825 | 0.761092122 | 0.766255187 | 0.781156712 | 0.030391383 |
| 114 | 0.384856852 | 0.33521788 | 0.390569916 | 0.370214883 | 0.030442608 |
| 115 | 0.372939216 | 0.448508389 | 0.415165021 | 0.412204209 | 0.03787149 |
| 116 | 0.410800431 | 0.38322212 | 0.345732122 | 0.379918224 | 0.03265973 |
| 117 | 0.08106556 | 0.102017994 | 0.077188433 | 0.086757329 | 0.013357543 |
| 118 | 0.355082885 | 0.392174813 | 0.306574495 | 0.351277398 | 0.042926855 |

# Appendix VIII: Image II Raw Data (degrees)

| Cell Number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 1 | 0.0141514 | 0.0149451 | 0.0149444 | 0.020346 | 0.0201554 | 0.0196788 |
| 2 | 0.0177804 | 0.017731 | 0.017692 | 0.0309711 | 0.0330329 | 0.0330334 |
| 3 | 0.0124603 | 0.0137849 | 0.0129622 | 0.0197486 | 0.0210872 | 0.0201244 |
| 4 | 0.0189253 | 0.0175275 | 0.0170265 | 0.0307195 | 0.0316664 | 0.0302498 |
| 5 | 0.0156744 | 0.0150466 | 0.0152469 | 0.023907 | 0.0242414 | 0.024389 |
| 6 | 0.0159924 | 0.0165379 | 0.0154482 | 0.020464 | 0.0204644 | 0.0208248 |
| 7 | 0.0153478 | 0.0159465 | 0.0143837 | 0.0238458 | 0.0232808 | 0.0233151 |
| 8 | 0.0194271 | 0.0192469 | 0.0198807 | 0.0264417 | 0.0231432 | 0.0251851 |
| 9 | 0.0239431 | 0.0236931 | 0.0238481 | 0.0422648 | 0.0408619 | 0.0409926 |
| 10 | 0.0284521 | 0.0256275 | 0.0260878 | 0.0323734 | 0.0329159 | 0.03405 |
| 11 | 0.014446 | 0.0122127 | 0.0127409 | 0.0180756 | 0.0188531 | 0.0179817 |
| 12 | 0.0070377 | 0.00739468 | 0.00776387 | 0.00871621 | 0.00899769 | 0.00882979 |
| 13 | 0.0157846 | 0.0154915 | 0.0152985 | 0.017154 | 0.0170759 | 0.0178266 |
| 14 | 0.0150416 | 0.0150418 | 0.0153867 | 0.0316524 | 0.0307289 | 0.0306149 |
| 15 | 0.0241599 | 0.0222891 | 0.0232669 | 0.024272 | 0.0246215 | 0.0242713 |
| 16 | 0.00721493 | 0.00709088 | 0.00769706 | 0.0282548 | 0.0257845 | 0.0258901 |
| 17 | 0.0107229 | 0.0104157 | 0.0108876 | 0.0134119 | 0.0132699 | 0.0132698 |
| 18 | 0.0239079 | 0.0225691 | 0.0216641 | 0.031072 | 0.0311662 | 0.0306148 |
| 19 | 0.0186582 | 0.0199806 | 0.019624 | 0.0815685 | 0.0818836 | 0.0812384 |
| 20 | 0.0310315 | 0.0326285 | 0.0293257 | 0.0500572 | 0.0477369 | 0.0467442 |
| 21 | 0.0366953 | 0.0352609 | 0.0380156 | 0.0408404 | 0.0399861 | 0.0396305 |
| 22 | 0.0402289 | 0.0409532 | 0.0410859 | 0.0499614 | 0.0499575 | 0.0497059 |
| 23 | 0.00747702 | 0.00762878 | 0.00782999 | 0.0178893 | 0.0171987 | 0.0171602 |
| 24 | 0.00719856 | 0.00656394 | 0.00681366 | 0.0197516 | 0.0197524 | 0.0187911 |
| 25 | 0.00676826 | 0.0068157 | 0.0068158 | 0.0107397 | 0.00971325 | 0.0100437 |
| 26 | 0.0094567 | 0.00899531 | 0.00992909 | 0.0179182 | 0.0196853 | 0.0195475 |
| 27 | 0.0156064 | 0.0169066 | 0.0165917 | 0.028867 | 0.0283927 | 0.0288653 |
| 28 | 0.0124229 | 0.0103892 | 0.0101605 | 0.0175841 | 0.0167479 | 0.0161689 |
| 29 | 0.018572 | 0.0169618 | 0.017088 | 0.0277913 | 0.0204361 | 0.0212963 |
| 30 | 0.0141257 | 0.0138294 | 0.0144324 | 0.0276037 | 0.0289383 | 0.0285755 |
| 31 | 0.0169653 | 0.0152627 | 0.0156754 | 0.0241263 | 0.0254659 | 0.0254574 |
| 32 | 0.00669754 | 0.00716665 | 0.00669757 | 0.0159782 | 0.014481 | 0.0149566 |
| 33 | 0.0106834 | 0.0121743 | 0.0112553 | 0.0211472 | 0.0194744 | 0.0203763 |
| 34 | 0.0129302 | 0.0134072 | 0.0137366 | 0.020633 | 0.019103 | 0.0191662 |
| 35 | 0.01155377 | 0.0113797 | 0.0113902 | 0.0168979 | 0.018615 | 0.0177454 |
| 36 | 0.00898221 | 0.00975987 | 0.00995226 | 0.0144329 | 0.0148695 | 0.0154908 |
| 37 | 0.0215388 | 0.0198405 | 0.0194348 | 0.030992 | 0.02990804 | 0.0299539 |
| 38 | 0.0255099 | 0.0250132 | 0.0251069 | 0.0740269 | 0.0750743 | 0.0750393 |
| 39 | 0.0144124 | 0.0150626 | 0.0146867 | 0.0312098 | 0.0335169 | 0.0322819 |
| 40 | 0.0130704 | 0.0140713 | 0.014802 | 0.0185724 | 0.0190027 | 0.0183043 |
| 41 | 0.0251274 | 0.0270419 | 0.0260744 | 0.030965 | 0.0300231 | 0.0318613 |

| Cell Number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 42 | 0.0157464 | 0.0146283 | 0.0151678 | 0.0241761 | 0.0246306 | 0.0251047 |
| 43 | 0.0109301 | 0.0118356 | 0.0118723 | 0.0217826 | 0.0208351 | 0.0203669 |
| 44 | 0.0256548 | 0.02584 | 0.0254871 | 0.0323296 | 0.0303764 | 0.0305456 |
| 45 | 0.0195027 | 0.0202075 | 0.0196747 | 0.0319001 | 0.0305434 | 0.0319021 |
| 46 | 0.0061661 | 0.006364 | 0.00672249 | 0.0099874 | 0.0101661 | 0.0112934 |
| 47 | 0.0143063 | 0.0157453 | 0.0143098 | 0.031327 | 0.0316212 | 0.0306976 |
| 48 | 0.00947639 | 0.0104242 | 0.0104352 | 0.013874 | 0.0134047 | 0.0138172 |
| 49 | 0.0194496 | 0.0176322 | 0.0184598 | 0.0234109 | 0.0234108 | 0.0236638 |
| 50 | 0.0206477 | 0.0209874 | 0.0209392 | 0.0262862 | 0.0295855 | 0.0282616 |
| 51 | 0.0081539 | 0.00934746 | 0.00838477 | 0.0198444 | 0.0201196 | 0.0197766 |
| 52 | 0.0111557 | 0.0124679 | 0.0119997 | 0.0175857 | 0.0181697 | 0.0186216 |
| 53 | 0.0167946 | 0.017386 | 0.0158945 | 0.0286905 | 0.0287224 | 0.0268301 |
| 54 | 0.0165482 | 0.0160875 | 0.0165483 | 0.0262355 | 0.0257822 | 0.0261024 |
| 55 | 0.0112284 | 0.0120756 | 0.0125048 | 0.0210239 | 0.0201076 | 0.0206908 |
| 56 | 0.021273 | 0.0233991 | 0.0231696 | 0.0243575 | 0.0249929 | 0.0235164 |
| 57 | 0.0153024 | 0.0149773 | 0.0142475 | 0.0299448 | 0.0305186 | 0.0306506 |
| 58 | 0.00809894 | 0.0104054 | 0.00933584 | 0.0175685 | 0.0185095 | 0.0178421 |
| 59 | 0.00911725 | 0.00996489 | 0.0108188 | 0.0286945 | 0.025027 | 0.0292643 |
| 60 | 0.0151749 | 0.0144158 | 0.0145013 | 0.0395109 | 0.0384943 | 0.0393514 |
| 61 | 0.0231126 | 0.0213862 | 0.0217508 | 0.0455793 | 0.0449716 | 0.0434402 |
| 62 | 0.0237009 | 0.0237013 | 0.0241604 | 0.0317616 | 0.030804 | 0.0322358 |
| 63 | 0.019974 | 0.0204457 | 0.0191501 | 0.0327979 | 0.0301489 | 0.0320241 |
| 64 | 0.0127867 | 0.0132853 | 0.0133274 | 0.0175824 | 0.0186602 | 0.0169469 |
| 65 | 0.0190775 | 0.0197403 | 0.0184793 | 0.0245515 | 0.0260302 | 0.0248348 |
| 66 | 0.0143059 | 0.0142046 | 0.0142041 | 0.0260072 | 0.0263383 | 0.0273812 |
| 67 | 0.0101433 | 0.00986257 | 0.00959701 | 0.0259816 | 0.0268324 | 0.026559 |
| 68 | 0.0194851 | 0.0184366 | 0.0194506 | 0.022482 | 0.0245986 | 0.0235746 |
| 69 | 0.0232415 | 0.0244653 | 0.0244655 | 0.0377242 | 0.0377454 | 0.0388041 |
| 70 | 0.00947707 | 0.00996301 | 0.00947696 | 0.0194712 | 0.0195114 | 0.018569 |
| 71 | 0.0071704 | 0.00784326 | 0.008055 | 0.0305493 | 0.031924 | 0.0314001 |
| 72 | 0.0108026 | 0.0106356 | 0.0106355 | 0.02966 | 0.0273699 | 0.0255141 |
| 73 | 0.0289502 | 0.0284437 | 0.0299819 | 0.0336545 | 0.0333178 | 0.0332363 |
| 74 | 0.0210278 | 0.0203596 | 0.0212757 | 0.0465445 | 0.0483734 | 0.0491611 |
| 75 | 0.0159315 | 0.0146996 | 0.0144143 | 0.0243919 | 0.0241603 | 0.0256481 |
| 76 | 0.0127594 | 0.0131064 | 0.0132175 | 0.0138721 | 0.01549 | 0.0151687 |
| 77 | 0.00894007 | 0.00847582 | 0.00890198 | 0.0282528 | 0.0278895 | 0.027288 |
| 78 | 0.018866 | 0.0195383 | 0.018448 | 0.0450563 | 0.0452736 | 0.0456705 |
| 79 | 0.00893901 | 0.00919915 | 0.00806847 | 0.0169075 | 0.0169678 | 0.0175171 |
| 80 | 0.0132915 | 0.013334 | 0.0120739 | 0.0241964 | 0.0237004 | 0.0241597 |
| 81 | 0.0151509 | 0.0156174 | 0.0151715 | 0.0180903 | 0.0180598 | 0.0181447 |
| 82 | 0.00846159 | 0.00804048 | 0.00808368 | 0.0101164 | 0.0106771 | 0.0107926 |
| 83 | 0.00643261 | 0.00709362 | 0.0053919 | 0.00985136 | 0.011461 | 0.00919209 |
| 84 | 0.00528572 | 0.00522245 | 0.00614748 | 0.0118427 | 0.0113591 | 0.0127869 |

| Cell Number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 85 | 0.00762458 | 0.00663644 | 0.00715595 | 0.0194923 | 0.0205417 | 0.0201444 |
| 86 | 0.00709873 | 0.0082766 | 0.00804247 | 0.0130996 | 0.0139576 | 0.0124522 |
| 87 | 0.00740277 | 0.00763918 | 0.0082586 | 0.0207349 | 0.0215333 | 0.0197472 |
| 88 | 0.00763201 | 0.00826629 | 0.00892981 | 0.0218289 | 0.0233769 | 0.0211078 |

# Appendix IX: Image II Raw Data (Width, meters)

| Cell Number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 1 | 19894 | 21009 | 21008 | 20637 | 644 |
| 2 | 24995 | 24926 | 24871 | 24931 | 62 |
| 3 | 17516 | 19378 | 18222 | 18372 | 940 |
| 4 | 26605 | 24640 | 23935 | 25060 | 1383 |
| 5 | 22035 | 21152 | 21434 | 21540 | 451 |
| 6 | 22482 | 23248 | 21717 | 22482 | 766 |
| 7 | 21575 | 22417 | 20220 | 21404 | 1108 |
| 8 | 27310 | 27057 | 27948 | 27438 | 459 |
| 9 | 33658 | 33307 | 33525 | 33497 | 177 |
| 10 | 39997 | 36026 | 36673 | 37566 | 2130 |
| 11 | 20308 | 17168 | 17911 | 18462 | 1641 |
| 12 | 9893 | 10395 | 10914 | 10401 | 510 |
| 13 | 22190 | 21777 | 21506 | 21824 | 344 |
| 14 | 21145 | 21145 | 21630 | 21307 | 280 |
| 15 | 33963 | 31333 | 32708 | 32668 | 1315 |
| 16 | 10143 | 9968 | 10820 | 10310 | 450 |
| 17 | 15074 | 14642 | 15305 | 15007 | 337 |
| 18 | 33609 | 31727 | 30455 | 31930 | 1587 |
| 19 | 26229 | 28088 | 27587 | 27301 | 962 |
| 20 | 43623 | 45868 | 41225 | 43572 | 2322 |
| 21 | 51585 | 49569 | 53441 | 51532 | 1937 |
| 22 | 56553 | 57571 | 57757 | 57294 | 648 |
| 23 | 10511 | 10724 | 11007 | 10747 | 249 |
| 24 | 10120 | 9227 | 9578 | 9642 | 449 |
| 25 | 9515 | 9581 | 9581 | 9559 | 39 |
| 26 | 13294 | 12645 | 13958 | 13299 | 656 |
| 27 | 21939 | 23767 | 23324 | 23010 | 954 |
| 28 | 17464 | 14605 | 14283 | 15451 | 1751 |
| 29 | 26108 | 23844 | 24022 | 24658 | 1259 |
| 30 | 19857 | 19441 | 20289 | 19862 | 424 |
| 31 | 23849 | 21456 | 22036 | 22447 | 1249 |
| 32 | 9415 | 10075 | 9415 | 9635 | 381 |
| 33 | 15018 | 17114 | 15822 | 15985 | 1057 |
| 34 | 18177 | 18847 | 19310 | 18778 | 570 |
| 35 | 16242 | 15997 | 16012 | 16084 | 137 |
| 36 | 12627 | 13720 | 13991 | 13446 | 722 |
| 37 | 30279 | 27891 | 27321 | 28497 | 1569 |
| 38 | 35861 | 35163 | 35295 | 35439 | 371 |
| 39 | 20261 | 21175 | 20646 | 20694 | 459 |
| 40 | 18374 | 19781 | 20808 | 19654 | 1222 |
| 41 | 35323 | 38015 | 36655 | 36664 | 1346 |

| Cell Number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 42 | 22136 | 20564 | 21322 | 21341 | 786 |
| 43 | 15365 | 16638 | 16690 | 16231 | 750 |
| 44 | 36065 | 36325 | 35829 | 36073 | 248 |
| 45 | 27416 | 28407 | 27658 | 27827 | 517 |
| 46 | 8668 | 8946 | 9450 | 9022 | 396 |
| 47 | 20111 | 22134 | 20116 | 20787 | 1167 |
| 48 | 13322 | 14654 | 14669 | 14215 | 774 |
| 49 | 27342 | 24787 | 25950 | 26026 | 1279 |
| 50 | 29026 | 29503 | 29436 | 29322 | 258 |
| 51 | 11463 | 13140 | 11787 | 12130 | 890 |
| 52 | 15682 | 17527 | 16869 | 16693 | 935 |
| 53 | 23609 | 24441 | 22344 | 23465 | 1056 |
| 54 | 23263 | 22615 | 23263 | 23047 | 374 |
| 55 | 15785 | 16976 | 17579 | 16780 | 913 |
| 56 | 29905 | 32894 | 32571 | 31790 | 1640 |
| 57 | 21512 | 21055 | 20029 | 20865 | 759 |
| 58 | 11385 | 14628 | 13124 | 13046 | 1623 |
| 59 | 12817 | 14008 | 15209 | 14011 | 1196 |
| 60 | 21332 | 20265 | 20385 | 20661 | 585 |
| 61 | 32491 | 30064 | 30577 | 31044 | 1279 |
| 62 | 33318 | 33319 | 33964 | 33534 | 373 |
| 63 | 28079 | 28742 | 26921 | 27914 | 922 |
| 64 | 17975 | 18676 | 18735 | 18462 | 423 |
| 65 | 26819 | 27750 | 25978 | 26849 | 887 |
| 66 | 20111 | 19968 | 19968 | 20016 | 82 |
| 67 | 14259 | 13864 | 13491 | 13872 | 384 |
| 68 | 27392 | 25918 | 27343 | 26884 | 837 |
| 69 | 32672 | 34393 | 34393 | 33819 | 993 |
| 70 | 13323 | 14006 | 13322 | 13550 | 394 |
| 71 | 10080 | 11026 | 11323 | 10810 | 649 |
| 72 | 15186 | 14951 | 14951 | 15029 | 136 |
| 73 | 40697 | 39985 | 42148 | 40943 | 1102 |
| 74 | 29560 | 28621 | 29909 | 29363 | 666 |
| 75 | 22396 | 20664 | 20263 | 21108 | 1133 |
| 76 | 17937 | 18425 | 18581 | 18314 | 336 |
| 77 | 12568 | 11915 | 12514 | 12332 | 362 |
| 78 | 26521 | 27466 | 25934 | 26640 | 773 |
| 79 | 12566 | 12932 | 11342 | 12280 | 832 |
| 80 | 18685 | 18745 | 16973 | 18134 | 1006 |
| 81 | 21299 | 21954 | 21328 | 21527 | 371 |
| 82 | 11895 | 11303 | 11364 | 11521 | 326 |
| 83 | 9043 | 9972 | 7580 | 8865 | 1206 |
| 84 | 7431 | 7342 | 8642 | 7805 | 726 |

| Cell Number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 85 | 10718 | 9329 | 10060 | 10036 | 695 |
| 86 | 9979 | 11635 | 11306 | 10973 | 877 |
| 87 | 10407 | 10739 | 11610 | 10918 | 621 |
| 88 | 10729 | 11620 | 12553 | 11634 | 912 |

# Appendix X: Image II Raw Data (Length, meters)

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 1 | 28602 | 28334 | 27664 | 28200 | 483 |
| 2 | 43538 | 46437 | 46437 | 45471 | 1674 |
| 3 | 27762 | 29644 | 28290 | 28565 | 971 |
| 4 | 43185 | 44516 | 42524 | 43408 | 1014 |
| 5 | 33608 | 34078 | 34285 | 33990 | 347 |
| 6 | 28768 | 28768 | 29275 | 28937 | 293 |
| 7 | 33522 | 32727 | 32776 | 33008 | 445 |
| 8 | 37171 | 32534 | 35404 | 35036 | 2340 |
| 9 | 59415 | 57442 | 57626 | 58161 | 1089 |
| 10 | 45510 | 46272 | 47866 | 46549 | 1203 |
| 11 | 25410 | 26503 | 25278 | 25730 | 672 |
| 12 | 12253 | 12649 | 12413 | 12438 | 199 |
| 13 | 24115 | 24005 | 25060 | 24393 | 580 |
| 14 | 44496 | 43198 | 43037 | 43577 | 800 |
| 15 | 34121 | 34612 | 34120 | 34284 | 284 |
| 16 | 39720 | 36247 | 36396 | 37454 | 1963 |
| 17 | 18854 | 18654 | 18654 | 18721 | 115 |
| 18 | 43680 | 43812 | 43037 | 43510 | 415 |
| 19 | 114667 | 115109 | 114202 | 114659 | 454 |
| 20 | 70369 | 67107 | 65712 | 67729 | 2390 |
| 21 | 57412 | 56211 | 55711 | 56445 | 874 |
| 22 | 70234 | 70229 | 69875 | 70113 | 206 |
| 23 | 25148 | 24177 | 24123 | 24483 | 577 |
| 24 | 27766 | 27767 | 26416 | 27316 | 780 |
| 25 | 15098 | 13655 | 14119 | 14290 | 737 |
| 26 | 25189 | 27673 | 27479 | 26780 | 1382 |
| 27 | 40580 | 39914 | 40578 | 40357 | 384 |
| 28 | 24719 | 23544 | 22730 | 23664 | 1000 |
| 29 | 39068 | 28728 | 29938 | 32578 | 5653 |
| 30 | 38804 | 40681 | 40171 | 39885 | 970 |
| 31 | 33916 | 35799 | 35787 | 35167 | 1084 |
| 32 | 22462 | 20357 | 21026 | 21281 | 1075 |
| 33 | 29728 | 27377 | 28644 | 28583 | 1177 |
| 34 | 29005 | 26854 | 26943 | 27601 | 1217 |
| 35 | 23755 | 26168 | 24946 | 24956 | 1207 |
| 36 | 20289 | 20903 | 21776 | 20990 | 747 |
| 37 | 43568 | 42044 | 42108 | 42573 | 862 |
| 38 | 104065 | 105537 | 105488 | 105030 | 836 |
| 39 | 43874 | 47117 | 45381 | 45457 | 1623 |
| 40 | 26109 | 26713 | 25732 | 26185 | 495 |
| 41 | 43530 | 42206 | 44790 | 43508 | 1292 |

