EUROPAN CYCLOIDAL RIFT DENSITIES AND IO VOLCANO DISTRIBUTION: IMPLICATIONS FOR TIDAL ACTIVITY.

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Introduction: Previous works have described cycloidal rifts and how they form (Hoppa, 1999), but none have gone into detail on where they occur and what rift density may mean to the system as a whole. In this study, GIS software is used in conjunction with high-resolution images to map cycloidal rifts (Fig. 1) on Europa's surface and compare with a map of volcanoes on Io. Cycloidal rifts are digitized to display which regions of the moon are most active in cyclodial rifting processes. GIS is also used to create contour maps displaying rift and volcano density.

Procedure: For the Europa data set, rifts were digitized if they displayed a clear, unmistakable cyclic arcing behavior as described in *Hoppa 1999.* Total cumulative lengths of rifts within any given ten degree bin were plotted for both longitude and latitude. The Io volcano coordinates used in the Io data set were acquired from *Carr 1998*. All mapping and digitizing was done in Arc GIS. The images used for the base maps were downloaded from the USGS map-a-planet website.

Results: Cumulative rift length plots are compared to volcano counts on Io using the same longitude and latitude bins. The initial results show clear minimum values at around ±90° longitude, and maxima near 0° and 180° longitude (the sub-Jovian point and its antipode). Maxima on latitude are clustered around the equator and taper off towards the poles. These values correspond well to expected areas of extension and compression in Europa's icy crust (Fig.2). There is also a fairly strong correlation between the positions of these minimum and maximum on both Europa and Io, further supporting this assertion. In both cases, the maxima values are shifted to the south and east of the sub-Jovian point (0° latitude, 0° longitude). Possible biases in the Europa data include false lows due to lower resolution zones in the image and false highs at higher latitudes due to image stretching. Little can be done about the low resolution zones unless better images can be acquired. The latter is not considered a problem because the lower latitudes are already areas of lower density, and correcting for stretching will only make the minimum values even smaller.

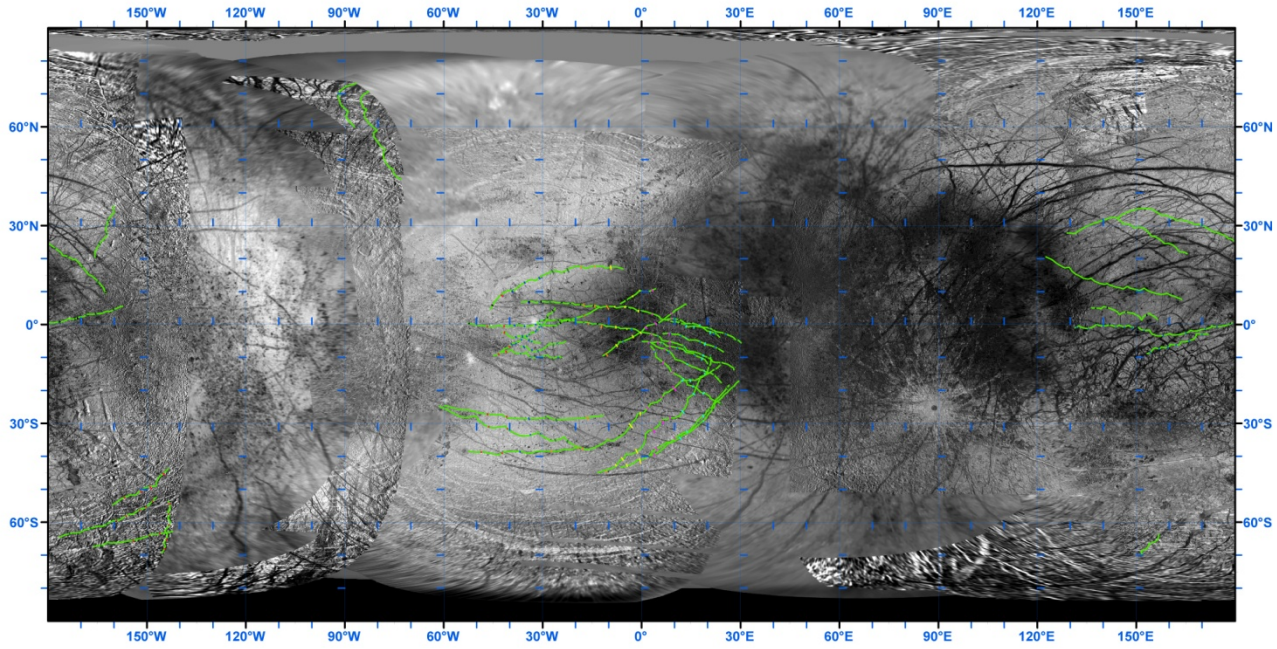

Figure 1: GIS map that was used to collect the rift data. The green lines are digitized rifts that were measured within varying zones of latitude and longitude.

