Investigating the Possible Presence of Plumes by Comparing Thermal Qualities of Linea on Europa and Sulcus on Enceladus. Livia Blackburn, Samuel Byers, Ronnie Evans, Amber Fan, Elizabeth Finley, Leonardo Martinez, Marland Moore, Jonathan Nguyen

Introduction: The Klein Astronomy Research Team (KART) in a previous investigation compared the surface features of Enceladus’ Sulcus family, more commonly referred to as Tiger Stripes, with locations on Europa. The team decided to revisit this subject focusing on thermal qualities of cracks rather than crack width. The KART hypothesizes that there are plumes on Europa found in areas with higher temperatures containing cracks in close proximity to each other. However, as we collected data, we chose to focus on individual cracks in specific thermal areas rather than multiple cracks in a closer area.

NASA’s official website has cited that the Hubble Space Telescope has observed possible plumes erupting from Jupiter’s Moon’s surface. However, most references did not have a clear confirmation of the locations of the plumes, thus we resorted to thermal images of Europa’s Pwyll crater area, and Enceladus’ Tiger Stripes.

Experimental Setup: We collected a combined rough total of 900 points from both of the lunar surfaces in areas of interest. Using 5 areas from Enceladus: Damascus, Baghdad (in 2 parts), Cairo, and Alexandria, and 5 areas in each thermal zone around Europa’s Pwyll Crater [Fig. 1], each dedicated area we measured had a total of 90 points identified. The collection procedure is as follows:

We started at the highest points in each area, both on Europa and Enceladus, we then placed a point on the top right edge of the crack. After the initial point, place a point parallel to the first point on the top left edge of the crack. Record the latitude and longitude of both the top right and top left points. Using the measuring tool, measure the distance between the top right and top left points. Record the distance in kilometers (km) between the points. From both the top right and the top left, measure 1 km along the edge Place a point at both new points. Repeat.

Results & Discussion: Europa is one of the planetary bodies in the Solar System that has a high probability of housing or being able to house life underneath its surface. Plumes can tell us if the body is adequate to being able to harbor life, as water- a very common element in most plumes- is an essential component for all life as we know it. The theory of a subsurface ocean on Europa is supported by the question, whether or not there are plumes on Europa. On Enceladus, the data suggests that plumes may very well have a higher chance of arising from the cracks in 0.7-1.5 km in width [Fig. 2], due to the temperature data we collected. On Europa, Zones 3, 4, and part of Zone 5 have a smaller width distance in comparison to the rest of the other zones [Fig. 3], which has a correlation to the tiger stripes on Enceladus. This tells us that if there are to be plumes on Europa, researchers could consider primarily focusing on linea with a shorter width distance rather than linea with a larger width distance.
Figure 4 (up): This graph shows the width lengths of each crack on Europa compared to one another. Crack (Zone) 2 and Crack (Zone) 3 share virtually the same distance, which are also the two zones that had a cluster of high thermal readings at smaller widths in Figure 3.

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