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 42 | 33986 | 34625 | 35291 | 34634 | 653 |
| 43 | 30621 | 29289 | 28631 | 29514 | 1014 |
| 44 | 45448 | 42702 | 42940 | 43697 | 1521 |
| 45 | 44844 | 42937 | 44847 | 44209 | 1102 |
| 46 | 14040 | 14291 | 15876 | 14736 | 995 |
| 47 | 44039 | 44452 | 43154 | 43881 | 663 |
| 48 | 19504 | 18844 | 19424 | 19257 | 360 |
| 49 | 32910 | 32910 | 33266 | 33029 | 205 |
| 50 | 36952 | 41590 | 39729 | 39424 | 2334 |
| 51 | 27897 | 28284 | 27801 | 27994 | 255 |
| 52 | 24721 | 25542 | 26178 | 25481 | 730 |
| 53 | 40332 | 40377 | 37717 | 39475 | 1523 |
| 54 | 36881 | 36244 | 36694 | 36606 | 328 |
| 55 | 29555 | 28267 | 29086 | 28969 | 652 |
| 56 | 34241 | 35134 | 33059 | 34145 | 1041 |
| 57 | 42095 | 42902 | 43088 | 42695 | 527 |
| 58 | 24697 | 26020 | 25082 | 25266 | 680 |
| 59 | 40338 | 35182 | 41139 | 38886 | 3233 |
| 60 | 55543 | 54114 | 55319 | 54992 | 769 |
| 61 | 64074 | 63220 | 61067 | 62787 | 1550 |
| 62 | 44649 | 43303 | 45316 | 44423 | 1025 |
| 63 | 46106 | 42382 | 45018 | 44502 | 1915 |
| 64 | 24717 | 26232 | 23823 | 24924 | 1218 |
| 65 | 34514 | 36592 | 34912 | 35339 | 1103 |
| 66 | 36560 | 37026 | 38492 | 37359 | 1008 |
| 67 | 36524 | 37720 | 37336 | 37193 | 611 |
| 68 | 31605 | 34580 | 33140 | 33108 | 1488 |
| 69 | 53032 | 53061 | 54550 | 53547 | 868 |
| 70 | 27372 | 27429 | 26104 | 26968 | 749 |
| 71 | 42945 | 44878 | 44141 | 43988 | 975 |
| 72 | 41695 | 38476 | 35867 | 38679 | 2919 |
| 73 | 47310 | 46837 | 46723 | 46957 | 312 |
| 74 | 65431 | 68002 | 69109 | 67514 | 1887 |
| 75 | 34289 | 33964 | 36055 | 34770 | 1125 |
| 76 | 19501 | 21775 | 21324 | 20867 | 1204 |
| 77 | 39717 | 39206 | 38361 | 39095 | 685 |
| 78 | 63339 | 63644 | 64202 | 63728 | 438 |
| 79 | 23768 | 23853 | 24625 | 24082 | 472 |
| 80 | 34015 | 33317 | 33963 | 33765 | 389 |
| 81 | 25431 | 25388 | 25507 | 25442 | 60 |
| 82 | 14221 | 15010 | 15172 | 14801 | 508 |
| 83 | 13849 | 16112 | 12922 | 14294 | 1641 |
| 84 | 16648 | 15968 | 17975 | 16864 | 1021 |

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 85 | 27402 | 28877 | 28318 | 28199 | 745 |
| 86 | 18415 | 19621 | 17505 | 18514 | 1062 |
| 87 | 29148 | 30271 | 27760 | 29060 | 1258 |
| 88 | 30686 | 32862.53009 | 29673 | 31074 | 1630 |

# Appendix XI: Image II Ellipse Area Calculations

| Cell Number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 1 | 4.47E+08 | 4.68E+08 | 4.56E+08 | 4.57E+08 | 1.03E+07 |
| 2 | 8.55E+08 | 9.09E+08 | 9.07E+08 | 8.90E+08 | 3.08E+07 |
| 3 | 3.82E+08 | 4.51E+08 | 4.05E+08 | 4.13E+08 | 3.53E+07 |
| 4 | 9.02E+08 | 8.61E+08 | 7.99E+08 | 8.54E+08 | 5.18E+07 |
| 5 | 5.82E+08 | 5.66E+08 | 5.77E+08 | 5.75E+08 | 7.97E+06 |
| 6 | 5.08E+08 | 5.25E+08 | 4.99E+08 | 5.11E+08 | 1.32E+07 |
| 7 | 5.68E+08 | 5.76E+08 | 5.21E+08 | 5.55E+08 | 3.01E+07 |
| 8 | 7.97E+08 | 6.91E+08 | 7.77E+08 | 7.55E+08 | 5.63E+07 |
| 9 | 1.57E+09 | 1.50E+09 | 1.52E+09 | 1.53E+09 | 3.58E+07 |
| 10 | 1.43E+09 | 1.31E+09 | 1.38E+09 | 1.37E+09 | 6.04E+07 |
| 11 | 4.05E+08 | 3.57E+08 | 3.56E+08 | 3.73E+08 | 2.82E+07 |
| 12 | 9.52E+07 | 1.03E+08 | 1.06E+08 | 1.02E+08 | 5.77E+06 |
| 13 | 4.20E+08 | 4.11E+08 | 4.23E+08 | 4.18E+08 | 6.64E+06 |
| 14 | 7.39E+08 | 7.17E+08 | 7.31E+08 | 7.29E+08 | 1.09E+07 |
| 15 | 9.10E+08 | 8.52E+08 | 8.76E+08 | 8.79E+08 | 2.93E+07 |
| 16 | 3.16E+08 | 2.84E+08 | 3.09E+08 | 3.03E+08 | 1.72E+07 |
| 17 | 2.23E+08 | 2.15E+08 | 2.24E+08 | 2.21E+08 | 5.34E+06 |
| 18 | 1.15E+09 | 1.09E+09 | 1.03E+09 | 1.09E+09 | 6.18E+07 |
| 19 | 2.36E+09 | 2.54E+09 | 2.47E+09 | 2.46E+09 | 8.96E+07 |
| 20 | 2.41E+09 | 2.42E+09 | 2.13E+09 | 2.32E+09 | 1.66E+08 |
| 21 | 2.33E+09 | 2.19E+09 | 2.34E+09 | 2.28E+09 | 8.33E+07 |
| 22 | 3.12E+09 | 3.18E+09 | 3.17E+09 | 3.15E+09 | 3.08E+07 |
| 23 | 2.08E+08 | 2.04E+08 | 2.09E+08 | 2.07E+08 | 2.60E+06 |
| 24 | 2.21E+08 | 2.01E+08 | 1.99E+08 | 2.07E+08 | 1.20E+07 |
| 25 | 1.13E+08 | 1.03E+08 | 1.06E+08 | 1.07E+08 | 5.11E+06 |
| 26 | 2.63E+08 | 2.75E+08 | 3.01E+08 | 2.80E+08 | 1.96E+07 |
| 27 | 6.99E+08 | 7.45E+08 | 7.43E+08 | 7.29E+08 | 2.60E+07 |
| 28 | 3.39E+08 | 2.70E+08 | 2.55E+08 | 2.88E+08 | 4.48E+07 |
| 29 | 8.01E+08 | 5.38E+08 | 5.65E+08 | 6.35E+08 | 1.45E+08 |
| 30 | 6.05E+08 | 6.21E+08 | 6.40E+08 | 6.22E+08 | 1.75E+07 |
| 31 | 6.35E+08 | 6.03E+08 | 6.19E+08 | 6.19E+08 | 1.60E+07 |
| 32 | 1.66E+08 | 1.61E+08 | 1.55E+08 | 1.61E+08 | 5.31E+06 |
| 33 | 3.51E+08 | 3.68E+08 | 3.56E+08 | 3.58E+08 | 8.88E+06 |
| 34 | 4.14E+08 | 3.98E+08 | 4.09E+08 | 4.07E+08 | 8.44E+06 |
| 35 | 3.03E+08 | 3.29E+08 | 3.14E+08 | 3.15E+08 | 1.29E+07 |
| 36 | 2.01E+08 | 2.25E+08 | 2.39E+08 | 2.22E+08 | 1.93E+07 |
| 37 | 1.04E+09 | 9.21E+08 | 9.04E+08 | 9.54E+08 | 7.20E+07 |
| 38 | 2.93E+09 | 2.91E+09 | 2.92E+09 | 2.92E+09 | 8.24E+06 |
| 39 | 6.98E+08 | 7.84E+08 | 7.36E+08 | 7.39E+08 | 4.28E+07 |
| 40 | 3.77E+08 | 4.15E+08 | 4.21E+08 | 4.04E+08 | 2.38E+07 |
| 41 | 1.21E+09 | 1.26E+09 | 1.29E+09 | 1.25E+09 | 4.14E+07 |

| Cell Number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 42 | 5.91E+08 | 5.59E+08 | 5.91E+08 | 5.80E+08 | 1.83E+07 |
| 43 | 3.70E+08 | 3.83E+08 | 3.75E+08 | 3.76E+08 | 6.62E+06 |
| 44 | 1.29E+09 | 1.22E+09 | 1.21E+09 | 1.24E+09 | 4.30E+07 |
| 45 | 9.66E+08 | 9.58E+08 | 9.74E+08 | 9.66E+08 | 8.12E+06 |
| 46 | 9.56E+07 | 1.00E+08 | 1.18E+08 | 1.05E+08 | 1.17E+07 |
| 47 | 6.96E+08 | 7.73E+08 | 6.82E+08 | 7.17E+08 | 4.90E+07 |
| 48 | 2.04E+08 | 2.17E+08 | 2.24E+08 | 2.15E+08 | 1.00E+07 |
| 49 | 7.07E+08 | 6.41E+08 | 6.78E+08 | 6.75E+08 | 3.31E+07 |
| 50 | 8.42E+08 | 9.64E+08 | 9.18E+08 | 9.08E+08 | 6.13E+07 |
| 51 | 2.51E+08 | 2.92E+08 | 2.57E+08 | 2.67E+08 | 2.20E+07 |
| 52 | 3.04E+08 | 3.52E+08 | 3.47E+08 | 3.34E+08 | 2.59E+07 |
| 53 | 7.48E+08 | 7.75E+08 | 6.62E+08 | 7.28E+08 | 5.91E+07 |
| 54 | 6.74E+08 | 6.44E+08 | 6.70E+08 | 6.63E+08 | 1.65E+07 |
| 55 | 3.66E+08 | 3.77E+08 | 4.02E+08 | 3.82E+08 | 1.81E+07 |
| 56 | 8.04E+08 | 9.08E+08 | 8.46E+08 | 8.53E+08 | 5.21E+07 |
| 57 | 7.11E+08 | 7.09E+08 | 6.78E+08 | 6.99E+08 | 1.88E+07 |
| 58 | 2.21E+08 | 2.99E+08 | 2.59E+08 | 2.59E+08 | 3.91E+07 |
| 59 | 4.06E+08 | 3.87E+08 | 4.91E+08 | 4.28E+08 | 5.56E+07 |
| 60 | 9.31E+08 | 8.61E+08 | 8.86E+08 | 8.93E+08 | 3.52E+07 |
| 61 | 1.64E+09 | 1.49E+09 | 1.47E+09 | 1.53E+09 | 9.07E+07 |
| 62 | 1.17E+09 | 1.13E+09 | 1.21E+09 | 1.17E+09 | 3.79E+07 |
| 63 | 1.02E+09 | 9.57E+08 | 9.52E+08 | 9.75E+08 | 3.62E+07 |
| 64 | 3.49E+08 | 3.85E+08 | 3.51E+08 | 3.61E+08 | 2.02E+07 |
| 65 | 7.27E+08 | 7.98E+08 | 7.12E+08 | 7.46E+08 | 4.56E+07 |
| 66 | 5.77E+08 | 5.81E+08 | 6.04E+08 | 5.87E+08 | 1.43E+07 |
| 67 | 4.09E+08 | 4.11E+08 | 3.96E+08 | 4.05E+08 | 8.29E+06 |
| 68 | 6.80E+08 | 7.04E+08 | 7.12E+08 | 6.99E+08 | 1.66E+07 |
| 69 | 1.36E+09 | 1.43E+09 | 1.47E+09 | 1.42E+09 | 5.71E+07 |
| 70 | 2.86E+08 | 3.02E+08 | 2.73E+08 | 2.87E+08 | 1.43E+07 |
| 71 | 3.40E+08 | 3.89E+08 | 3.93E+08 | 3.74E+08 | 2.93E+07 |
| 72 | 4.97E+08 | 4.52E+08 | 4.21E+08 | 4.57E+08 | 3.83E+07 |
| 73 | 1.51E+09 | 1.47E+09 | 1.55E+09 | 1.51E+09 | 3.79E+07 |
| 74 | 1.52E+09 | 1.53E+09 | 1.62E+09 | 1.56E+09 | 5.77E+07 |
| 75 | 6.03E+08 | 5.51E+08 | 5.74E+08 | 5.76E+08 | 2.60E+07 |
| 76 | 2.75E+08 | 3.15E+08 | 3.11E+08 | 3.00E+08 | 2.23E+07 |
| 77 | 3.92E+08 | 3.67E+08 | 3.77E+08 | 3.79E+08 | 1.26E+07 |
| 78 | 1.32E+09 | 1.37E+09 | 1.31E+09 | 1.33E+09 | 3.48E+07 |
| 79 | 2.35E+08 | 2.42E+08 | 2.19E+08 | 2.32E+08 | 1.17E+07 |
| 80 | 4.99E+08 | 4.90E+08 | 4.53E+08 | 4.81E+08 | 2.47E+07 |
| 81 | 4.25E+08 | 4.38E+08 | 4.27E+08 | 4.30E+08 | 6.66E+06 |
| 82 | 1.33E+08 | 1.33E+08 | 1.35E+08 | 1.34E+08 | 1.37E+06 |
| 83 | 9.84E+07 | 1.26E+08 | 7.69E+07 | 1.00E+08 | 2.47E+07 |
| 84 | 9.72E+07 | 9.21E+07 | 1.22E+08 | 1.04E+08 | 1.60E+07 |

| Cell Number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 85 | 2.31E+08 | 2.12E+08 | 2.24E+08 | 2.22E+08 | 9.66E+06 |
| 86 | 1.44E+08 | 1.79E+08 | 1.55E+08 | 1.60E+08 | 1.79E+07 |
| 87 | 2.38E+08 | 2.55E+08 | 2.53E+08 | 2.49E+08 | 9.29E+06 |
| 88 | 2.59E+08 | 3.00E+08 | 2.93E+08 | 2.84E+08 | 2.21E+07 |

# Appendix XII: Image II Eccentricity Calculations

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 1 | 0.718490083 | 0.67095995 | 0.650605105 | 0.680018379 | 0.034837249 |
| 2 | 0.818787655 | 0.84372996 | 0.844485047 | 0.835667554 | 0.014623296 |
| 3 | 0.77582676 | 0.756745716 | 0.764938207 | 0.765836894 | 0.009572214 |
| 4 | 0.787693004 | 0.832846085 | 0.826550059 | 0.815696382 | 0.0244551 |
| 5 | 0.75507311 | 0.784049368 | 0.780500804 | 0.77320776 | 0.015804975 |
| 6 | 0.623918466 | 0.589003869 | 0.670601878 | 0.627841405 | 0.04094021 |
| 7 | 0.765339356 | 0.728577318 | 0.787020877 | 0.760312517 | 0.029544276 |
| 8 | 0.678376469 | 0.555309381 | 0.613900519 | 0.615862123 | 0.06155699 |
| 9 | 0.824060274 | 0.81473498 | 0.813356236 | 0.81738383 | 0.005822921 |
| 10 | 0.477056233 | 0.627551459 | 0.64264806 | 0.582418584 | 0.091558154 |
| 11 | 0.601066627 | 0.761825705 | 0.705662486 | 0.689518273 | 0.081586439 |
| 12 | 0.589968008 | 0.569715407 | 0.47630268 | 0.545328698 | 0.060629905 |
| 13 | 0.391518535 | 0.420668856 | 0.513342482 | 0.441843291 | 0.063612389 |
| 14 | 0.879871339 | 0.872003239 | 0.864525708 | 0.872133429 | 0.007673644 |
| 15 | 0.095998181 | 0.424837171 | 0.28469621 | 0.268510521 | 0.165015917 |
| 16 | 0.966848061 | 0.961442647 | 0.954784921 | 0.961025209 | 0.006042394 |
| 17 | 0.60065756 | 0.619607616 | 0.571675828 | 0.597313668 | 0.024140221 |
| 18 | 0.638724523 | 0.689639265 | 0.706578307 | 0.678314032 | 0.035316139 |
| 19 | 0.973486922 | 0.969772164 | 0.970385735 | 0.97121494 | 0.001991367 |
| 20 | 0.784664399 | 0.729944081 | 0.778724928 | 0.764444469 | 0.030025438 |
| 21 | 0.43896348 | 0.471569446 | 0.28255507 | 0.397695999 | 0.101038915 |
| 22 | 0.593003887 | 0.572706089 | 0.562819353 | 0.576176443 | 0.015388601 |
| 23 | 0.908465222 | 0.896241095 | 0.889832254 | 0.898179524 | 0.00946652 |
| 24 | 0.931221188 | 0.943169865 | 0.931944723 | 0.935445259 | 0.00669948 |
| 25 | 0.776425206 | 0.712481408 | 0.734494672 | 0.741133762 | 0.032484773 |
| 26 | 0.849386925 | 0.889489457 | 0.861388447 | 0.866754943 | 0.020582826 |
| 27 | 0.841259738 | 0.80338802 | 0.81829575 | 0.820981169 | 0.019078138 |
| 28 | 0.707728183 | 0.784342101 | 0.777892217 | 0.756654167 | 0.042493696 |
| 29 | 0.743921799 | 0.557775264 | 0.59679614 | 0.632831068 | 0.098165779 |
| 30 | 0.859145065 | 0.878418267 | 0.863083052 | 0.866882128 | 0.01018277 |
| 31 | 0.711004979 | 0.800495535 | 0.787941405 | 0.76648064 | 0.048451659 |
| 32 | 0.907908983 | 0.868949814 | 0.894133598 | 0.890330799 | 0.019756016 |
| 33 | 0.863006876 | 0.780509616 | 0.833597653 | 0.825704715 | 0.041811163 |
| 34 | 0.779280152 | 0.71233718 | 0.697371722 | 0.729663018 | 0.043616353 |
| 35 | 0.729725721 | 0.791384416 | 0.766815358 | 0.762641832 | 0.031040496 |
| 36 | 0.78274489 | 0.754440534 | 0.766317024 | 0.767834149 | 0.014213036 |
| 37 | 0.719029704 | 0.748279596 | 0.76093878 | 0.74274936 | 0.02149489 |
| 38 | 0.938748489 | 0.942863514 | 0.942366178 | 0.94132606 | 0.00224605 |
| 39 | 0.886988851 | 0.893329071 | 0.890516203 | 0.890278042 | 0.003176813 |
| 40 | 0.710443785 | 0.672067921 | 0.588272941 | 0.656928216 | 0.06247669 |
| 41 | 0.584383709 | 0.434435136 | 0.574688668 | 0.531169171 | 0.083914264 |