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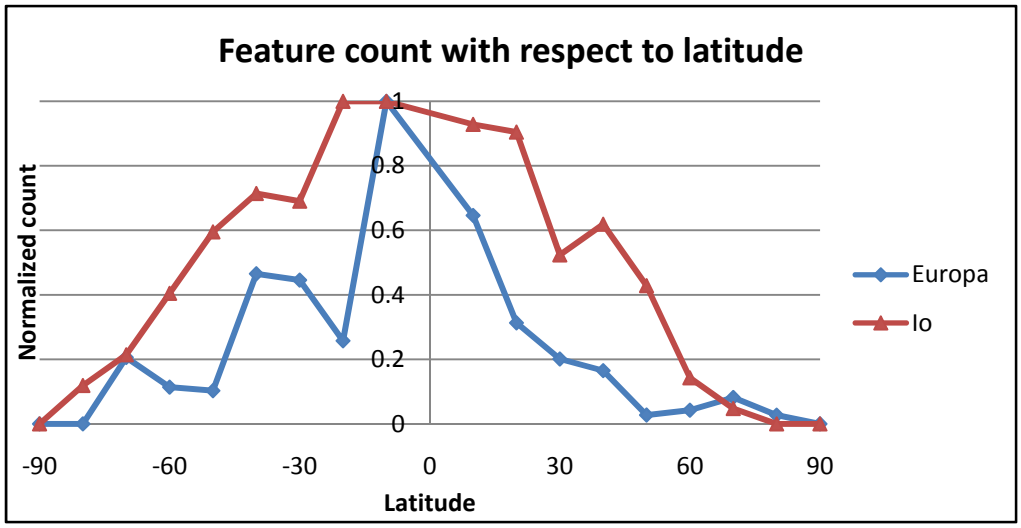

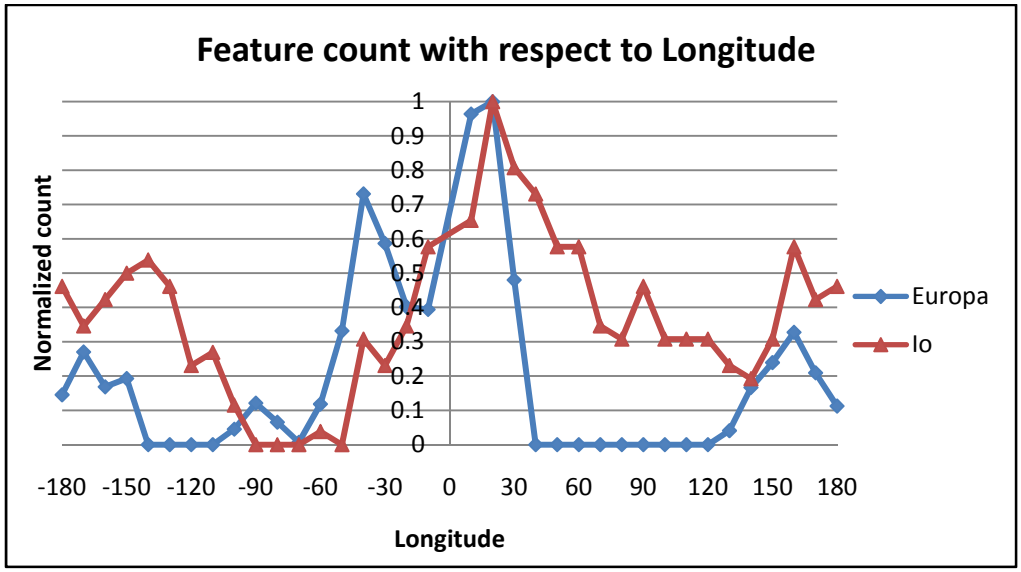

Figure 2: Normalized distributions of rifts on Europa (blue) and volcanoes on Io (red), as a function of latitude (upper), and longitude (lower).