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 42 | 0.758802379 | 0.804533278 | 0.796846595 | 0.786727417 | 0.024487285 |
| 43 | 0.864994563 | 0.822986711 | 0.812528617 | 0.833503297 | 0.027769008 |
| 44 | 0.608519344 | 0.525715632 | 0.551166736 | 0.56180057 | 0.042413707 |
| 45 | 0.791346443 | 0.749857342 | 0.787181699 | 0.776128495 | 0.022846583 |
| 46 | 0.786658866 | 0.779821368 | 0.803534422 | 0.790004885 | 0.012205495 |
| 47 | 0.889632913 | 0.8672144 | 0.884703753 | 0.880517022 | 0.011781085 |
| 48 | 0.730388179 | 0.628694213 | 0.655456871 | 0.671513088 | 0.052714014 |
| 49 | 0.556582283 | 0.657831422 | 0.625672262 | 0.613361989 | 0.051734941 |
| 50 | 0.61886698 | 0.704824946 | 0.671608318 | 0.665100081 | 0.043346982 |
| 51 | 0.911684146 | 0.885523431 | 0.905674225 | 0.900960601 | 0.013702534 |
| 52 | 0.773036121 | 0.727420617 | 0.764691265 | 0.755049334 | 0.024288242 |
| 53 | 0.81076523 | 0.795988666 | 0.805634438 | 0.804129445 | 0.007502364 |
| 54 | 0.775981205 | 0.781442706 | 0.773352574 | 0.776925495 | 0.004126902 |
| 55 | 0.845435284 | 0.799587924 | 0.796707399 | 0.813910202 | 0.027339485 |
| 56 | 0.487065417 | 0.351388101 | 0.171104742 | 0.33651942 | 0.158504244 |
| 57 | 0.859568662 | 0.871294952 | 0.885396844 | 0.872086819 | 0.012932286 |
| 58 | 0.887404232 | 0.827024846 | 0.852180567 | 0.855536548 | 0.030329269 |
| 59 | 0.948179522 | 0.917313564 | 0.929154058 | 0.931549048 | 0.015571732 |
| 60 | 0.923304524 | 0.927230228 | 0.929624639 | 0.926719797 | 0.003190826 |
| 61 | 0.861895796 | 0.879689237 | 0.865617005 | 0.869067346 | 0.009385109 |
| 62 | 0.665707936 | 0.638739824 | 0.662016016 | 0.655487925 | 0.014621277 |
| 63 | 0.793168382 | 0.734916686 | 0.801503373 | 0.77652948 | 0.036277906 |
| 64 | 0.68637872 | 0.702220893 | 0.617690726 | 0.668763446 | 0.044933959 |
| 65 | 0.629451103 | 0.651834283 | 0.668080577 | 0.649788654 | 0.019395812 |
| 66 | 0.835115529 | 0.842105093 | 0.854923717 | 0.844048113 | 0.010046022 |
| 67 | 0.920643981 | 0.929999031 | 0.932431491 | 0.927691501 | 0.006223333 |
| 68 | 0.498833563 | 0.662006682 | 0.565036429 | 0.575292225 | 0.082068585 |
| 69 | 0.787675826 | 0.761498744 | 0.776199414 | 0.775124661 | 0.013121594 |
| 70 | 0.873556677 | 0.85980349 | 0.859958134 | 0.864439434 | 0.007896143 |
| 71 | 0.972064066 | 0.969349626 | 0.966536842 | 0.969316845 | 0.002763757 |
| 72 | 0.931315121 | 0.921411845 | 0.908976238 | 0.920567735 | 0.011193338 |
| 73 | 0.509926804 | 0.520750658 | 0.431562667 | 0.487413376 | 0.048669962 |
| 74 | 0.892130198 | 0.907114383 | 0.901501931 | 0.900248837 | 0.007570279 |
| 75 | 0.757231012 | 0.793615524 | 0.82713544 | 0.792660659 | 0.034961995 |
| 76 | 0.392414141 | 0.532992324 | 0.49063233 | 0.472012932 | 0.072114963 |
| 77 | 0.948615434 | 0.95270164 | 0.945292757 | 0.948869943 | 0.003710993 |
| 78 | 0.908115132 | 0.902083977 | 0.91478686 | 0.908328656 | 0.006354133 |
| 79 | 0.848808218 | 0.840279551 | 0.887605043 | 0.858897604 | 0.02522444 |
| 80 | 0.835613883 | 0.826724797 | 0.866167549 | 0.842835409 | 0.020689261 |
| 81 | 0.546414135 | 0.502184669 | 0.548516887 | 0.532371897 | 0.026164039 |
| 82 | 0.548084397 | 0.657953665 | 0.66256763 | 0.622868564 | 0.064806064 |
| 83 | 0.757386621 | 0.785441801 | 0.809890989 | 0.784239804 | 0.026272814 |
| 84 | 0.894869804 | 0.888043658 | 0.876850083 | 0.886587848 | 0.009097644 |

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 85 | 0.920323304 | 0.946374524 | 0.934777897 | 0.933825242 | 0.013051712 |
| 86 | 0.84044018 | 0.80521601 | 0.76344961 | 0.803035267 | 0.038541584 |
| 87 | 0.934096815 | 0.934956936 | 0.908347493 | 0.925800415 | 0.015120791 |
| 88 | 0.936888346 | 0.935393202 | 0.906102908 | 0.926128152 | 0.017358475 |

# Appendix XIII: Image II Flattening Calculations

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 1 | 0.304462797 | 0.258506409 | 0.240583779 | 0.267850995 | 0.032948797 |
| 2 | 0.425903513 | 0.463232122 | 0.464420869 | 0.451185501 | 0.02190291 |
| 3 | 0.369054013 | 0.346290645 | 0.355896329 | 0.357080329 | 0.011427778 |
| 4 | 0.383932039 | 0.446495349 | 0.437136783 | 0.42252139 | 0.033745358 |
| 5 | 0.344359398 | 0.379301531 | 0.374845223 | 0.366168717 | 0.019018398 |
| 6 | 0.218510558 | 0.191869787 | 0.258182555 | 0.2228543 | 0.033369101 |
| 7 | 0.356373035 | 0.31503643 | 0.383073636 | 0.351494367 | 0.034279971 |
| 8 | 0.265285521 | 0.168356151 | 0.2106166 | 0.214752757 | 0.048596878 |
| 9 | 0.433497869 | 0.420166479 | 0.418234039 | 0.423966129 | 0.008311085 |
| 10 | 0.121127227 | 0.221424913 | 0.233838482 | 0.192130207 | 0.061802844 |
| 11 | 0.200801082 | 0.352217941 | 0.291451868 | 0.281490297 | 0.076198366 |
| 12 | 0.192573378 | 0.17815795 | 0.120718613 | 0.163816647 | 0.03801357 |
| 13 | 0.079829778 | 0.09278574 | 0.141816164 | 0.104810561 | 0.032695951 |
| 14 | 0.524788019 | 0.510499897 | 0.4974114 | 0.510899772 | 0.013692689 |
| 15 | 0.004618491 | 0.094730218 | 0.04138221 | 0.046910306 | 0.045309499 |
| 16 | 0.74464764 | 0.724994478 | 0.702702582 | 0.7241149 | 0.020986358 |
| 17 | 0.200493593 | 0.215088284 | 0.179520416 | 0.198367431 | 0.017879002 |
| 18 | 0.230564503 | 0.27584692 | 0.292365139 | 0.266258854 | 0.03199653 |
| 19 | 0.771257323 | 0.755987807 | 0.758439397 | 0.761894842 | 0.008200281 |
| 20 | 0.380079214 | 0.316493132 | 0.372634487 | 0.356402278 | 0.034762205 |
| 21 | 0.101495096 | 0.118171072 | 0.040748921 | 0.08680503 | 0.040747956 |
| 22 | 0.194800404 | 0.18023922 | 0.173420073 | 0.182819899 | 0.010921289 |
| 23 | 0.582039546 | 0.556432756 | 0.543712197 | 0.560728167 | 0.019521381 |
| 24 | 0.635545478 | 0.667688993 | 0.637399623 | 0.646878031 | 0.018046649 |
| 25 | 0.369790591 | 0.298309012 | 0.321385546 | 0.329828383 | 0.036481025 |
| 26 | 0.472229356 | 0.543044306 | 0.492053207 | 0.50244229 | 0.036532712 |
| 27 | 0.459368838 | 0.404544134 | 0.425202587 | 0.429705186 | 0.027688302 |
| 28 | 0.293515167 | 0.379671484 | 0.371602276 | 0.348262976 | 0.047584346 |
| 29 | 0.331733319 | 0.170007979 | 0.197607099 | 0.233116133 | 0.086512658 |
| 30 | 0.488267884 | 0.522107388 | 0.494937979 | 0.501771084 | 0.017924745 |
| 31 | 0.296813027 | 0.400661283 | 0.384249773 | 0.360574694 | 0.055825595 |
| 32 | 0.580832637 | 0.505099788 | 0.5521997 | 0.546044041 | 0.038239838 |
| 33 | 0.494807828 | 0.374856225 | 0.447627885 | 0.439097313 | 0.060429088 |
| 34 | 0.37332429 | 0.298162596 | 0.283290379 | 0.318259088 | 0.048264149 |
| 35 | 0.316260011 | 0.388681174 | 0.358132251 | 0.354357812 | 0.036357819 |
| 36 | 0.377657299 | 0.343631597 | 0.357537379 | 0.359608758 | 0.017107164 |
| 37 | 0.305020659 | 0.336616517 | 0.351176316 | 0.330937831 | 0.023596012 |
| 38 | 0.655396932 | 0.666820779 | 0.665416697 | 0.662544803 | 0.00622992 |
| 39 | 0.538209161 | 0.550596873 | 0.545048473 | 0.544618169 | 0.006205056 |
| 40 | 0.296246046 | 0.259510494 | 0.191337557 | 0.249031365 | 0.053233512 |
| 41 | 0.188522532 | 0.099296879 | 0.181627875 | 0.156482429 | 0.049643977 |

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 42 | 0.348679073 | 0.406092428 | 0.395818319 | 0.38352994 | 0.030615789 |
| 43 | 0.498218766 | 0.431939376 | 0.417078695 | 0.449078946 | 0.043200132 |
| 44 | 0.20646096 | 0.149339624 | 0.165604872 | 0.173801819 | 0.029429648 |
| 45 | 0.38863202 | 0.338400449 | 0.383278854 | 0.370103774 | 0.027586042 |
| 46 | 0.382612092 | 0.373997896 | 0.404741709 | 0.387117232 | 0.01585931 |
| 47 | 0.54332366 | 0.50206508 | 0.533846303 | 0.526411681 | 0.02161071 |
| 48 | 0.316967711 | 0.222347387 | 0.244767393 | 0.26136083 | 0.049444495 |
| 49 | 0.169207509 | 0.246834799 | 0.219913966 | 0.211985425 | 0.039416308 |
| 50 | 0.214504194 | 0.290618723 | 0.259093618 | 0.254738845 | 0.038243672 |
| 51 | 0.589108266 | 0.53540528 | 0.576025711 | 0.566846419 | 0.028003521 |
| 52 | 0.365637993 | 0.313808156 | 0.355603174 | 0.345016441 | 0.027488946 |
| 53 | 0.414628544 | 0.394688474 | 0.407587008 | 0.405634675 | 0.010112383 |
| 54 | 0.36924397 | 0.376022999 | 0.36602382 | 0.370430263 | 0.005104053 |
| 55 | 0.465922121 | 0.399450958 | 0.395634779 | 0.420335953 | 0.039524864 |
| 56 | 0.12663451 | 0.063770113 | 0.014747156 | 0.068383926 | 0.056086188 |
| 57 | 0.488979731 | 0.509240275 | 0.535164084 | 0.51112803 | 0.023149974 |
| 58 | 0.539007886 | 0.437834629 | 0.476752179 | 0.484531565 | 0.051033285 |
| 59 | 0.6822649 | 0.601834424 | 0.630307241 | 0.638135522 | 0.040782678 |
| 60 | 0.615931313 | 0.625508204 | 0.631492158 | 0.624310558 | 0.007849251 |
| 61 | 0.492914567 | 0.524451006 | 0.499293299 | 0.505552957 | 0.016674059 |
| 62 | 0.253787601 | 0.230577205 | 0.250510311 | 0.244958372 | 0.012561793 |
| 63 | 0.390997605 | 0.321842596 | 0.402009746 | 0.371616649 | 0.043455829 |
| 64 | 0.272755713 | 0.28804086 | 0.213578887 | 0.258125153 | 0.039327933 |
| 65 | 0.222959905 | 0.241638564 | 0.255911065 | 0.240169845 | 0.016524606 |
| 66 | 0.449925412 | 0.460686535 | 0.481246264 | 0.463952737 | 0.01591383 |
| 67 | 0.609596797 | 0.632438028 | 0.638653193 | 0.626896006 | 0.015300459 |
| 68 | 0.1333022 | 0.250502066 | 0.174934043 | 0.186246103 | 0.059413165 |
| 69 | 0.383910077 | 0.351833615 | 0.369512514 | 0.368418735 | 0.016066179 |
| 70 | 0.513277562 | 0.489374933 | 0.489635417 | 0.497429304 | 0.013725612 |
| 71 | 0.765284316 | 0.754314628 | 0.743472161 | 0.754357035 | 0.01090614 |
| 72 | 0.635785577 | 0.611412543 | 0.583152067 | 0.610116729 | 0.026340671 |
| 73 | 0.139782205 | 0.146291178 | 0.097917041 | 0.127996808 | 0.026252352 |
| 74 | 0.548221614 | 0.579115816 | 0.567224921 | 0.564854117 | 0.015582954 |
| 75 | 0.346852854 | 0.391580408 | 0.437997363 | 0.392143542 | 0.045574864 |
| 76 | 0.08021136 | 0.153879924 | 0.128633305 | 0.120908197 | 0.037436911 |
| 77 | 0.683568714 | 0.6960928 | 0.673776757 | 0.684479424 | 0.011185861 |
| 78 | 0.581279439 | 0.568439462 | 0.596063122 | 0.581927341 | 0.013823223 |
| 79 | 0.47129913 | 0.45784663 | 0.539394651 | 0.489513471 | 0.043718893 |
| 80 | 0.450682752 | 0.437393467 | 0.500246283 | 0.462774168 | 0.033125079 |
| 81 | 0.16248487 | 0.135239595 | 0.163860523 | 0.153861663 | 0.016141845 |
| 82 | 0.163576965 | 0.246941586 | 0.250997907 | 0.220505486 | 0.049343245 |
| 83 | 0.347033304 | 0.381064481 | 0.413419582 | 0.380505789 | 0.033196665 |
| 84 | 0.553672728 | 0.540240865 | 0.519236095 | 0.537716563 | 0.017356541 |

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 85 | 0.608841443 | 0.676928398 | 0.644767283 | 0.643512375 | 0.03406082 |
| 86 | 0.458095669 | 0.4070184 | 0.354132605 | 0.406415558 | 0.051984154 |
| 87 | 0.642980196 | 0.645238773 | 0.58178375 | 0.62333424 | 0.036001496 |
| 88 | 0.6503713 | 0.646390672 | 0.576942651 | 0.624568208 | 0.041292937 |

# Appendix XIV: Image III Raw Data (degrees)

| Cell Number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 1 | 0.003448 | 0.00344796 | 0.0030505 | 0.00950673 | 0.00935156 | 0.00935152 |
| 2 | 0.00801929 | 0.00811687 | 0.0081114 | 0.0149862 | 0.0140168 | 0.0145397 |
| 3 | 0.00603613 | 0.0061427 | 0.00642379 | 0.0134232 | 0.0142015 | 0.0147229 |
| 4 | 0.00818725 | 0.00727106 | 0.0078858 | 0.0116215 | 0.0128158 | 0.0120416 |
| 5 | 0.00558521 | 0.00566838 | 0.00613192 | 0.0136586 | 0.0153103 | 0.0142238 |
| 6 | 0.00634174 | 0.00761015 | 0.00634184 | 0.0171849 | 0.0166896 | 0.015925 |
| 7 | 0.00790325 | 0.0071763 | 0.00761416 | 0.0123893 | 0.0115728 | 0.0115727 |
| 8 | 0.00825883 | 0.00968999 | 0.00950785 | 0.0116897 | 0.0111409 | 0.0100486 |
| 9 | 0.0130938 | 0.0129613 | 0.0125551 | 0.0143797 | 0.0145907 | 0.0156968 |
| 10 | 0.0109186 | 0.0106637 | 0.010421 | 0.0139535 | 0.0131961 | 0.0134483 |
| 11 | 0.0113198 | 0.0117131 | 0.0119451 | 0.0193797 | 0.020204 | 0.0210746 |
| 12 | 0.00853837 | 0.00757547 | 0.00740529 | 0.0136755 | 0.0159348 | 0.0151405 |
| 13 | 0.0120767 | 0.0120791 | 0.0132629 | 0.0228676 | 0.0246295 | 0.0258974 |
| 14 | 0.00970297 | 0.00922741 | 0.00970283 | 0.0268505 | 0.0280442 | 0.0285457 |
| 15 | 0.0206596 | 0.0250393 | 0.0219067 | 0.0447501 | 0.0468369 | 0.0447496 |
| 16 | 0.0133045 | 0.0136777 | 0.0117093 | 0.0277751 | 0.0266063 | 0.0275601 |
| 17 | 0.0108601 | 0.0108155 | 0.0102479 | 0.015993 | 0.0167028 | 0.0152915 |
| 18 | 0.0160619 | 0.0159913 | 0.0165562 | 0.0187911 | 0.0187909 | 0.0193338 |
| 19 | 0.021274 | 0.0213032 | 0.0200814 | 0.0419598 | 0.0424945 | 0.0421459 |
| 20 | 0.0171139 | 0.017136 | 0.0173664 | 0.0369723 | 0.0380645 | 0.0378501 |
| 21 | 0.00883672 | 0.0092017 | 0.00931514 | 0.0200806 | 0.0228461 | 0.0212125 |
| 22 | 0.00485221 | 0.00633879 | 0.00579706 | 0.012383 | 0.0129569 | 0.0124256 |
| 23 | 0.00688785 | 0.00716164 | 0.00708986 | 0.0208177 | 0.0229323 | 0.0222214 |
| 24 | 0.00785104 | 0.00824233 | 0.00890686 | 0.0180022 | 0.0189725 | 0.0192764 |
| 25 | 0.00634272 | 0.00542787 | 0.00542795 | 0.00658202 | 0.00744479 | 0.00744516 |
| 26 | 0.00766847 | 0.00707929 | 0.00736342 | 0.0104234 | 0.0104236 | 0.0106081 |
| 27 | 0.0125387 | 0.0122704 | 0.0123866 | 0.0285702 | 0.0287785 | 0.0307437 |
| 28 | 0.00901066 | 0.00817008 | 0.00791486 | 0.0136302 | 0.0125082 | 0.0136683 |
| 29 | 0.00591252 | 0.00531022 | 0.00615078 | 0.0092585 | 0.0103515 | 0.00966769 |
| 30 | 0.00776076 | 0.00793025 | 0.00822773 | 0.0320536 | 0.0309958 | 0.0308304 |
| 31 | 0.0103175 | 0.0108408 | 0.0108954 | 0.0265328 | 0.0275675 | 0.0284954 |
| 32 | 0.0133304 | 0.0137497 | 0.0142323 | 0.0260868 | 0.0276302 | 0.0260862 |
| 33 | 0.0206281 | 0.0206282 | 0.0202449 | 0.0507815 | 0.0513348 | 0.0518058 |
| 34 | 0.015977 | 0.0147208 | 0.0155165 | 0.0305201 | 0.0319152 | 0.0318088 |
| 35 | 0.0230138 | 0.0232523 | 0.0229377 | 0.0378853 | 0.0382722 | 0.0380161 |
| 36 | 0.0102434 | 0.0092194 | 0.00921919 | 0.0111999 | 0.0112826 | 0.0107514 |
| 37 | 0.0187793 | 0.0181635 | 0.018473 | 0.0195951 | 0.0207905 | 0.0204344 |
| 38 | 0.0256806 | 0.0221743 | 0.0250261 | 0.0307313 | 0.0307856 | 0.0307109 |
| 39 | 0.0118447 | 0.0116822 | 0.00985507 | 0.0149824 | 0.0174877 | 0.0166059 |
| 40 | 0.0092145 | 0.00921429 | 0.00977415 | 0.0153524 | 0.0160669 | 0.0153895 |
| 41 | 0.0123034 | 0.0132197 | 0.0124204 | 0.0157834 | 0.0161822 | 0.0152261 |

| Cell Number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 42 | 0.00463049 | 0.00383305 | 0.00383309 | 0.010596 | 0.0110066 | 0.0116833 |
| 43 | 0.00599072 | 0.00763348 | 0.000693949 | 0.0170007 | 0.0177455 | 0.0162808 |
| 44 | 0.0194449 | 0.0213572 | 0.0200866 | 0.0289745 | 0.0304442 | 0.0290027 |
| 45 | 0.0138598 | 0.0131737 | 0.0134004 | 0.0153421 | 0.0171187 | 0.0171466 |
| 46 | 0.0147548 | 0.0142981 | 0.0153611 | 0.0198804 | 0.0205596 | 0.0203258 |
| 47 | 0.0108073 | 0.0111883 | 0.0109718 | 0.0202785 | 0.0219574 | 0.0219574 |
| 48 | 0.00729887 | 0.00621025 | 0.00654962 | 0.011864 | 0.011814 | 0.0118141 |
| 49 | 0.00686954 | 0.00736027 | 0.00639849 | 0.0182542 | 0.0197727 | 0.018092 |
| 50 | 0.0143637 | 0.0135731 | 0.014532 | 0.0162897 | 0.0161197 | 0.0161205 |
| 51 | 0.00857387 | 0.00812664 | 0.00776342 | 0.0142527 | 0.0153492 | 0.0142944 |
| 52 | 0.00888396 | 0.00835266 | 0.00790978 | 0.0201585 | 0.0211756 | 0.0220737 |
| 53 | 0.00966846 | 0.0102159 | 0.0115867 | 0.0217657 | 0.0212065 | 0.0220204 |
| 54 | 0.00714654 | 0.00714652 | 0.00714665 | 0.012407 | 0.0122612 | 0.0129039 |
| 55 | 0.00888974 | 0.00933882 | 0.00884861 | 0.0272872 | 0.0287057 | 0.0274471 |
| 56 | 0.00512273 | 0.00528444 | 0.00606932 | 0.0133602 | 0.0128917 | 0.0138304 |
| 57 | 0.00493413 | 0.00444584 | 0.00493498 | 0.010969 | 0.010989 | 0.0104867 |
| 58 | 0.0361313 | 0.0346102 | 0.0365635 | 0.0810147 | 0.081015 | 0.0820007 |
| 59 | 0.016346 | 0.0172363 | 0.017469 | 0.0372753 | 0.0365075 | 0.0366549 |
| 60 | 0.0138287 | 0.0155665 | 0.0136985 | 0.0242872 | 0.0231079 | 0.0234039 |
| 61 | 0.0107749 | 0.0107751 | 0.0104222 | 0.0430503 | 0.0393665 | 0.0404992 |
| 62 | 0.0184941 | 0.019732 | 0.0183972 | 0.0465885 | 0.0463506 | 0.0454678 |
| 63 | 0.0156094 | 0.0154226 | 0.0156043 | 0.0358745 | 0.0387074 | 0.0370468 |
| 64 | 0.0268783 | 0.0263885 | 0.0261543 | 0.0460486 | 0.0474988 | 0.0471186 |
| 65 | 0.019888 | 0.0207201 | 0.0203078 | 0.0259179 | 0.0285736 | 0.0277162 |
| 66 | 0.022241 | 0.0218009 | 0.0217526 | 0.0264887 | 0.0279383 | 0.0264894 |
| 67 | 0.0225208 | 0.0225197 | 0.0229803 | 0.0433845 | 0.0450974 | 0.045098 |
| 68 | 0.0147653 | 0.0140699 | 0.0145991 | 0.0309314 | 0.0323209 | 0.0310255 |
| 69 | 0.013406 | 0.0125223 | 0.0129758 | 0.0225854 | 0.0226496 | 0.0214226 |
| 70 | 0.0148119 | 0.0143232 | 0.0158435 | 0.0224086 | 0.0225481 | 0.0220724 |
| 71 | 0.00889848 | 0.00938698 | 0.00889854 | 0.0206365 | 0.0181863 | 0.0181868 |
| 72 | 0.00786235 | 0.00836817 | 0.00786233 | 0.0128144 | 0.0127765 | 0.0137682 |
| 73 | 0.0127814 | 0.0120652 | 0.0124738 | 0.0318343 | 0.0291889 | 0.0306278 |
| 74 | 0.0130927 | 0.0127805 | 0.013744 | 0.0418291 | 0.0430449 | 0.0434378 |
| 75 | 0.0142634 | 0.0147978 | 0.0143986 | 0.03273 | 0.032814 | 0.0328142 |
| 76 | 0.0146759 | 0.0165307 | 0.0156185 | 0.0244697 | 0.0236641 | 0.0236639 |
| 77 | 0.0144964 | 0.0140778 | 0.014124 | 0.0325808 | 0.0341315 | 0.0309164 |
| 78 | 0.0164863 | 0.0172898 | 0.0165258 | 0.0382236 | 0.0367618 | 0.0383312 |
| 79 | 0.00920141 | 0.00838932 | 0.00980015 | 0.0450111 | 0.0437431 | 0.0428193 |
| 80 | 0.0108822 | 0.0112835 | 0.0111188 | 0.0341 | 0.0343583 | 0.0341635 |
| 81 | 0.0107309 | 0.0114663 | 0.010598 | 0.0214789 | 0.0205736 | 0.0199736 |
| 82 | 0.00865195 | 0.00765812 | 0.00949745 | 0.0137804 | 0.0111178 | 0.0120804 |
| 83 | 0.0142787 | 0.012372 | 0.0130509 | 0.0228702 | 0.0229926 | 0.022527 |
| 84 | 0.0186232 | 0.0166504 | 0.0172932 | 0.0293582 | 0.0294487 | 0.0306251 |

| Cell Number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 85 | 0.0121198 | 0.0126631 | 0.013211 | 0.0268647 | 0.0265793 | 0.0263434 |
| 86 | 0.00999262 | 0.0105803 | 0.0111837 | 0.0170923 | 0.0165352 | 0.0165874 |
| 87 | 0.0245834 | 0.0217681 | 0.0223241 | 0.0463312 | 0.0469934 | 0.0463315 |
| 88 | 0.0270628 | 0.0288014 | 0.0262301 | 0.0499785 | 0.0510812 | 0.0497381 |
| 89 | 0.0112541 | 0.0122586 | 0.0129723 | 0.0316849 | 0.0304489 | 0.0296632 |
| 90 | 0.0121327 | 0.0118583 | 0.0134495 | 0.0237373 | 0.0274631 | 0.0265114 |
| 91 | 0.0166662 | 0.0145549 | 0.0154674 | 0.0301955 | 0.0310242 | 0.0309457 |
| 92 | 0.00915292 | 0.0102969 | 0.00981283 | 0.0218179 | 0.0224071 | 0.0229894 |
| 93 | 0.00892137 | 0.00972257 | 0.0104461 | 0.0486642 | 0.0491739 | 0.0493576 |
| 94 | 0.00827537 | 0.00943246 | 0.0106128 | 0.0347673 | 0.0373534 | 0.036638 |
| 95 | 0.0107024 | 0.0118629 | 0.011503 | 0.019652 | 0.0201052 | 0.0195676 |
| 96 | 0.0243379 | 0.0240386 | 0.024844 | 0.0346749 | 0.0340715 | 0.0333885 |
| 97 | 0.0131309 | 0.0139462 | 0.0151391 | 0.0256643 | 0.0251951 | 0.0253854 |
| 98 | 0.00374028 | 0.00455878 | 0.00430326 | 0.0160864 | 0.0166251 | 0.0160157 |
| 99 | 0.0325797 | 0.0337513 | 0.0335241 | 0.0469924 | 0.0456082 | 0.0467628 |
| 100 | 0.0115219 | 0.0120502 | 0.0120701 | 0.018802 | 0.0193552 | 0.0199132 |
| 101 | 0.0119736 | 0.0111483 | 0.0113886 | 0.0233169 | 0.0250371 | 0.0233183 |
| 102 | 0.0127171 | 0.0114454 | 0.0120813 | 0.0174531 | 0.0180805 | 0.018964 |
| 103 | 0.0136597 | 0.0157312 | 0.014829 | 0.0233237 | 0.0227181 | 0.0227176 |
| 104 | 0.00628063 | 0.00631273 | 0.00659451 | 0.0133608 | 0.0113825 | 0.0125085 |
| 105 | 0.0102954 | 0.0105509 | 0.0106123 | 0.022493 | 0.0251723 | 0.0235544 |
| 106 | 0.0244956 | 0.0216858 | 0.0221116 | 0.0314157 | 0.0307211 | 0.0327532 |
| 107 | 0.0185171 | 0.0188272 | 0.018827 | 0.0496705 | 0.0503178 | 0.0500202 |
| 108 | 0.00896676 | 0.0102228 | 0.00941487 | 0.0135975 | 0.0138962 | 0.0134495 |
| 109 | 0.0157931 | 0.0159061 | 0.0168463 | 0.0249588 | 0.0251861 | 0.0252509 |
| 110 | 0.00737313 | 0.00659362 | 0.00714027 | 0.0151898 | 0.0151512 | 0.0155958 |
| 111 | 0.0124668 | 0.012173 | 0.0113996 | 0.0417695 | 0.0407181 | 0.0417684 |
| 112 | 0.0214389 | 0.020865 | 0.0211239 | 0.0402149 | 0.0395103 | 0.039553 |
| 113 | 0.0253709 | 0.0261877 | 0.0245701 | 0.0508862 | 0.0509897 | 0.0510312 |
| 114 | 0.0122626 | 0.0110185 | 0.0112365 | 0.0193218 | 0.019773 | 0.0194477 |
| 115 | 0.0126973 | 0.0115569 | 0.012431 | 0.0221979 | 0.0231865 | 0.0279752 |
| 116 | 0.0124505 | 0.0114622 | 0.0126907 | 0.0284273 | 0.0283454 | 0.0288843 |
| 117 | 0.014114 | 0.0135568 | 0.0143268 | 0.0377208 | 0.0370688 | 0.0377186 |
| 118 | 0.0118081 | 0.0122139 | 0.0119 | 0.0194358 | 0.0209007 | 0.0208284 |
| 119 | 0.0320262 | 0.0332234 | 0.0327512 | 0.0616673 | 0.0593672 | 0.0597274 |
| 120 | 0.0154095 | 0.0144737 | 0.0153671 | 0.0294088 | 0.0282577 | 0.0282577 |
| 121 | 0.0110858 | 0.0103099 | 0.0110555 | 0.0167279 | 0.0166651 | 0.0167281 |
| 122 | 0.011954 | 0.0116347 | 0.0111718 | 0.0358947 | 0.0344159 | 0.0345503 |
| 123 | 0.0117816 | 0.0116469 | 0.0111314 | 0.0217653 | 0.022917 | 0.022399 |
| 124 | 0.00818575 | 0.00870165 | 0.00885421 | 0.0239942 | 0.0220347 | 0.0223744 |
| 125 | 0.0235062 | 0.0220329 | 0.0230573 | 0.0565752 | 0.0597353 | 0.0575056 |
| 126 | 0.020215 | 0.020076 | 0.0209805 | 0.0344086 | 0.0344061 | 0.033737 |
| 127 | 0.0164021 | 0.0168878 | 0.0162769 | 0.021711 | 0.0213294 | 0.0212723 |

| Cell Number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 128 | 0.0120374 | 0.0127862 | 0.012786 | 0.0320864 | 0.0333081 | 0.0320139 |
| 129 | 0.0136299 | 0.0139627 | 0.0139522 | 0.0305247 | 0.0311127 | 0.0303944 |
| 130 | 0.0139385 | 0.0146537 | 0.0140828 | 0.032973 | 0.0329745 | 0.031096 |
| 131 | 0.0220537 | 0.0211269 | 0.0213494 | 0.0262298 | 0.0246645 | 0.0249835 |
| 132 | 0.00866286 | 0.0084298 | 0.00874232 | 0.0481571 | 0.0484863 | 0.0495022 |
| 133 | 0.0129805 | 0.0126803 | 0.0126744 | 0.0271981 | 0.0275502 | 0.0255802 |
| 134 | 0.00736902 | 0.00737054 | 0.00736884 | 0.0122473 | 0.0110153 | 0.0110857 |
| 135 | 0.0126248 | 0.0117749 | 0.0112548 | 0.0175712 | 0.0170333 | 0.0189613 |
| 136 | 0.0151619 | 0.015067 | 0.0152016 | 0.0249685 | 0.0257334 | 0.0251177 |
| 137 | 0.0216485 | 0.0217304 | 0.0217602 | 0.0299148 | 0.0293774 | 0.0294428 |
| 138 | 0.0140567 | 0.0158854 | 0.0151798 | 0.0316051 | 0.0319401 | 0.0321373 |
| 139 | 0.00607483 | 0.0066013 | 0.00639519 | 0.0116404 | 0.0120861 | 0.0124609 |
| 140 | 0.017746 | 0.0174276 | 0.0186415 | 0.0362269 | 0.0376878 | 0.0368042 |
| 141 | 0.0109183 | 0.0103592 | 0.0105202 | 0.0130974 | 0.0130907 | 0.0139529 |
| 142 | 0.0214911 | 0.021801 | 0.0214837 | 0.0382337 | 0.0398025 | 0.0384586 |
| 143 | 0.0134288 | 0.0146582 | 0.0136823 | 0.0284485 | 0.0273494 | 0.0272948 |
| 144 | 0.0113726 | 0.0124955 | 0.0116341 | 0.0166439 | 0.0159259 | 0.0153712 |
| 145 | 0.0129384 | 0.0134216 | 0.0127832 | 0.0223612 | 0.0232103 | 0.0228631 |
| 146 | 0.013997 | 0.0149954 | 0.0148799 | 0.0222636 | 0.0219064 | 0.0218251 |
| 147 | 0.00926088 | 0.00897637 | 0.00926082 | 0.013605 | 0.0142065 | 0.0148993 |
| 148 | 0.0164946 | 0.0176511 | 0.0166214 | 0.0206405 | 0.0216032 | 0.0212795 |
| 149 | 0.00787491 | 0.00827951 | 0.00778921 | 0.0225439 | 0.0227361 | 0.0229448 |
| 150 | 0.0196565 | 0.0194449 | 0.0199877 | 0.0379713 | 0.0363405 | 0.0369855 |
| 151 | 0.0162795 | 0.0159242 | 0.0169 | 0.0233274 | 0.0237233 | 0.0238337 |
| 152 | 0.0188917 | 0.0185038 | 0.0188925 | 0.0329495 | 0.034147 | 0.0335959 |
| 153 | 0.0187286 | 0.0170712 | 0.0179537 | 0.0366729 | 0.030991 | 0.0395293 |
| 154 | 0.0187401 | 0.0193891 | 0.0199052 | 0.0344445 | 0.031818 | 0.0339846 |
| 155 | 0.0149224 | 0.0156494 | 0.0159743 | 0.0341675 | 0.0344018 | 0.0332888 |
| 156 | 0.00776165 | 0.00884978 | 0.00817004 | 0.0234424 | 0.0234799 | 0.0221988 |
| 157 | 0.0117918 | 0.012733 | 0.0116611 | 0.0304965 | 0.0299026 | 0.0309234 |
| 158 | 0.00597739 | 0.00489646 | 0.00484651 | 0.0102395 | 0.0102396 | 0.0105852 |
| 159 | 0.00626819 | 0.00695674 | 0.00589366 | 0.0087361 | 0.00925668 | 0.00873633 |
| 160 | 0.00833159 | 0.00882133 | 0.00902088 | 0.0147462 | 0.0140429 | 0.013843 |
| 161 | 0.0124674 | 0.0119389 | 0.0121058 | 0.0208159 | 0.0216068 | 0.020308 |
| 162 | 0.0136733 | 0.0147429 | 0.0141768 | 0.0244796 | 0.024479 | 0.0246198 |
| 163 | 0.0142785 | 0.0144678 | 0.0144677 | 0.0198767 | 0.0198759 | 0.0192832 |
| 164 | 0.0120249 | 0.0125865 | 0.0122336 | 0.0206156 | 0.0194928 | 0.0208049 |
| 165 | 0.0120798 | 0.0112771 | 0.0112482 | 0.0289613 | 0.0272181 | 0.028308 |
| 166 | 0.0162601 | 0.0161457 | 0.0165578 | 0.0316827 | 0.0308588 | 0.0304562 |
| 167 | 0.00802404 | 0.00909138 | 0.00909349 | 0.0245085 | 0.0227047 | 0.0238963 |
| 168 | 0.00950684 | 0.00969067 | 0.00969121 | 0.019624 | 0.0201514 | 0.0204839 |
| 169 | 0.0112611 | 0.0116394 | 0.0116403 | 0.0358194 | 0.038174 | 0.0370019 |
| 170 | 0.0163115 | 0.0161125 | 0.0177768 | 0.0226331 | 0.0220706 | 0.0222308 |

| Cell Number | Width 1 | Width 2 | Width 3 | Length 1 | Length 2 | Length 3 |
|---|---|---|---|---|---|---|
| 171 | 0.0102295 | 0.0107944 | 0.0104596 | 0.0245387 | 0.0241953 | 0.024756 |
| 172 | 0.0157953 | 0.0143374 | 0.0154535 | 0.0396465 | 0.0401039 | 0.0391726 |
| 173 | 0.0172672 | 0.0185903 | 0.0175258 | 0.0313684 | 0.0310551 | 0.0315868 |
| 174 | 0.0149509 | 0.0148216 | 0.0142214 | 0.0280986 | 0.0297136 | 0.0296548 |
| 175 | 0.0120405 | 0.0125377 | 0.0114788 | 0.0176279 | 0.018764 | 0.0183299 |
| 176 | 0.0220586 | 0.0229307 | 0.0221899 | 0.0353146 | 0.0353902 | 0.0349258 |

# Appendix XV: Image III Raw Data (Width, meters)

| Cell Number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 1 | 4690 | 4690 | 4150 | 4510 | 312 |
| 2 | 10909 | 11041 | 11034 | 10995 | 75 |
| 3 | 8211 | 8356 | 8738 | 8435 | 272 |
| 4 | 11137 | 9891 | 10727 | 10585 | 635 |
| 5 | 7598 | 7711 | 8341 | 7883 | 401 |
| 6 | 8627 | 10352 | 8627 | 9202 | 996 |
| 7 | 10751 | 9762 | 10358 | 10290 | 498 |
| 8 | 11234 | 13181 | 12934 | 12450 | 1060 |
| 9 | 17811 | 17631 | 17079 | 17507 | 382 |
| 10 | 14853 | 14506 | 14176 | 14511 | 338 |
| 11 | 15398 | 15933 | 16249 | 15860 | 430 |
| 12 | 11615 | 10305 | 10073 | 10664 | 831 |
| 13 | 16428 | 16431 | 18042 | 16967 | 931 |
| 14 | 13199 | 12552 | 13199 | 12983 | 373 |
| 15 | 28103 | 34061 | 29800 | 30655 | 3069 |
| 16 | 18098 | 18606 | 15928 | 17544 | 1422 |
| 17 | 14773 | 14712 | 13940 | 14475 | 464 |
| 18 | 21849 | 21753 | 22521 | 22041 | 419 |
| 19 | 28939 | 28979 | 27317 | 28411 | 948 |
| 20 | 23280 | 23310 | 23624 | 23405 | 190 |
| 21 | 12021 | 12517 | 12671 | 12403 | 340 |
| 22 | 6600 | 8623 | 7886 | 7703 | 1023 |
| 23 | 9370 | 9742 | 9644 | 9585 | 193 |
| 24 | 10680 | 11212 | 12116 | 11336 | 726 |
| 25 | 8628 | 7384 | 7384 | 7798 | 718 |
| 26 | 10431 | 9630 | 10016 | 10026 | 401 |
| 27 | 17056 | 16691 | 16849 | 16866 | 183 |
| 28 | 12257 | 11114 | 10767 | 11379 | 780 |
| 29 | 8043 | 7223 | 8367 | 7878 | 589 |
| 30 | 10557 | 10788 | 11192 | 10846 | 322 |
| 31 | 14035 | 14747 | 14821 | 14534 | 434 |
| 32 | 18133 | 18704 | 19360 | 18732 | 614 |
| 33 | 28060 | 28061 | 27539 | 27887 | 301 |
| 34 | 21734 | 20025 | 21107 | 20955 | 864 |
| 35 | 31306 | 31630 | 31202 | 31379 | 223 |
| 36 | 13934 | 12541 | 12541 | 13005 | 804 |
| 37 | 25545 | 24708 | 25129 | 25127 | 419 |
| 38 | 34933 | 30164 | 34043 | 33047 | 2536 |
| 39 | 16112 | 15891 | 13406 | 15136 | 1503 |
| 40 | 12534 | 12534 | 13296 | 12788 | 440 |
| 41 | 16736 | 17983 | 16895 | 17205 | 678 |

| Cell Number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 42 | 6299 | 5214 | 5214 | 5576 | 626 |
| 43 | 8149 | 10384 | 944 | 6492 | 4933 |
| 44 | 26451 | 29052 | 27324 | 27609 | 1324 |
| 45 | 18853 | 17920 | 18229 | 18334 | 476 |
| 46 | 20071 | 19450 | 20896 | 20139 | 725 |
| 47 | 14701 | 15219 | 14925 | 14949 | 260 |
| 48 | 9929 | 8448 | 8909 | 9095 | 758 |
| 49 | 9345 | 10012 | 8704 | 9354 | 654 |
| 50 | 19539 | 18463 | 19768 | 19257 | 696 |
| 51 | 11663 | 11055 | 10561 | 11093 | 552 |
| 52 | 12085 | 11362 | 10760 | 11402 | 663 |
| 53 | 13152 | 13897 | 15761 | 14270 | 1344 |
| 54 | 9721 | 9721 | 9722 | 9721 | 0 |
| 55 | 12093 | 12704 | 12037 | 12278 | 370 |
| 56 | 6968 | 7188 | 8256 | 7471 | 689 |
| 57 | 6712 | 6048 | 6713 | 6491 | 384 |
| 58 | 49149 | 47080 | 49737 | 48656 | 1396 |
| 59 | 22235 | 23447 | 23763 | 23148 | 806 |
| 60 | 18811 | 21175 | 18634 | 19540 | 1419 |
| 61 | 14657 | 14657 | 14177 | 14497 | 277 |
| 62 | 25158 | 26841 | 25026 | 25675 | 1012 |
| 63 | 21233 | 20979 | 21227 | 21146 | 145 |
| 64 | 36563 | 35896 | 35578 | 36012 | 503 |
| 65 | 27054 | 28186 | 27625 | 27621 | 566 |
| 66 | 30254 | 29656 | 29590 | 29833 | 366 |
| 67 | 30635 | 30634 | 31260 | 30843 | 361 |
| 68 | 20085 | 19139 | 19859 | 19695 | 494 |
| 69 | 18236 | 17034 | 17651 | 17640 | 601 |
| 70 | 20149 | 19484 | 21552 | 20395 | 1056 |
| 71 | 12105 | 12769 | 12105 | 12326 | 384 |
| 72 | 10695 | 11383 | 10695 | 10925 | 397 |
| 73 | 17387 | 16412 | 16968 | 16922 | 489 |
| 74 | 17810 | 17385 | 18696 | 17964 | 669 |
| 75 | 19403 | 20129 | 19586 | 19706 | 378 |
| 76 | 19964 | 22487 | 21246 | 21232 | 1262 |
| 77 | 19719 | 19150 | 19213 | 19361 | 312 |
| 78 | 22426 | 23519 | 22480 | 22809 | 616 |
| 79 | 12517 | 11412 | 13331 | 12420 | 963 |
| 80 | 14803 | 15349 | 15125 | 15092 | 274 |
| 81 | 14597 | 15598 | 14416 | 14870 | 636 |
| 82 | 11769 | 10417 | 12919 | 11702 | 1252 |
| 83 | 19423 | 16830 | 17753 | 18002 | 1315 |
| 84 | 25333 | 22650 | 23524 | 23836 | 1369 |

| Cell Number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 85 | 16487 | 17226 | 17971 | 17228 | 742 |
| 86 | 13593 | 14392 | 15213 | 14400 | 810 |
| 87 | 33441 | 29611 | 30367 | 31140 | 2028 |
| 88 | 36814 | 39179 | 35681 | 37224 | 1785 |
| 89 | 15309 | 16675 | 17646 | 16544 | 1174 |
| 90 | 16504 | 16131 | 18295 | 16977 | 1157 |
| 91 | 22671 | 19799 | 21040 | 21170 | 1440 |
| 92 | 12451 | 14007 | 13348 | 13269 | 781 |
| 93 | 12136 | 13226 | 14210 | 13190 | 1037 |
| 94 | 11257 | 12831 | 14437 | 12842 | 1590 |
| 95 | 14558 | 16137 | 15648 | 15448 | 808 |
| 96 | 33107 | 32700 | 33795 | 33201 | 554 |
| 97 | 17862 | 18971 | 20594 | 19142 | 1374 |
| 98 | 5088 | 6201 | 5854 | 5714 | 570 |
| 99 | 44318 | 45912 | 45603 | 45278 | 845 |
| 100 | 15673 | 16392 | 16419 | 16161 | 423 |
| 101 | 16288 | 15165 | 15492 | 15648 | 577 |
| 102 | 17299 | 15569 | 16434 | 16434 | 865 |
| 103 | 18581 | 21399 | 20172 | 20051 | 1413 |
| 104 | 8544 | 8587 | 8971 | 8700 | 235 |
| 105 | 14005 | 14352 | 14436 | 14264 | 229 |
| 106 | 33321 | 29499 | 30078 | 30966 | 2060 |
| 107 | 25189 | 25611 | 25610 | 25470 | 243 |
| 108 | 12197 | 13906 | 12807 | 12970 | 866 |
| 109 | 21483 | 21637 | 22916 | 22012 | 787 |
| 110 | 10030 | 8969 | 9713 | 9571 | 544 |
| 111 | 16959 | 16559 | 15507 | 16341 | 750 |
| 112 | 29163 | 28383 | 28735 | 28760 | 391 |
| 113 | 34512 | 35623 | 33423 | 34519 | 1100 |
| 114 | 16681 | 14988 | 15285 | 15651 | 904 |
| 115 | 17272 | 15721 | 16910 | 16634 | 812 |
| 116 | 16936 | 15592 | 17263 | 16597 | 886 |
| 117 | 19199 | 18441 | 19489 | 19043 | 541 |
| 118 | 16063 | 16615 | 16188 | 16288 | 289 |
| 119 | 43565 | 45194 | 44551 | 44437 | 820 |
| 120 | 20962 | 19689 | 20904 | 20518 | 719 |
| 121 | 15080 | 14025 | 15039 | 14714 | 598 |
| 122 | 16261 | 15827 | 15197 | 15762 | 535 |
| 123 | 16027 | 15843 | 15142 | 15671 | 467 |
| 124 | 11135 | 11837 | 12044 | 11672 | 477 |
| 125 | 31975 | 29971 | 31365 | 31104 | 1027 |
| 126 | 27498 | 27309 | 28540 | 27783 | 663 |
| 127 | 22312 | 22972 | 22141 | 22475 | 439 |

| Cell Number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 128 | 16374 | 17393 | 17393 | 17053 | 588 |
| 129 | 18541 | 18993 | 18979 | 18838 | 257 |
| 130 | 18961 | 19933 | 19157 | 19350 | 514 |
| 131 | 30000 | 28739 | 29042 | 29260 | 658 |
| 132 | 11784 | 11467 | 11892 | 11714 | 221 |
| 133 | 17657 | 17249 | 17241 | 17382 | 238 |
| 134 | 10024 | 10026 | 10024 | 10025 | 1 |
| 135 | 17174 | 16017 | 15310 | 16167 | 941 |
| 136 | 20625 | 20496 | 20679 | 20600 | 94 |
| 137 | 29448 | 29560 | 29600 | 29536 | 79 |
| 138 | 19121 | 21609 | 20649 | 20460 | 1255 |
| 139 | 8264 | 8980 | 8699 | 8648 | 361 |
| 140 | 24140 | 23707 | 25358 | 24402 | 856 |
| 141 | 14852 | 14092 | 14311 | 14418 | 392 |
| 142 | 29234 | 29656 | 29224 | 29372 | 246 |
| 143 | 18267 | 19940 | 18612 | 18940 | 883 |
| 144 | 15470 | 16998 | 15826 | 16098 | 799 |
| 145 | 17600 | 18257 | 17389 | 17749 | 453 |
| 146 | 19040 | 20398 | 20241 | 19893 | 743 |
| 147 | 12598 | 12211 | 12597 | 12469 | 223 |
| 148 | 22438 | 24011 | 22610 | 23019 | 863 |
| 149 | 10712 | 11263 | 10596 | 10857 | 356 |
| 150 | 26739 | 26451 | 27189 | 26793 | 372 |
| 151 | 22145 | 21662 | 22989 | 22265 | 672 |
| 152 | 25698 | 25171 | 25699 | 25523 | 305 |
| 153 | 25477 | 23222 | 24422 | 24374 | 1128 |
| 154 | 25492 | 26375 | 27077 | 26315 | 794 |
| 155 | 20299 | 21288 | 21730 | 21106 | 733 |
| 156 | 10558 | 12038 | 11114 | 11237 | 748 |
| 157 | 16040 | 17321 | 15863 | 16408 | 795 |
| 158 | 8131 | 6661 | 6593 | 7128 | 869 |
| 159 | 8527 | 9463 | 8017 | 8669 | 733 |
| 160 | 11333 | 12000 | 12271 | 11868 | 482 |
| 161 | 16959 | 16240 | 16468 | 16556 | 368 |
| 162 | 18600 | 20055 | 19285 | 19313 | 728 |
| 163 | 19423 | 19681 | 19680 | 19595 | 149 |
| 164 | 16357 | 17121 | 16641 | 16707 | 386 |
| 165 | 16432 | 15340 | 15301 | 15691 | 642 |
| 166 | 22119 | 21963 | 22524 | 22202 | 289 |
| 167 | 10915 | 12367 | 12370 | 11884 | 839 |
| 168 | 12932 | 13182 | 13183 | 13099 | 145 |
| 169 | 15318 | 15833 | 15834 | 15662 | 297 |
| 170 | 22189 | 21918 | 24182 | 22763 | 1236 |

| Cell Number | Width 1 | Width 2 | Width 3 | Mean Width | Width STDEV |
|---|---|---|---|---|---|
| 171 | 13915 | 14684 | 14228 | 14276 | 386 |
| 172 | 21486 | 19503 | 21021 | 20670 | 1037 |
| 173 | 23489 | 25288 | 23840 | 24206 | 954 |
| 174 | 20338 | 20162 | 19345 | 19948 | 530 |
| 175 | 16379 | 17055 | 15615 | 16349 | 721 |
| 176 | 30006 | 31193 | 30185 | 30461 | 640 |

# Appendix XVI: Image III Raw Data (Length, meters)

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 1 | 12932 | 12721 | 12721 | 12791 | 122 |
| 2 | 20386 | 19067 | 19778 | 19744 | 660 |
| 3 | 18260 | 19318 | 20028 | 19202 | 890 |
| 4 | 15809 | 17433 | 16380 | 16541 | 824 |
| 5 | 18580 | 20827 | 19349 | 19585 | 1142 |
| 6 | 23377 | 22703 | 21663 | 22581 | 863 |
| 7 | 16853 | 15742 | 15742 | 16113 | 641 |
| 8 | 15901 | 15155 | 13669 | 14909 | 1136 |
| 9 | 19561 | 19848 | 21352 | 20254 | 962 |
| 10 | 18981 | 17951 | 18294 | 18408 | 525 |
| 11 | 26362 | 27484 | 28668 | 27504 | 1153 |
| 12 | 18603 | 21676 | 20596 | 20292 | 1559 |
| 13 | 31107 | 33504 | 35228 | 33280 | 2070 |
| 14 | 36525 | 38149 | 38831 | 37835 | 1185 |
| 15 | 60874 | 63712 | 60873 | 61820 | 1639 |
| 16 | 37782 | 36193 | 37490 | 37155 | 846 |
| 17 | 21755 | 22721 | 20801 | 21759 | 960 |
| 18 | 25562 | 25561 | 26300 | 25808 | 426 |
| 19 | 57078 | 57805 | 57331 | 57405 | 369 |
| 20 | 50293 | 51779 | 51487 | 51187 | 787 |
| 21 | 27316 | 31078 | 28855 | 29083 | 1891 |
| 22 | 16845 | 17625 | 16903 | 17124 | 435 |
| 23 | 28318 | 31195 | 30228 | 29914 | 1464 |
| 24 | 24488 | 25808 | 26222 | 25506 | 905 |
| 25 | 8954 | 10127 | 10128 | 9736 | 678 |
| 26 | 14179 | 14179 | 14430 | 14263 | 145 |
| 27 | 38864 | 39147 | 41821 | 39944 | 1631 |
| 28 | 18541 | 17015 | 18593 | 18050 | 897 |
| 29 | 12594 | 14081 | 13151 | 13275 | 751 |
| 30 | 43603 | 42164 | 41939 | 42568 | 903 |
| 31 | 36093 | 37500 | 38762 | 37452 | 1336 |
| 32 | 35486 | 37585 | 35485 | 36185 | 1212 |
| 33 | 69078 | 69831 | 70471 | 69793 | 697 |
| 34 | 41516 | 43414 | 43270 | 42733 | 1056 |
| 35 | 51535 | 52062 | 51713 | 51770 | 268 |
| 36 | 15235 | 15348 | 14625 | 15069 | 389 |
| 37 | 26655 | 28281 | 27797 | 27578 | 835 |
| 38 | 41804 | 41878 | 41776 | 41819 | 53 |
| 39 | 20381 | 23789 | 22589 | 22253 | 1729 |
| 40 | 20884 | 21856 | 20934 | 21225 | 547 |
| 41 | 21470 | 22013 | 20712 | 21398 | 653 |

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 42 | 14414 | 14972 | 15893 | 15093 | 747 |
| 43 | 23126 | 24139 | 22147 | 23137 | 996 |
| 44 | 39414 | 41413 | 39452 | 40093 | 1143 |
| 45 | 20870 | 23287 | 23325 | 22494 | 1406 |
| 46 | 27043 | 27967 | 27649 | 27553 | 469 |
| 47 | 27585 | 29869 | 29869 | 29107 | 1319 |
| 48 | 16139 | 16071 | 16071 | 16093 | 39 |
| 49 | 24831 | 26897 | 24611 | 25446 | 1261 |
| 50 | 22159 | 21928 | 21929 | 22005 | 133 |
| 51 | 19388 | 20880 | 19445 | 19904 | 845 |
| 52 | 27422 | 28805 | 30027 | 28751 | 1303 |
| 53 | 29608 | 28847 | 29954 | 29470 | 566 |
| 54 | 16877 | 16679 | 17553 | 17036 | 458 |
| 55 | 37119 | 39048 | 37336 | 37834 | 1057 |
| 56 | 18174 | 17537 | 18813 | 18175 | 638 |
| 57 | 14921 | 14948 | 14265 | 14712 | 387 |
| 58 | 110204 | 110205 | 111546 | 110652 | 774 |
| 59 | 50706 | 49661 | 49862 | 50076 | 554 |
| 60 | 33038 | 31434 | 31836 | 32103 | 835 |
| 61 | 58561 | 53550 | 55091 | 55734 | 2567 |
| 62 | 63374 | 63051 | 61850 | 62758 | 803 |
| 63 | 48800 | 52654 | 50395 | 50616 | 1936 |
| 64 | 62640 | 64613 | 64095 | 63783 | 1023 |
| 65 | 35256 | 38869 | 37702 | 37276 | 1844 |
| 66 | 36033 | 38004 | 36034 | 36690 | 1138 |
| 67 | 59016 | 61346 | 61347 | 60570 | 1345 |
| 68 | 42076 | 43966 | 42204 | 42749 | 1056 |
| 69 | 30723 | 30810 | 29141 | 30225 | 939 |
| 70 | 30482 | 30672 | 30025 | 30393 | 333 |
| 71 | 28072 | 24739 | 24740 | 25850 | 1924 |
| 72 | 17431 | 17380 | 18729 | 17847 | 764 |
| 73 | 43304 | 39706 | 41663 | 41558 | 1802 |
| 74 | 56900 | 58554 | 59088 | 58181 | 1141 |
| 75 | 44523 | 44637 | 44637 | 44599 | 66 |
| 76 | 33286 | 32190 | 32190 | 32555 | 633 |
| 77 | 44320 | 46429 | 42056 | 44268 | 2187 |
| 78 | 51996 | 50007 | 52142 | 51382 | 1193 |
| 79 | 61229 | 59504 | 58247 | 59660 | 1497 |
| 80 | 46386 | 46738 | 46473 | 46532 | 183 |
| 81 | 29218 | 27986 | 27170 | 28125 | 1031 |
| 82 | 18745 | 15124 | 16433 | 16767 | 1834 |
| 83 | 31110 | 31277 | 30643 | 31010 | 328 |
| 84 | 39936 | 40059 | 41659 | 40551 | 961 |

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 85 | 36544 | 36156 | 35835 | 36178 | 355 |
| 86 | 23251 | 22493 | 22564 | 22769 | 419 |
| 87 | 63024 | 63925 | 63025 | 63325 | 520 |
| 88 | 67986 | 69486 | 67659 | 68377 | 974 |
| 89 | 43101 | 41420 | 40351 | 41624 | 1386 |
| 90 | 32290 | 37358 | 36063 | 35237 | 2633 |
| 91 | 41075 | 42202 | 42095 | 41791 | 622 |
| 92 | 29679 | 30480 | 31272 | 30477 | 797 |
| 93 | 66198 | 66891 | 67141 | 66743 | 489 |
| 94 | 47294 | 50812 | 49839 | 49315 | 1816 |
| 95 | 26733 | 27349 | 26618 | 26900 | 393 |
| 96 | 47168 | 46347 | 45418 | 46311 | 876 |
| 97 | 34911 | 34273 | 34532 | 34572 | 321 |
| 98 | 21882 | 22615 | 21786 | 22095 | 453 |
| 99 | 63924 | 62041 | 63611 | 63192 | 1009 |
| 100 | 25576 | 26329 | 27088 | 26331 | 756 |
| 101 | 31718 | 34058 | 31720 | 32499 | 1350 |
| 102 | 23741 | 24595 | 25797 | 24711 | 1033 |
| 103 | 31727 | 30903 | 30903 | 31178 | 476 |
| 104 | 18175 | 15484 | 17015 | 16891 | 1350 |
| 105 | 30597 | 34242 | 32041 | 32293 | 1835 |
| 106 | 42735 | 41790 | 44554 | 43026 | 1405 |
| 107 | 67567 | 68447 | 68042 | 68019 | 441 |
| 108 | 18497 | 18903 | 18295 | 18565 | 310 |
| 109 | 33951 | 34261 | 34349 | 34187 | 209 |
| 110 | 20663 | 20610 | 21215 | 20829 | 335 |
| 111 | 56819 | 55389 | 56818 | 56342 | 825 |
| 112 | 54704 | 53746 | 53804 | 54085 | 537 |
| 113 | 69221 | 69361 | 69418 | 69333 | 102 |
| 114 | 26283 | 26897 | 26455 | 26545 | 317 |
| 115 | 30196 | 31541 | 38055 | 33264 | 4203 |
| 116 | 38670 | 38558 | 39291 | 38840 | 395 |
| 117 | 51312 | 50425 | 51309 | 51015 | 511 |
| 118 | 26439 | 28431 | 28333 | 27734 | 1123 |
| 119 | 83886 | 80757 | 81247 | 81963 | 1683 |
| 120 | 40005 | 38439 | 38439 | 38961 | 904 |
| 121 | 22755 | 22670 | 22755 | 22727 | 49 |
| 122 | 48828 | 46816 | 46999 | 47547 | 1112 |
| 123 | 29607 | 31174 | 30469 | 30417 | 785 |
| 124 | 32639 | 29974 | 30436 | 31016 | 1424 |
| 125 | 76959 | 81258 | 78225 | 78814 | 2209 |
| 126 | 46806 | 46803 | 45892 | 46500 | 526 |
| 127 | 29533 | 29014 | 28937 | 29162 | 324 |

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 128 | 43647 | 45309 | 43549 | 44168 | 989 |
| 129 | 41523 | 42323 | 41346 | 41730 | 521 |
| 130 | 44853 | 44855 | 42300 | 44003 | 1475 |
| 131 | 35680 | 33551 | 33985 | 34406 | 1125 |
| 132 | 65508 | 65956 | 67338 | 66267 | 954 |
| 133 | 36998 | 37477 | 34797 | 36424 | 1429 |
| 134 | 16660 | 14984 | 15080 | 15575 | 941 |
| 135 | 23902 | 23170 | 25793 | 24289 | 1353 |
| 136 | 33965 | 35005 | 34168 | 34379 | 552 |
| 137 | 40693 | 39962 | 40051 | 40235 | 399 |
| 138 | 42992 | 43448 | 43716 | 43386 | 366 |
| 139 | 15834 | 16441 | 16951 | 16409 | 559 |
| 140 | 49279 | 51267 | 50065 | 50204 | 1001 |
| 141 | 17816 | 17807 | 18980 | 18201 | 675 |
| 142 | 52009 | 54143 | 52315 | 52823 | 1154 |
| 143 | 38698 | 37203 | 37129 | 37677 | 885 |
| 144 | 22641 | 21664 | 20909 | 21738 | 868 |
| 145 | 30418 | 31573 | 31101 | 31031 | 581 |
| 146 | 30285 | 29799 | 29689 | 29924 | 317 |
| 147 | 18507 | 19325 | 20268 | 19367 | 881 |
| 148 | 28077 | 29387 | 28947 | 28804 | 666 |
| 149 | 30666 | 30928 | 31212 | 30935 | 273 |
| 150 | 51652 | 49434 | 50311 | 50466 | 1117 |
| 151 | 31732 | 32271 | 32421 | 32141 | 362 |
| 152 | 44821 | 46450 | 45701 | 45657 | 815 |
| 153 | 49886 | 42157 | 53772 | 48605 | 5912 |
| 154 | 46855 | 43282 | 46229 | 45455 | 1908 |
| 155 | 46478 | 46797 | 45283 | 46186 | 798 |
| 156 | 31889 | 31940 | 30197 | 31342 | 992 |
| 157 | 41484 | 40677 | 42065 | 41409 | 697 |
| 158 | 13929 | 13929 | 14399 | 14086 | 271 |
| 159 | 11884 | 12592 | 11884 | 12120 | 409 |
| 160 | 20059 | 19103 | 18831 | 19331 | 645 |
| 161 | 28316 | 29392 | 27625 | 28444 | 890 |
| 162 | 33300 | 33299 | 33490 | 33363 | 110 |
| 163 | 27038 | 27037 | 26231 | 26769 | 466 |
| 164 | 28043 | 26516 | 28301 | 27620 | 965 |
| 165 | 39396 | 37025 | 38507 | 38309 | 1198 |
| 166 | 43098 | 41977 | 41430 | 42168 | 850 |
| 167 | 33339 | 30885 | 32506 | 32243 | 1248 |
| 168 | 26695 | 27412 | 27864 | 27324 | 590 |
| 169 | 48725 | 51928 | 50334 | 50329 | 1601 |
| 170 | 30788 | 30023 | 30241 | 30350 | 394 |

| Cell Number | Length 1 | Length 2 | Length 3 | Mean Length | Length STDEV |
|---|---|---|---|---|---|
| 171 | 33380 | 32913 | 33676 | 33323 | 385 |
| 172 | 53931 | 54553 | 53286 | 53924 | 633 |
| 173 | 42670 | 42244 | 42968 | 42627 | 364 |
| 174 | 38223 | 40419 | 40339 | 39660 | 1246 |
| 175 | 23979 | 25525 | 24934 | 24813 | 780 |
| 176 | 48038 | 48141 | 47510 | 47896 | 339 |

# Appendix XVII: Image III Ellipse Area Calculations

| Cell Number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 1 | 4.76E+07 | 4.69E+07 | 4.15E+07 | 4.53E+07 | 3.37E+06 |
| 2 | 1.75E+08 | 1.65E+08 | 1.71E+08 | 1.70E+08 | 4.72E+06 |
| 3 | 1.18E+08 | 1.27E+08 | 1.37E+08 | 1.27E+08 | 9.86E+06 |
| 4 | 1.38E+08 | 1.35E+08 | 1.38E+08 | 1.37E+08 | 1.57E+06 |
| 5 | 1.11E+08 | 1.26E+08 | 1.27E+08 | 1.21E+08 | 9.00E+06 |
| 6 | 1.58E+08 | 1.85E+08 | 1.47E+08 | 1.63E+08 | 1.94E+07 |
| 7 | 1.42E+08 | 1.21E+08 | 1.28E+08 | 1.30E+08 | 1.10E+07 |
| 8 | 1.40E+08 | 1.57E+08 | 1.39E+08 | 1.45E+08 | 1.00E+07 |
| 9 | 2.74E+08 | 2.75E+08 | 2.86E+08 | 2.78E+08 | 7.05E+06 |
| 10 | 2.21E+08 | 2.05E+08 | 2.04E+08 | 2.10E+08 | 1.00E+07 |
| 11 | 3.19E+08 | 3.44E+08 | 3.66E+08 | 3.43E+08 | 2.35E+07 |
| 12 | 1.70E+08 | 1.75E+08 | 1.63E+08 | 1.69E+08 | 6.25E+06 |
| 13 | 4.01E+08 | 4.32E+08 | 4.99E+08 | 4.44E+08 | 5.00E+07 |
| 14 | 3.79E+08 | 3.76E+08 | 4.03E+08 | 3.86E+08 | 1.46E+07 |
| 15 | 1.34E+09 | 1.70E+09 | 1.42E+09 | 1.49E+09 | 1.89E+08 |
| 16 | 5.37E+08 | 5.29E+08 | 4.69E+08 | 5.12E+08 | 3.72E+07 |
| 17 | 2.52E+08 | 2.63E+08 | 2.28E+08 | 2.48E+08 | 1.79E+07 |
| 18 | 4.39E+08 | 4.37E+08 | 4.65E+08 | 4.47E+08 | 1.59E+07 |
| 19 | 1.30E+09 | 1.32E+09 | 1.23E+09 | 1.28E+09 | 4.51E+07 |
| 20 | 9.20E+08 | 9.48E+08 | 9.55E+08 | 9.41E+08 | 1.89E+07 |
| 21 | 2.58E+08 | 3.06E+08 | 2.87E+08 | 2.84E+08 | 2.40E+07 |
| 22 | 8.73E+07 | 1.19E+08 | 1.05E+08 | 1.04E+08 | 1.60E+07 |
| 23 | 2.08E+08 | 2.39E+08 | 2.29E+08 | 2.25E+08 | 1.55E+07 |
| 24 | 2.05E+08 | 2.27E+08 | 2.50E+08 | 2.27E+08 | 2.21E+07 |
| 25 | 6.07E+07 | 5.87E+07 | 5.87E+07 | 5.94E+07 | 1.12E+06 |
| 26 | 1.16E+08 | 1.07E+08 | 1.14E+08 | 1.12E+08 | 4.58E+06 |
| 27 | 5.21E+08 | 5.13E+08 | 5.53E+08 | 5.29E+08 | 2.14E+07 |
| 28 | 1.78E+08 | 1.49E+08 | 1.57E+08 | 1.61E+08 | 1.54E+07 |
| 29 | 7.96E+07 | 7.99E+07 | 8.64E+07 | 8.20E+07 | 3.87E+06 |
| 30 | 3.62E+08 | 3.57E+08 | 3.69E+08 | 3.62E+08 | 5.77E+06 |
| 31 | 3.98E+08 | 4.34E+08 | 4.51E+08 | 4.28E+08 | 2.73E+07 |
| 32 | 5.05E+08 | 5.52E+08 | 5.40E+08 | 5.32E+08 | 2.42E+07 |
| 33 | 1.52E+09 | 1.54E+09 | 1.52E+09 | 1.53E+09 | 9.09E+06 |
| 34 | 7.09E+08 | 6.83E+08 | 7.17E+08 | 7.03E+08 | 1.80E+07 |
| 35 | 1.27E+09 | 1.29E+09 | 1.27E+09 | 1.28E+09 | 1.51E+07 |
| 36 | 1.67E+08 | 1.51E+08 | 1.44E+08 | 1.54E+08 | 1.16E+07 |
| 37 | 5.35E+08 | 5.49E+08 | 5.49E+08 | 5.44E+08 | 8.03E+06 |
| 38 | 1.15E+09 | 9.92E+08 | 1.12E+09 | 1.09E+09 | 8.21E+07 |
| 39 | 2.58E+08 | 2.97E+08 | 2.38E+08 | 2.64E+08 | 3.00E+07 |
| 40 | 2.06E+08 | 2.15E+08 | 2.19E+08 | 2.13E+08 | 6.74E+06 |
| 41 | 2.82E+08 | 3.11E+08 | 2.75E+08 | 2.89E+08 | 1.90E+07 |

| Cell Number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 42 | 7.13E+07 | 6.13E+07 | 6.51E+07 | 6.59E+07 | 5.05E+06 |
| 43 | 1.48E+08 | 1.97E+08 | 1.64E+07 | 1.20E+08 | 9.33E+07 |
| 44 | 8.19E+08 | 9.45E+08 | 8.47E+08 | 8.70E+08 | 6.63E+07 |
| 45 | 3.09E+08 | 3.28E+08 | 3.34E+08 | 3.24E+08 | 1.30E+07 |
| 46 | 4.26E+08 | 4.27E+08 | 4.54E+08 | 4.36E+08 | 1.56E+07 |
| 47 | 3.19E+08 | 3.57E+08 | 3.50E+08 | 3.42E+08 | 2.05E+07 |
| 48 | 1.26E+08 | 1.07E+08 | 1.12E+08 | 1.15E+08 | 9.86E+06 |
| 49 | 1.82E+08 | 2.12E+08 | 1.68E+08 | 1.87E+08 | 2.21E+07 |
| 50 | 3.40E+08 | 3.18E+08 | 3.40E+08 | 3.33E+08 | 1.29E+07 |
| 51 | 1.78E+08 | 1.81E+08 | 1.61E+08 | 1.73E+08 | 1.06E+07 |
| 52 | 2.60E+08 | 2.57E+08 | 2.54E+08 | 2.57E+08 | 3.26E+06 |
| 53 | 3.06E+08 | 3.15E+08 | 3.71E+08 | 3.30E+08 | 3.52E+07 |
| 54 | 1.29E+08 | 1.27E+08 | 1.34E+08 | 1.30E+08 | 3.50E+06 |
| 55 | 3.53E+08 | 3.90E+08 | 3.53E+08 | 3.65E+08 | 2.13E+07 |
| 56 | 9.95E+07 | 9.90E+07 | 1.22E+08 | 1.07E+08 | 1.31E+07 |
| 57 | 7.87E+07 | 7.10E+07 | 7.52E+07 | 7.50E+07 | 3.83E+06 |
| 58 | 4.25E+09 | 4.08E+09 | 4.36E+09 | 4.23E+09 | 1.43E+08 |
| 59 | 8.86E+08 | 9.15E+08 | 9.31E+08 | 9.10E+08 | 2.28E+07 |
| 60 | 4.88E+08 | 5.23E+08 | 4.66E+08 | 4.92E+08 | 2.86E+07 |
| 61 | 6.74E+08 | 6.16E+08 | 6.13E+08 | 6.35E+08 | 3.42E+07 |
| 62 | 1.25E+09 | 1.33E+09 | 1.22E+09 | 1.27E+09 | 5.79E+07 |
| 63 | 8.14E+08 | 8.68E+08 | 8.40E+08 | 8.41E+08 | 2.69E+07 |
| 64 | 1.80E+09 | 1.82E+09 | 1.79E+09 | 1.80E+09 | 1.59E+07 |
| 65 | 7.49E+08 | 8.60E+08 | 8.18E+08 | 8.09E+08 | 5.62E+07 |
| 66 | 8.56E+08 | 8.85E+08 | 8.37E+08 | 8.60E+08 | 2.41E+07 |
| 67 | 1.42E+09 | 1.48E+09 | 1.51E+09 | 1.47E+09 | 4.37E+07 |
| 68 | 6.64E+08 | 6.61E+08 | 6.58E+08 | 6.61E+08 | 2.74E+06 |
| 69 | 4.40E+08 | 4.12E+08 | 4.04E+08 | 4.19E+08 | 1.89E+07 |
| 70 | 4.82E+08 | 4.69E+08 | 5.08E+08 | 4.87E+08 | 1.98E+07 |
| 71 | 2.67E+08 | 2.48E+08 | 2.35E+08 | 2.50E+08 | 1.59E+07 |
| 72 | 1.46E+08 | 1.55E+08 | 1.57E+08 | 1.53E+08 | 5.81E+06 |
| 73 | 5.91E+08 | 5.12E+08 | 5.55E+08 | 5.53E+08 | 3.98E+07 |
| 74 | 7.96E+08 | 8.00E+08 | 8.68E+08 | 8.21E+08 | 4.04E+07 |
| 75 | 6.78E+08 | 7.06E+08 | 6.87E+08 | 6.90E+08 | 1.40E+07 |
| 76 | 5.22E+08 | 5.69E+08 | 5.37E+08 | 5.43E+08 | 2.38E+07 |
| 77 | 6.86E+08 | 6.98E+08 | 6.35E+08 | 6.73E+08 | 3.39E+07 |
| 78 | 9.16E+08 | 9.24E+08 | 9.21E+08 | 9.20E+08 | 3.98E+06 |
| 79 | 6.02E+08 | 5.33E+08 | 6.10E+08 | 5.82E+08 | 4.21E+07 |
| 80 | 5.39E+08 | 5.63E+08 | 5.52E+08 | 5.52E+08 | 1.21E+07 |
| 81 | 3.35E+08 | 3.43E+08 | 3.08E+08 | 3.28E+08 | 1.85E+07 |
| 82 | 1.73E+08 | 1.24E+08 | 1.67E+08 | 1.55E+08 | 2.69E+07 |
| 83 | 4.75E+08 | 4.13E+08 | 4.27E+08 | 4.38E+08 | 3.21E+07 |
| 84 | 7.95E+08 | 7.13E+08 | 7.70E+08 | 7.59E+08 | 4.20E+07 |

| Cell Number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 85 | 4.73E+08 | 4.89E+08 | 5.06E+08 | 4.89E+08 | 1.63E+07 |
| 86 | 2.48E+08 | 2.54E+08 | 2.70E+08 | 2.57E+08 | 1.10E+07 |
| 87 | 1.66E+09 | 1.49E+09 | 1.50E+09 | 1.55E+09 | 9.30E+07 |
| 88 | 1.97E+09 | 2.14E+09 | 1.90E+09 | 2.00E+09 | 1.25E+08 |
| 89 | 5.18E+08 | 5.42E+08 | 5.59E+08 | 5.40E+08 | 2.06E+07 |
| 90 | 4.19E+08 | 4.73E+08 | 5.18E+08 | 4.70E+08 | 4.99E+07 |
| 91 | 7.31E+08 | 6.56E+08 | 6.96E+08 | 6.94E+08 | 3.76E+07 |
| 92 | 2.90E+08 | 3.35E+08 | 3.28E+08 | 3.18E+08 | 2.42E+07 |
| 93 | 6.31E+08 | 6.95E+08 | 7.49E+08 | 6.92E+08 | 5.92E+07 |
| 94 | 4.18E+08 | 5.12E+08 | 5.65E+08 | 4.98E+08 | 7.44E+07 |
| 95 | 3.06E+08 | 3.47E+08 | 3.27E+08 | 3.26E+08 | 2.05E+07 |
| 96 | 1.23E+09 | 1.19E+09 | 1.21E+09 | 1.21E+09 | 1.82E+07 |
| 97 | 4.90E+08 | 5.11E+08 | 5.59E+08 | 5.20E+08 | 3.53E+07 |
| 98 | 8.74E+07 | 1.10E+08 | 1.00E+08 | 9.93E+07 | 1.14E+07 |
| 99 | 2.23E+09 | 2.24E+09 | 2.28E+09 | 2.25E+09 | 2.79E+07 |
| 100 | 3.15E+08 | 3.39E+08 | 3.49E+08 | 3.34E+08 | 1.77E+07 |
| 101 | 4.06E+08 | 4.06E+08 | 3.86E+08 | 3.99E+08 | 1.14E+07 |
| 102 | 3.23E+08 | 3.01E+08 | 3.33E+08 | 3.19E+08 | 1.64E+07 |
| 103 | 4.63E+08 | 5.19E+08 | 4.90E+08 | 4.91E+08 | 2.82E+07 |
| 104 | 1.22E+08 | 1.04E+08 | 1.20E+08 | 1.15E+08 | 9.58E+06 |
| 105 | 3.37E+08 | 3.86E+08 | 3.63E+08 | 3.62E+08 | 2.47E+07 |
| 106 | 1.12E+09 | 9.68E+08 | 1.05E+09 | 1.05E+09 | 7.53E+07 |
| 107 | 1.34E+09 | 1.38E+09 | 1.37E+09 | 1.36E+09 | 2.12E+07 |
| 108 | 1.77E+08 | 2.06E+08 | 1.84E+08 | 1.89E+08 | 1.53E+07 |
| 109 | 5.73E+08 | 5.82E+08 | 6.18E+08 | 5.91E+08 | 2.39E+07 |
| 110 | 1.63E+08 | 1.45E+08 | 1.62E+08 | 1.57E+08 | 9.89E+06 |
| 111 | 7.57E+08 | 7.20E+08 | 6.92E+08 | 7.23E+08 | 3.25E+07 |
| 112 | 1.25E+09 | 1.20E+09 | 1.21E+09 | 1.22E+09 | 2.82E+07 |
| 113 | 1.88E+09 | 1.94E+09 | 1.82E+09 | 1.88E+09 | 5.93E+07 |
| 114 | 3.44E+08 | 3.17E+08 | 3.18E+08 | 3.26E+08 | 1.57E+07 |
| 115 | 4.10E+08 | 3.89E+08 | 5.05E+08 | 4.35E+08 | 6.20E+07 |
| 116 | 5.14E+08 | 4.72E+08 | 5.33E+08 | 5.06E+08 | 3.10E+07 |
| 117 | 7.74E+08 | 7.30E+08 | 7.85E+08 | 7.63E+08 | 2.90E+07 |
| 118 | 3.34E+08 | 3.71E+08 | 3.60E+08 | 3.55E+08 | 1.93E+07 |
| 119 | 2.87E+09 | 2.87E+09 | 2.84E+09 | 2.86E+09 | 1.48E+07 |
| 120 | 6.59E+08 | 5.94E+08 | 6.31E+08 | 6.28E+08 | 3.22E+07 |
| 121 | 2.70E+08 | 2.50E+08 | 2.69E+08 | 2.63E+08 | 1.12E+07 |
| 122 | 6.24E+08 | 5.82E+08 | 5.61E+08 | 5.89E+08 | 3.19E+07 |
| 123 | 3.73E+08 | 3.88E+08 | 3.62E+08 | 3.74E+08 | 1.29E+07 |
| 124 | 2.85E+08 | 2.79E+08 | 2.88E+08 | 2.84E+08 | 4.79E+06 |
| 125 | 1.93E+09 | 1.91E+09 | 1.93E+09 | 1.92E+09 | 1.03E+07 |
| 126 | 1.01E+09 | 1.00E+09 | 1.03E+09 | 1.01E+09 | 1.28E+07 |
| 127 | 5.18E+08 | 5.23E+08 | 5.03E+08 | 5.15E+08 | 1.04E+07 |

| Cell Number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 128 | 5.61E+08 | 6.19E+08 | 5.95E+08 | 5.92E+08 | 2.89E+07 |
| 129 | 6.05E+08 | 6.31E+08 | 6.16E+08 | 6.17E+08 | 1.34E+07 |
| 130 | 6.68E+08 | 7.02E+08 | 6.36E+08 | 6.69E+08 | 3.29E+07 |
| 131 | 8.41E+08 | 7.57E+08 | 7.75E+08 | 7.91E+08 | 4.39E+07 |
| 132 | 6.06E+08 | 5.94E+08 | 6.29E+08 | 6.10E+08 | 1.77E+07 |
| 133 | 5.13E+08 | 5.08E+08 | 4.71E+08 | 4.97E+08 | 2.28E+07 |
| 134 | 1.31E+08 | 1.18E+08 | 1.19E+08 | 1.23E+08 | 7.40E+06 |
| 135 | 3.22E+08 | 2.91E+08 | 3.10E+08 | 3.08E+08 | 1.56E+07 |
| 136 | 5.50E+08 | 5.63E+08 | 5.55E+08 | 5.56E+08 | 6.74E+06 |
| 137 | 9.41E+08 | 9.28E+08 | 9.31E+08 | 9.33E+08 | 6.98E+06 |
| 138 | 6.46E+08 | 7.37E+08 | 7.09E+08 | 6.97E+08 | 4.70E+07 |
| 139 | 1.03E+08 | 1.16E+08 | 1.16E+08 | 1.12E+08 | 7.57E+06 |
| 140 | 9.34E+08 | 9.55E+08 | 9.97E+08 | 9.62E+08 | 3.20E+07 |
| 141 | 2.08E+08 | 1.97E+08 | 2.13E+08 | 2.06E+08 | 8.26E+06 |
| 142 | 1.19E+09 | 1.26E+09 | 1.20E+09 | 1.22E+09 | 3.69E+07 |
| 143 | 5.55E+08 | 5.83E+08 | 5.43E+08 | 5.60E+08 | 2.04E+07 |
| 144 | 2.75E+08 | 2.89E+08 | 2.60E+08 | 2.75E+08 | 1.47E+07 |
| 145 | 4.20E+08 | 4.53E+08 | 4.25E+08 | 4.33E+08 | 1.75E+07 |
| 146 | 4.53E+08 | 4.77E+08 | 4.72E+08 | 4.67E+08 | 1.29E+07 |
| 147 | 1.83E+08 | 1.85E+08 | 2.01E+08 | 1.90E+08 | 9.48E+06 |
| 148 | 4.95E+08 | 5.54E+08 | 5.14E+08 | 5.21E+08 | 3.03E+07 |
| 149 | 2.58E+08 | 2.74E+08 | 2.60E+08 | 2.64E+08 | 8.53E+06 |
| 150 | 1.08E+09 | 1.03E+09 | 1.07E+09 | 1.06E+09 | 3.08E+07 |
| 151 | 5.52E+08 | 5.49E+08 | 5.85E+08 | 5.62E+08 | 2.02E+07 |
| 152 | 9.05E+08 | 9.18E+08 | 9.22E+08 | 9.15E+08 | 9.30E+06 |
| 153 | 9.98E+08 | 7.69E+08 | 1.03E+09 | 9.33E+08 | 1.43E+08 |
| 154 | 9.38E+08 | 8.97E+08 | 9.83E+08 | 9.39E+08 | 4.33E+07 |
| 155 | 7.41E+08 | 7.82E+08 | 7.73E+08 | 7.65E+08 | 2.17E+07 |
| 156 | 2.64E+08 | 3.02E+08 | 2.64E+08 | 2.77E+08 | 2.19E+07 |
| 157 | 5.23E+08 | 5.53E+08 | 5.24E+08 | 5.33E+08 | 1.73E+07 |
| 158 | 8.90E+07 | 7.29E+07 | 7.46E+07 | 7.88E+07 | 8.84E+06 |
| 159 | 7.96E+07 | 9.36E+07 | 7.48E+07 | 8.27E+07 | 9.75E+06 |
| 160 | 1.79E+08 | 1.80E+08 | 1.81E+08 | 1.80E+08 | 1.47E+06 |
| 161 | 3.77E+08 | 3.75E+08 | 3.57E+08 | 3.70E+08 | 1.09E+07 |
| 162 | 4.86E+08 | 5.24E+08 | 5.07E+08 | 5.06E+08 | 1.90E+07 |
| 163 | 4.12E+08 | 4.18E+08 | 4.05E+08 | 4.12E+08 | 6.25E+06 |
| 164 | 3.60E+08 | 3.57E+08 | 3.70E+08 | 3.62E+08 | 6.88E+06 |
| 165 | 5.08E+08 | 4.46E+08 | 4.63E+08 | 4.72E+08 | 3.23E+07 |
| 166 | 7.49E+08 | 7.24E+08 | 7.33E+08 | 7.35E+08 | 1.25E+07 |
| 167 | 2.86E+08 | 3.00E+08 | 3.16E+08 | 3.01E+08 | 1.50E+07 |
| 168 | 2.71E+08 | 2.84E+08 | 2.89E+08 | 2.81E+08 | 8.98E+06 |
| 169 | 5.86E+08 | 6.46E+08 | 6.26E+08 | 6.19E+08 | 3.03E+07 |
| 170 | 5.37E+08 | 5.17E+08 | 5.74E+08 | 5.43E+08 | 2.92E+07 |

| Cell Number | Ellipse Area 1 | Ellipse Area 2 | Ellipse Area 3 | Mean Area | Area STDEV |
|---|---|---|---|---|---|
| 171 | 3.65E+08 | 3.80E+08 | 3.76E+08 | 3.74E+08 | 7.75E+06 |
| 172 | 9.10E+08 | 8.36E+08 | 8.80E+08 | 8.75E+08 | 3.74E+07 |
| 173 | 7.87E+08 | 8.39E+08 | 8.05E+08 | 8.10E+08 | 2.64E+07 |
| 174 | 6.11E+08 | 6.40E+08 | 6.13E+08 | 6.21E+08 | 1.64E+07 |
| 175 | 3.08E+08 | 3.42E+08 | 3.06E+08 | 3.19E+08 | 2.01E+07 |
| 176 | 1.13E+09 | 1.18E+09 | 1.13E+09 | 1.15E+09 | 2.91E+07 |

# Appendix XVIII: Image III Eccentricity Calculations

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 1 | 0.93190968 | 0.929546755 | 0.945299517 | 0.935585317 | 0.008495299 |
| 2 | 0.844781356 | 0.815269638 | 0.82992199 | 0.829990995 | 0.01475598 |
| 3 | 0.89319028 | 0.901615314 | 0.899795047 | 0.898200213 | 0.004433161 |
| 4 | 0.709712253 | 0.82347591 | 0.755733097 | 0.762973753 | 0.057226417 |
| 5 | 0.912572359 | 0.928938881 | 0.902302819 | 0.914604686 | 0.013433827 |
| 6 | 0.929417569 | 0.889989219 | 0.917284855 | 0.912230548 | 0.020194262 |
| 7 | 0.770111482 | 0.784522321 | 0.753069013 | 0.769234272 | 0.015744992 |
| 8 | 0.70770818 | 0.493462182 | 0.323621761 | 0.508264041 | 0.192470557 |
| 9 | 0.413343174 | 0.459213128 | 0.600198718 | 0.49091834 | 0.097378971 |
| 10 | 0.622651824 | 0.589052434 | 0.632091841 | 0.6145987 | 0.02262161 |
| 11 | 0.811677354 | 0.814800369 | 0.823854881 | 0.816777535 | 0.006324945 |
| 12 | 0.781140541 | 0.879767526 | 0.872225072 | 0.844377713 | 0.054894691 |
| 13 | 0.849173477 | 0.87147935 | 0.858906466 | 0.859853098 | 0.011183026 |
| 14 | 0.932422435 | 0.944319137 | 0.94045973 | 0.939067101 | 0.006069385 |
| 15 | 0.88705384 | 0.845101277 | 0.871981093 | 0.868045403 | 0.021251391 |
| 16 | 0.877810443 | 0.857743749 | 0.905257097 | 0.88027043 | 0.023852007 |
| 17 | 0.734088939 | 0.762043221 | 0.742207904 | 0.746113355 | 0.014380538 |
| 18 | 0.519021757 | 0.525144641 | 0.516421556 | 0.520195985 | 0.004478522 |
| 19 | 0.861940717 | 0.865263915 | 0.879188899 | 0.868797844 | 0.009151035 |
| 20 | 0.886418675 | 0.892936202 | 0.888529012 | 0.889294629 | 0.003325533 |
| 21 | 0.897967125 | 0.91530168 | 0.898421348 | 0.903896718 | 0.009879598 |
| 22 | 0.920031476 | 0.872159751 | 0.884499228 | 0.892230152 | 0.024854595 |
| 23 | 0.94367807 | 0.949985214 | 0.947736032 | 0.947133106 | 0.003196507 |
| 24 | 0.899890659 | 0.900702884 | 0.886848489 | 0.895814011 | 0.007774983 |
| 25 | 0.267191759 | 0.684425267 | 0.684452417 | 0.545356481 | 0.240897716 |
| 26 | 0.67731019 | 0.733990449 | 0.719847891 | 0.710382844 | 0.02950175 |
| 27 | 0.898548925 | 0.904547037 | 0.915244535 | 0.906113499 | 0.008457317 |
| 28 | 0.750314947 | 0.757204472 | 0.815280036 | 0.774266485 | 0.03568543 |
| 29 | 0.769535094 | 0.858394352 | 0.771507495 | 0.799812313 | 0.050743118 |
| 30 | 0.970246762 | 0.966716712 | 0.963732349 | 0.966898607 | 0.003261014 |
| 31 | 0.92129757 | 0.919433439 | 0.924014908 | 0.921581972 | 0.002303938 |
| 32 | 0.859579686 | 0.867387676 | 0.838053985 | 0.855007115 | 0.015192026 |
| 33 | 0.913778476 | 0.915711411 | 0.920482236 | 0.916657375 | 0.003450541 |
| 34 | 0.852031163 | 0.887271622 | 0.872952482 | 0.870751756 | 0.017723005 |
| 35 | 0.794350366 | 0.794280948 | 0.797462863 | 0.795364726 | 0.001817371 |
| 36 | 0.404365555 | 0.576447273 | 0.514504971 | 0.498439266 | 0.087158531 |
| 37 | 0.285538826 | 0.486565303 | 0.427501166 | 0.399868432 | 0.103322733 |
| 38 | 0.549262849 | 0.693681833 | 0.579611312 | 0.607518665 | 0.07614674 |
| 39 | 0.612366165 | 0.744139901 | 0.804857599 | 0.720454555 | 0.098407239 |
| 40 | 0.799850475 | 0.819208924 | 0.772415045 | 0.797158148 | 0.023512831 |
| 41 | 0.62638333 | 0.576738993 | 0.578431611 | 0.593851312 | 0.028186263 |

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 42 | 0.899459764 | 0.937401643 | 0.944648964 | 0.927170123 | 0.024269918 |
| 43 | 0.935856711 | 0.902750633 | 0.999091194 | 0.945899513 | 0.04894915 |
| 44 | 0.741363314 | 0.712650266 | 0.721344059 | 0.725119213 | 0.014724083 |
| 45 | 0.428833596 | 0.638586254 | 0.623880983 | 0.563766944 | 0.117086795 |
| 46 | 0.670202571 | 0.718577969 | 0.65486725 | 0.68121593 | 0.033252586 |
| 47 | 0.846150669 | 0.860443564 | 0.86620676 | 0.857600331 | 0.010325922 |
| 48 | 0.788362057 | 0.85068938 | 0.832256947 | 0.823769461 | 0.032018774 |
| 49 | 0.926487093 | 0.928134886 | 0.935372515 | 0.929998165 | 0.004726683 |
| 50 | 0.471687518 | 0.539447259 | 0.432860597 | 0.481331791 | 0.053943842 |
| 51 | 0.798826787 | 0.8483409 | 0.839662081 | 0.828943256 | 0.026440154 |
| 52 | 0.897651795 | 0.91891853 | 0.933593063 | 0.916721129 | 0.018071113 |
| 53 | 0.895924556 | 0.876317292 | 0.850373053 | 0.874204967 | 0.022849098 |
| 54 | 0.81744356 | 0.812575112 | 0.832625488 | 0.820881387 | 0.010457934 |
| 55 | 0.945444142 | 0.945600612 | 0.946607688 | 0.945884147 | 0.00063147 |
| 56 | 0.923569055 | 0.912125861 | 0.89856567 | 0.911420196 | 0.01251662 |
| 57 | 0.893116737 | 0.914506218 | 0.882349771 | 0.896657575 | 0.016368031 |
| 58 | 0.895040716 | 0.904153729 | 0.895086533 | 0.89809366 | 0.005248224 |
| 59 | 0.898720973 | 0.881528736 | 0.879130999 | 0.886460236 | 0.010685576 |
| 60 | 0.822072921 | 0.739055926 | 0.810810734 | 0.790646527 | 0.04503223 |
| 61 | 0.968171874 | 0.96181158 | 0.966320031 | 0.965434495 | 0.003271309 |
| 62 | 0.917832864 | 0.904858791 | 0.914484738 | 0.912392131 | 0.006735421 |
| 63 | 0.900376685 | 0.917194141 | 0.906965434 | 0.908178753 | 0.008474126 |
| 64 | 0.811973598 | 0.831475527 | 0.831801123 | 0.825083416 | 0.011354603 |
| 65 | 0.641233141 | 0.688592641 | 0.680546328 | 0.670124036 | 0.025341639 |
| 66 | 0.543141701 | 0.62537662 | 0.570667395 | 0.579728572 | 0.041859577 |
| 67 | 0.85471484 | 0.866396363 | 0.860432996 | 0.860514733 | 0.005841191 |
| 68 | 0.87870981 | 0.900276306 | 0.882372461 | 0.887119525 | 0.011540338 |
| 69 | 0.804782887 | 0.833267067 | 0.795688442 | 0.811246132 | 0.019605316 |
| 70 | 0.750393161 | 0.772324102 | 0.696252566 | 0.73965661 | 0.039155776 |
| 71 | 0.902255882 | 0.85649419 | 0.872123598 | 0.87695789 | 0.023260716 |
| 72 | 0.789651334 | 0.75565856 | 0.820915312 | 0.788741735 | 0.032637884 |
| 73 | 0.915860011 | 0.910572723 | 0.913307577 | 0.913246771 | 0.002644168 |
| 74 | 0.94975162 | 0.954905192 | 0.948623723 | 0.951093512 | 0.003348838 |
| 75 | 0.900048478 | 0.892544188 | 0.898588791 | 0.897060485 | 0.003978741 |
| 76 | 0.800181396 | 0.715555354 | 0.751253501 | 0.755663417 | 0.042485024 |
| 77 | 0.895561928 | 0.910976758 | 0.889546365 | 0.898695017 | 0.011053399 |
| 78 | 0.90220281 | 0.882496096 | 0.902288959 | 0.895662622 | 0.011402627 |
| 79 | 0.978882158 | 0.981436744 | 0.973456467 | 0.977925123 | 0.004075309 |
| 80 | 0.947712265 | 0.944536377 | 0.945556343 | 0.945934995 | 0.00162145 |
| 81 | 0.866255107 | 0.830290573 | 0.847622102 | 0.848055927 | 0.017986192 |
| 82 | 0.778338702 | 0.724936092 | 0.617989037 | 0.707087944 | 0.081651216 |
| 83 | 0.781155538 | 0.84288984 | 0.815082587 | 0.813042655 | 0.030917665 |
| 84 | 0.773050849 | 0.824814414 | 0.825314001 | 0.807726421 | 0.030030965 |

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 85 | 0.892452081 | 0.879213957 | 0.865162381 | 0.878942806 | 0.01364687 |
| 86 | 0.811302212 | 0.768487122 | 0.738522685 | 0.772770673 | 0.036578361 |
| 87 | 0.847621476 | 0.886245369 | 0.876262432 | 0.870043092 | 0.020048975 |
| 88 | 0.840707953 | 0.825887053 | 0.849639267 | 0.838744758 | 0.011997188 |
| 89 | 0.934794847 | 0.91537785 | 0.899306142 | 0.916492947 | 0.017770611 |
| 90 | 0.859507081 | 0.901974029 | 0.861763603 | 0.874414904 | 0.023893555 |
| 91 | 0.833881734 | 0.883120272 | 0.866127065 | 0.861043024 | 0.025009878 |
| 92 | 0.907748751 | 0.888158433 | 0.904326455 | 0.90007788 | 0.01046341 |
| 93 | 0.983052342 | 0.980258924 | 0.977347442 | 0.980219569 | 0.002852653 |
| 94 | 0.971259851 | 0.967591821 | 0.957127653 | 0.965326442 | 0.007333397 |
| 95 | 0.838698536 | 0.807373007 | 0.808963031 | 0.818344858 | 0.017644721 |
| 96 | 0.71228723 | 0.708676131 | 0.668081034 | 0.696348132 | 0.024546519 |
| 97 | 0.859199521 | 0.832830395 | 0.802709417 | 0.831579778 | 0.02826581 |
| 98 | 0.972593543 | 0.961669643 | 0.963226677 | 0.965829955 | 0.00590895 |
| 99 | 0.720651789 | 0.672577168 | 0.697179358 | 0.696802772 | 0.024039523 |
| 100 | 0.790236624 | 0.782554536 | 0.795361304 | 0.789384155 | 0.006445802 |
| 101 | 0.858080053 | 0.895395749 | 0.87262126 | 0.875365687 | 0.018808621 |
| 102 | 0.68489243 | 0.774131739 | 0.770810116 | 0.743278095 | 0.050590737 |
| 103 | 0.810558629 | 0.721463689 | 0.757570107 | 0.763197475 | 0.044813251 |
| 104 | 0.882624405 | 0.832117347 | 0.849739804 | 0.854827186 | 0.025634973 |
| 105 | 0.889098595 | 0.907918277 | 0.892754089 | 0.89659032 | 0.009979109 |
| 106 | 0.626122407 | 0.708318797 | 0.737728623 | 0.690723275 | 0.05784625 |
| 107 | 0.927912233 | 0.927361832 | 0.92646216 | 0.927245408 | 0.000732013 |
| 108 | 0.751755614 | 0.677357127 | 0.714126811 | 0.714413184 | 0.03720007 |
| 109 | 0.774342421 | 0.775341025 | 0.744917661 | 0.764867036 | 0.017283879 |
| 110 | 0.874292155 | 0.90033962 | 0.889038277 | 0.887890017 | 0.013061641 |
| 111 | 0.954420088 | 0.954266287 | 0.962035592 | 0.956907323 | 0.004441878 |
| 112 | 0.846046971 | 0.849188328 | 0.845442997 | 0.846892765 | 0.002010821 |
| 113 | 0.866843044 | 0.858036918 | 0.876461421 | 0.867113794 | 0.009215235 |
| 114 | 0.772798869 | 0.830344917 | 0.816192261 | 0.806445349 | 0.02998564 |
| 115 | 0.820250443 | 0.866928642 | 0.895849373 | 0.861009486 | 0.038145469 |
| 116 | 0.898986242 | 0.914592828 | 0.898309489 | 0.903962853 | 0.009212045 |
| 117 | 0.927360047 | 0.930724943 | 0.925054742 | 0.927713244 | 0.002851553 |
| 118 | 0.794286172 | 0.811481901 | 0.820716753 | 0.808828275 | 0.01341362 |
| 119 | 0.85456867 | 0.82874563 | 0.836252466 | 0.839855589 | 0.013283231 |
| 120 | 0.851733146 | 0.858863972 | 0.839201948 | 0.849933022 | 0.00995385 |
| 121 | 0.748873306 | 0.785665015 | 0.750479312 | 0.761672544 | 0.0207936 |
| 122 | 0.942916352 | 0.941123928 | 0.946279833 | 0.943440038 | 0.002617542 |
| 123 | 0.840828265 | 0.861226712 | 0.867773631 | 0.856609536 | 0.014053538 |
| 124 | 0.940006926 | 0.918721245 | 0.918367122 | 0.925698431 | 0.012392785 |
| 125 | 0.909599615 | 0.929492037 | 0.916096681 | 0.918396111 | 0.010143601 |
| 126 | 0.809225282 | 0.812112298 | 0.783109394 | 0.801482325 | 0.015976769 |
| 127 | 0.655178421 | 0.610830226 | 0.643829738 | 0.636612795 | 0.023038095 |

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 128 | 0.926961763 | 0.923384409 | 0.916781556 | 0.922375909 | 0.00516449 |
| 129 | 0.894773478 | 0.893643205 | 0.888416376 | 0.892277686 | 0.003391411 |
| 130 | 0.906258173 | 0.895830995 | 0.891570775 | 0.897886647 | 0.007556401 |
| 131 | 0.541364587 | 0.516028885 | 0.519385599 | 0.525593024 | 0.013761305 |
| 132 | 0.983687193 | 0.984770484 | 0.984281866 | 0.984246514 | 0.00054251 |
| 133 | 0.878763442 | 0.887783328 | 0.868621078 | 0.878389283 | 0.009586602 |
| 134 | 0.798733271 | 0.74315581 | 0.747096312 | 0.762995131 | 0.031012786 |
| 135 | 0.695533264 | 0.722580234 | 0.804784656 | 0.740966051 | 0.056898993 |
| 136 | 0.794517605 | 0.810669764 | 0.796062331 | 0.800416567 | 0.008913057 |
| 137 | 0.690144188 | 0.672939137 | 0.673632002 | 0.678905109 | 0.009739491 |
| 138 | 0.895649545 | 0.867550148 | 0.881415307 | 0.881538333 | 0.014050103 |
| 139 | 0.85302217 | 0.837661694 | 0.858256759 | 0.849646874 | 0.010704375 |
| 140 | 0.871802814 | 0.886660911 | 0.862237212 | 0.873566979 | 0.01230705 |
| 141 | 0.552333157 | 0.611375781 | 0.656897996 | 0.606868978 | 0.052427901 |
| 142 | 0.827070403 | 0.836655548 | 0.829424478 | 0.831050143 | 0.004995082 |
| 143 | 0.881577699 | 0.844243019 | 0.86528593 | 0.863702216 | 0.018717657 |
| 144 | 0.730147681 | 0.619999205 | 0.653557933 | 0.667901606 | 0.056457749 |
| 145 | 0.815604803 | 0.815852183 | 0.829087231 | 0.820181406 | 0.007713663 |
| 146 | 0.777652489 | 0.728992753 | 0.731557981 | 0.746067741 | 0.027383249 |
| 147 | 0.732565263 | 0.775091095 | 0.78336597 | 0.763674109 | 0.0272569 |
| 148 | 0.601148129 | 0.576553348 | 0.62440698 | 0.600702819 | 0.023929924 |
| 149 | 0.93700556 | 0.931337576 | 0.940614701 | 0.936319279 | 0.004676483 |
| 150 | 0.855582018 | 0.844804447 | 0.841395479 | 0.847260648 | 0.007405347 |
| 151 | 0.716224148 | 0.741233519 | 0.705128046 | 0.720861904 | 0.018494131 |
| 152 | 0.819308345 | 0.840451652 | 0.826902447 | 0.828887482 | 0.010710515 |
| 153 | 0.859763041 | 0.834608367 | 0.890906307 | 0.861759238 | 0.028202006 |
| 154 | 0.839042079 | 0.79288201 | 0.810519003 | 0.814147697 | 0.023292994 |
| 155 | 0.899586562 | 0.890542217 | 0.877339553 | 0.88915611 | 0.011188088 |
| 156 | 0.943597598 | 0.926250393 | 0.929810073 | 0.933219354 | 0.009162357 |
| 157 | 0.922222023 | 0.904809869 | 0.926174055 | 0.917735315 | 0.011366839 |
| 158 | 0.811927708 | 0.878257173 | 0.889025752 | 0.859736878 | 0.041752582 |
| 159 | 0.696553995 | 0.659690636 | 0.738169688 | 0.698138107 | 0.0392635 |
| 160 | 0.825091509 | 0.778076037 | 0.758514269 | 0.787227272 | 0.034219016 |
| 161 | 0.800796607 | 0.833477833 | 0.802902848 | 0.812392429 | 0.018290838 |
| 162 | 0.829464822 | 0.798294537 | 0.817570014 | 0.815109791 | 0.015730105 |
| 163 | 0.695678114 | 0.685676234 | 0.661126049 | 0.680826799 | 0.017779175 |
| 164 | 0.812263055 | 0.763591238 | 0.808849791 | 0.794901361 | 0.027169017 |
| 165 | 0.908859941 | 0.910129659 | 0.917666894 | 0.912218831 | 0.004760681 |
| 166 | 0.858258894 | 0.852202455 | 0.839305931 | 0.849922427 | 0.00968001 |
| 167 | 0.944886442 | 0.916332416 | 0.924764601 | 0.928661153 | 0.014670394 |
| 168 | 0.874819145 | 0.876779215 | 0.881001477 | 0.877533279 | 0.003159393 |
| 169 | 0.949295403 | 0.952383138 | 0.949228797 | 0.950302446 | 0.00180224 |
| 170 | 0.693255128 | 0.68340059 | 0.600469936 | 0.659041885 | 0.050963545 |

| Cell Number | Eccentricity 1 | Eccentricity 2 | Eccentricity 3 | Mean Eccentricity | Eccentricity STDEV |
|---|---|---|---|---|---|
| 171 | 0.908965146 | 0.894965064 | 0.906359349 | 0.903429853 | 0.007445605 |
| 172 | 0.917210308 | 0.933910702 | 0.91889694 | 0.923339317 | 0.009193847 |
| 173 | 0.834858381 | 0.801030839 | 0.831953283 | 0.822614167 | 0.018748066 |
| 174 | 0.846689686 | 0.866708283 | 0.877506441 | 0.863634803 | 0.015636585 |
| 175 | 0.730384197 | 0.744001072 | 0.779635448 | 0.751340239 | 0.025432636 |
| 176 | 0.780919915 | 0.761692018 | 0.772229192 | 0.771613708 | 0.009628713 |

# Appendix XIX: Image III Flattening Calculations

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 1 | 0.63730957 | 0.631295742 | 0.673796346 | 0.647467219 | 0.022999103 |
| 2 | 0.464888366 | 0.420918471 | 0.442120541 | 0.442642459 | 0.021989593 |
| 3 | 0.550321088 | 0.567461185 | 0.563687183 | 0.560489819 | 0.009006281 |
| 4 | 0.295508326 | 0.432648763 | 0.345120251 | 0.357759114 | 0.069438322 |
| 5 | 0.591084739 | 0.629766891 | 0.568897202 | 0.596582944 | 0.030805072 |
| 6 | 0.630970215 | 0.544018433 | 0.601768291 | 0.592252313 | 0.044250067 |
| 7 | 0.362090676 | 0.379899421 | 0.342058466 | 0.361349521 | 0.018931361 |
| 8 | 0.293495129 | 0.130232747 | 0.053813467 | 0.159180448 | 0.122434888 |
| 9 | 0.089424676 | 0.111673875 | 0.200149077 | 0.133749209 | 0.058570159 |
| 10 | 0.217500987 | 0.191905185 | 0.22510652 | 0.211504231 | 0.01739405 |
| 11 | 0.415893955 | 0.420258369 | 0.433199211 | 0.423117178 | 0.008999865 |
| 12 | 0.375644768 | 0.524595855 | 0.510895283 | 0.470378636 | 0.08232743 |
| 13 | 0.471885992 | 0.5095678 | 0.487867514 | 0.489773769 | 0.018913091 |
| 14 | 0.638629826 | 0.670969048 | 0.660094872 | 0.656564582 | 0.016456109 |
| 15 | 0.538334011 | 0.46539376 | 0.510460448 | 0.504729406 | 0.0368063 |
| 16 | 0.520991831 | 0.485922514 | 0.575135801 | 0.527350049 | 0.04494522 |
| 17 | 0.320946667 | 0.352473839 | 0.3298303 | 0.334416935 | 0.01625634 |
| 18 | 0.145238972 | 0.148987012 | 0.1436655 | 0.145963828 | 0.002733804 |
| 19 | 0.492990927 | 0.498683376 | 0.523526623 | 0.505066975 | 0.016237917 |
| 20 | 0.537115637 | 0.549816772 | 0.541179561 | 0.54270399 | 0.006486341 |
| 21 | 0.559937456 | 0.597231042 | 0.560865531 | 0.57267801 | 0.021268612 |
| 22 | 0.608155537 | 0.510778814 | 0.533458345 | 0.550797566 | 0.050951378 |
| 23 | 0.669134922 | 0.687705118 | 0.680944499 | 0.679261513 | 0.009398797 |
| 24 | 0.563884417 | 0.565564373 | 0.53793966 | 0.55579615 | 0.01548697 |
| 25 | 0.03635662 | 0.270916977 | 0.270942465 | 0.192738688 | 0.135430844 |
| 26 | 0.264302436 | 0.32084021 | 0.305868158 | 0.297003601 | 0.029292751 |
| 27 | 0.561126636 | 0.573626152 | 0.597101203 | 0.577284663 | 0.018264197 |
| 28 | 0.33891946 | 0.346822086 | 0.42093311 | 0.368891552 | 0.045242189 |
| 29 | 0.361395475 | 0.487009613 | 0.363779766 | 0.404061618 | 0.071844962 |
| 30 | 0.757881804 | 0.744150826 | 0.73312932 | 0.745053983 | 0.012400933 |
| 31 | 0.611141687 | 0.606754337 | 0.617643556 | 0.611846527 | 0.00547872 |
| 32 | 0.488998274 | 0.502366983 | 0.454412685 | 0.48192598 | 0.024747054 |
| 33 | 0.59378713 | 0.598163452 | 0.609215593 | 0.600388725 | 0.007951305 |
| 34 | 0.476508933 | 0.538752704 | 0.512194748 | 0.509152128 | 0.031233234 |
| 35 | 0.392540128 | 0.392449364 | 0.396631967 | 0.39387382 | 0.002389057 |
| 36 | 0.085402549 | 0.182865652 | 0.142512604 | 0.136926935 | 0.048971052 |
| 37 | 0.041632858 | 0.12635579 | 0.095985203 | 0.087991284 | 0.04292343 |
| 38 | 0.164350359 | 0.279718448 | 0.185106923 | 0.209725243 | 0.061497929 |
| 39 | 0.209425728 | 0.331976192 | 0.406532018 | 0.315977979 | 0.099522257 |
| 40 | 0.399800685 | 0.426504804 | 0.364881902 | 0.397062464 | 0.030902571 |
| 41 | 0.220484815 | 0.183071525 | 0.184269118 | 0.195941819 | 0.021263291 |

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 42 | 0.562996415 | 0.65174986 | 0.671917182 | 0.628887819 | 0.057947718 |
| 43 | 0.647619218 | 0.569835736 | 0.957376235 | 0.72494373 | 0.205015169 |
| 44 | 0.328896106 | 0.298480507 | 0.30742311 | 0.311599908 | 0.015632063 |
| 45 | 0.096616501 | 0.230449744 | 0.218480634 | 0.18184896 | 0.074055681 |
| 46 | 0.257821778 | 0.304553594 | 0.244256072 | 0.268877148 | 0.031632479 |
| 47 | 0.467056246 | 0.490454248 | 0.500314249 | 0.485941581 | 0.017082061 |
| 48 | 0.384788437 | 0.474331303 | 0.445609908 | 0.434909883 | 0.045720336 |
| 49 | 0.623673459 | 0.62775595 | 0.646335952 | 0.632588453 | 0.012079403 |
| 50 | 0.118234223 | 0.157980609 | 0.098539128 | 0.124917987 | 0.03027915 |
| 51 | 0.398438894 | 0.470549607 | 0.456890812 | 0.441959771 | 0.038303926 |
| 52 | 0.559294594 | 0.605552621 | 0.641664972 | 0.602170729 | 0.041289196 |
| 53 | 0.555793753 | 0.51826563 | 0.473819735 | 0.515959706 | 0.041035629 |
| 54 | 0.423991297 | 0.417143511 | 0.446163565 | 0.429099457 | 0.015169405 |
| 55 | 0.674215755 | 0.674670194 | 0.677612212 | 0.675499387 | 0.001843814 |
| 56 | 0.616567867 | 0.590089749 | 0.561160923 | 0.589272846 | 0.027712504 |
| 57 | 0.55017504 | 0.595428156 | 0.52940582 | 0.558336339 | 0.03375933 |
| 58 | 0.554015565 | 0.572792751 | 0.554107526 | 0.560305281 | 0.010814564 |
| 59 | 0.561479062 | 0.527869628 | 0.523419801 | 0.537589497 | 0.020808261 |
| 60 | 0.43061778 | 0.326355927 | 0.414691574 | 0.390555093 | 0.056165477 |
| 61 | 0.749713718 | 0.72628759 | 0.742656655 | 0.739552654 | 0.01201757 |
| 62 | 0.603032956 | 0.574288162 | 0.595379605 | 0.590900241 | 0.014886716 |
| 63 | 0.564888721 | 0.601559404 | 0.578794942 | 0.581747689 | 0.018512801 |
| 64 | 0.416305837 | 0.444438618 | 0.444926229 | 0.435223561 | 0.016385044 |
| 65 | 0.232653886 | 0.274851618 | 0.267294946 | 0.258266817 | 0.022500945 |
| 66 | 0.16035895 | 0.219676937 | 0.178818702 | 0.186284863 | 0.030355618 |
| 67 | 0.480902184 | 0.500643072 | 0.490436402 | 0.490660553 | 0.009872353 |
| 68 | 0.522643666 | 0.564681067 | 0.529448366 | 0.538924366 | 0.022563947 |
| 69 | 0.406430708 | 0.447129314 | 0.394293881 | 0.415951301 | 0.027674483 |
| 70 | 0.339008243 | 0.364771316 | 0.282203118 | 0.328660892 | 0.042245445 |
| 71 | 0.568798976 | 0.483843336 | 0.510714367 | 0.521118893 | 0.043422987 |
| 72 | 0.386444158 | 0.345034244 | 0.428950046 | 0.386809483 | 0.041959094 |
| 73 | 0.598502253 | 0.586651097 | 0.592729489 | 0.592627613 | 0.005926235 |
| 74 | 0.68699543 | 0.703089113 | 0.683593566 | 0.691226036 | 0.010413578 |
| 75 | 0.564210214 | 0.549040054 | 0.561208267 | 0.558152845 | 0.008033377 |
| 76 | 0.400241938 | 0.301443964 | 0.339986229 | 0.347224044 | 0.049795074 |
| 77 | 0.555063114 | 0.58754231 | 0.543155098 | 0.561920174 | 0.022974346 |
| 78 | 0.568687944 | 0.529680278 | 0.568868194 | 0.555745472 | 0.0225733 |
| 79 | 0.795574657 | 0.808213876 | 0.771127749 | 0.791638761 | 0.018853744 |
| 80 | 0.680873909 | 0.67159319 | 0.674541551 | 0.67566955 | 0.004742069 |
| 81 | 0.500398069 | 0.44266925 | 0.469399611 | 0.47082231 | 0.028890694 |
| 82 | 0.372155382 | 0.311183868 | 0.213813285 | 0.299050845 | 0.079865278 |
| 83 | 0.375663532 | 0.461913838 | 0.420655219 | 0.419410863 | 0.043138615 |
| 84 | 0.365655941 | 0.434596442 | 0.435325935 | 0.411859439 | 0.040015066 |

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 85 | 0.548857801 | 0.523572862 | 0.498508172 | 0.523646278 | 0.025174895 |
| 86 | 0.415373007 | 0.360134745 | 0.325771371 | 0.367093041 | 0.045204277 |
| 87 | 0.469398612 | 0.536783909 | 0.518165847 | 0.508116123 | 0.034798596 |
| 88 | 0.458511184 | 0.436164407 | 0.47263569 | 0.455770427 | 0.018389465 |
| 89 | 0.64481189 | 0.597404183 | 0.562680366 | 0.601632146 | 0.041228674 |
| 90 | 0.488876162 | 0.568209714 | 0.492689944 | 0.51659194 | 0.044742956 |
| 91 | 0.448056839 | 0.530853343 | 0.500176124 | 0.493028768 | 0.041858438 |
| 92 | 0.580485752 | 0.540462626 | 0.573158504 | 0.564702294 | 0.021309464 |
| 93 | 0.816674897 | 0.802281913 | 0.788358847 | 0.802438552 | 0.014158675 |
| 94 | 0.76197836 | 0.747480559 | 0.710333543 | 0.739930821 | 0.026637299 |
| 95 | 0.455404034 | 0.409958622 | 0.412140481 | 0.425834379 | 0.025631299 |
| 96 | 0.298111902 | 0.29446606 | 0.255911476 | 0.282829812 | 0.023383128 |
| 97 | 0.488359323 | 0.446471741 | 0.403629652 | 0.446153572 | 0.042365732 |
| 98 | 0.767488066 | 0.72578932 | 0.731309904 | 0.741529097 | 0.022649951 |
| 99 | 0.306702806 | 0.259973005 | 0.283103255 | 0.283259689 | 0.023365293 |
| 100 | 0.387198174 | 0.377417958 | 0.393864375 | 0.386160169 | 0.008272197 |
| 101 | 0.486484058 | 0.554728788 | 0.51160248 | 0.517605109 | 0.034516076 |
| 102 | 0.271355808 | 0.366975474 | 0.362935038 | 0.33375544 | 0.054077415 |
| 103 | 0.414342498 | 0.307547731 | 0.347246193 | 0.356378807 | 0.053979941 |
| 104 | 0.529921114 | 0.445400397 | 0.472797699 | 0.482706403 | 0.043122787 |
| 105 | 0.542284271 | 0.580852768 | 0.549455733 | 0.557530924 | 0.020513137 |
| 106 | 0.22027522 | 0.294107316 | 0.324902615 | 0.279761717 | 0.053768672 |
| 107 | 0.627201276 | 0.625834219 | 0.623612081 | 0.625549192 | 0.001811494 |
| 108 | 0.340558193 | 0.26434565 | 0.299983644 | 0.301629162 | 0.038132908 |
| 109 | 0.367233206 | 0.368457211 | 0.332843588 | 0.356178002 | 0.02021746 |
| 110 | 0.514599931 | 0.56481203 | 0.542167124 | 0.540526362 | 0.025146228 |
| 111 | 0.701533428 | 0.701042054 | 0.727075982 | 0.709883821 | 0.014890875 |
| 112 | 0.46689164 | 0.471909872 | 0.465934331 | 0.468245281 | 0.003209521 |
| 113 | 0.501418877 | 0.486411987 | 0.518527905 | 0.50211959 | 0.016069422 |
| 114 | 0.365348988 | 0.442750219 | 0.422219598 | 0.410106268 | 0.040097222 |
| 115 | 0.427995446 | 0.501567728 | 0.555642147 | 0.49506844 | 0.064071059 |
| 116 | 0.562023133 | 0.595623988 | 0.560636755 | 0.572761292 | 0.019811806 |
| 117 | 0.625829793 | 0.634280052 | 0.62016619 | 0.626758678 | 0.007102633 |
| 118 | 0.392456193 | 0.415622448 | 0.428664712 | 0.412247784 | 0.018338634 |
| 119 | 0.480661587 | 0.440374517 | 0.451655389 | 0.457563831 | 0.020783269 |
| 120 | 0.476024192 | 0.487796254 | 0.456180093 | 0.473333513 | 0.015978899 |
| 121 | 0.337286811 | 0.381347849 | 0.339106058 | 0.352580239 | 0.024930081 |
| 122 | 0.666970342 | 0.661938241 | 0.676651152 | 0.668519912 | 0.007477855 |
| 123 | 0.458698024 | 0.491779034 | 0.503040319 | 0.484505792 | 0.023048532 |
| 124 | 0.658844642 | 0.605093334 | 0.60427051 | 0.622736162 | 0.031273567 |
| 125 | 0.584514091 | 0.63115782 | 0.599042556 | 0.604904822 | 0.023868054 |
| 126 | 0.412501537 | 0.41649883 | 0.378116026 | 0.402372131 | 0.021101269 |
| 127 | 0.24452582 | 0.208238397 | 0.234831216 | 0.229198478 | 0.01878803 |

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 128 | 0.624844179 | 0.616123415 | 0.600610993 | 0.613859529 | 0.012274189 |
| 129 | 0.55347965 | 0.551221857 | 0.540961501 | 0.548554336 | 0.006671788 |
| 130 | 0.577275356 | 0.555605099 | 0.547118609 | 0.559999688 | 0.015551259 |
| 131 | 0.159212046 | 0.143428818 | 0.145460007 | 0.149366957 | 0.008586371 |
| 132 | 0.820112517 | 0.82614059 | 0.823395334 | 0.823216147 | 0.003018029 |
| 133 | 0.522742404 | 0.539738375 | 0.504523036 | 0.522334605 | 0.017611211 |
| 134 | 0.398314732 | 0.330881593 | 0.335284196 | 0.35482684 | 0.037725897 |
| 135 | 0.281506104 | 0.308712936 | 0.406433107 | 0.332217382 | 0.065696524 |
| 136 | 0.392758882 | 0.414496342 | 0.394785357 | 0.400680194 | 0.012007961 |
| 137 | 0.276328113 | 0.260302144 | 0.260933071 | 0.265854443 | 0.009075949 |
| 138 | 0.555239512 | 0.502650283 | 0.527657902 | 0.528515899 | 0.026305111 |
| 139 | 0.478125323 | 0.453810577 | 0.486779448 | 0.472905116 | 0.017093113 |
| 140 | 0.510143028 | 0.537579813 | 0.493495321 | 0.513739387 | 0.022261199 |
| 141 | 0.166376534 | 0.208659584 | 0.246020542 | 0.207018887 | 0.039847345 |
| 142 | 0.437901656 | 0.452270601 | 0.441381136 | 0.443851131 | 0.007496153 |
| 143 | 0.52796106 | 0.464039438 | 0.498721375 | 0.496907291 | 0.0319994 |
| 144 | 0.316710629 | 0.215397562 | 0.243123506 | 0.258410566 | 0.052357951 |
| 145 | 0.421390628 | 0.421739492 | 0.440880726 | 0.428003615 | 0.011153269 |
| 146 | 0.371305634 | 0.315478586 | 0.318220769 | 0.335001663 | 0.031470043 |
| 147 | 0.319303199 | 0.368150496 | 0.378439258 | 0.355297651 | 0.031593751 |
| 148 | 0.200862385 | 0.182940494 | 0.218900824 | 0.200901234 | 0.017980196 |
| 149 | 0.650685555 | 0.635843003 | 0.660523957 | 0.649017505 | 0.01242474 |
| 150 | 0.482332723 | 0.464924821 | 0.459580119 | 0.468945888 | 0.011897352 |
| 151 | 0.302129689 | 0.32875275 | 0.290920005 | 0.307267482 | 0.019432623 |
| 152 | 0.426646849 | 0.458113462 | 0.437654606 | 0.440804972 | 0.01596811 |
| 153 | 0.489306831 | 0.449156216 | 0.545812867 | 0.494758638 | 0.048558405 |
| 154 | 0.45593347 | 0.390624813 | 0.414287659 | 0.420281981 | 0.033064393 |
| 155 | 0.563257492 | 0.545099395 | 0.520129904 | 0.54282893 | 0.021653255 |
| 156 | 0.668905492 | 0.623091244 | 0.63196029 | 0.641319009 | 0.024298673 |
| 157 | 0.613339243 | 0.574184193 | 0.622903699 | 0.603475712 | 0.025814037 |
| 158 | 0.416242005 | 0.5218114 | 0.542142804 | 0.493398736 | 0.067588552 |
| 159 | 0.282495622 | 0.248462732 | 0.325384916 | 0.285447757 | 0.038545971 |
| 160 | 0.435000884 | 0.371829895 | 0.348343569 | 0.385058116 | 0.04481754 |
| 161 | 0.401063614 | 0.447447105 | 0.403890097 | 0.417466938 | 0.02600202 |
| 162 | 0.441441042 | 0.397732756 | 0.424170795 | 0.421114865 | 0.022013805 |
| 163 | 0.281646353 | 0.272093343 | 0.249725152 | 0.267821616 | 0.016383727 |
| 164 | 0.41670871 | 0.354300053 | 0.411984681 | 0.394331148 | 0.034748317 |
| 165 | 0.582898565 | 0.58567645 | 0.602649435 | 0.59040815 | 0.010691864 |
| 166 | 0.486783017 | 0.47678783 | 0.45634059 | 0.473303812 | 0.015517382 |
| 167 | 0.672601755 | 0.599581589 | 0.61946034 | 0.630547894 | 0.037751643 |
| 168 | 0.51555035 | 0.519106865 | 0.526886485 | 0.520514567 | 0.00579769 |
| 169 | 0.685614509 | 0.695096149 | 0.685413462 | 0.68870804 | 0.005533178 |
| 170 | 0.279307744 | 0.269956417 | 0.200352667 | 0.249872276 | 0.043139374 |

| Cell Number | Flattening 1 | Flattening 2 | Flattening 3 | Mean Flattening | Flattening STDEV |
|---|---|---|---|---|---|
| 171 | 0.583127881 | 0.553863772 | 0.57749233 | 0.571494661 | 0.015526624 |
| 172 | 0.601596623 | 0.642493636 | 0.605502328 | 0.616530862 | 0.022569068 |
| 173 | 0.449535211 | 0.401376917 | 0.445154315 | 0.432022147 | 0.026629789 |
| 174 | 0.467913 | 0.501184651 | 0.520435149 | 0.496510933 | 0.026571164 |
| 175 | 0.316963453 | 0.331821577 | 0.373766363 | 0.340850464 | 0.029458161 |
| 176 | 0.37536884 | 0.352060752 | 0.364655939 | 0.36402851 | 0.011666704 |