**DIRECTION OF ELONGATION OF LENTICULAE ON EUROPA** K. A. Nuñez[1] and L. G. J. Montési[1], [1]Department of Geology, University of Maryland, College Park (knunez12@umd.edu; montesi@umd.edu)

**Introduction:** Microchaos has been hypothesized to be formed via cyrovolcanism [1], diapirism [2,3] and melt-through of the icy shell [4, 5, 6]. Mapping of these features has been previously accomplished at a resolution of (resolution here)[7, 6]. With a new, higher resolution mosaic, ~230 m/pix , [8] were able to produce a map of all features under 100 km$^2$. The region mapped by [8] and investigated in this study are the northern (0°-55°N) and southern (0°-65°S) extents of ~90°W and ~230°W.

Comparing the feature map created by [8] and surrounding bands, yields a potential correlation between microchaos and band orientations. This observed relationship may be evidence for structural control of bands on microchaos and chaos. This relationship could be then be tested by comparing orientation to other tectonic features.

**Methods:** Using [9] as a base map, a band map was created in the same regions as [8] to distinguish bands from the rest of the terrain. This elementary band map was created using the USGS Europa 500m global mosaic. Figure 1 and 2 are sections of the maps created using the methods described above.

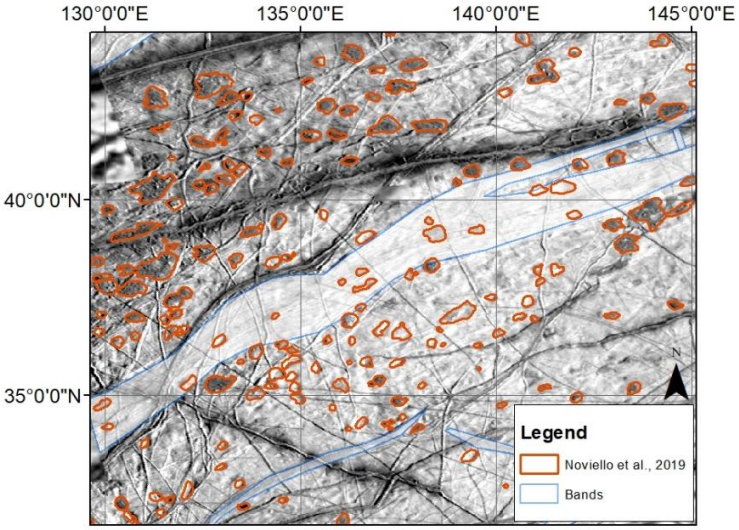


**Figure 1. North-east portion of Europan surface. The microchaos captured in this region appeared to be orientated parallel to nearby bands.**

**Discussion:** From Fig. 1 and 2, microchaos appears to be parallel to bands and cracks. In Fig. 1, a majority of the features mapped by [8] are orientated in a North-East direction. Bands identified in the same region also

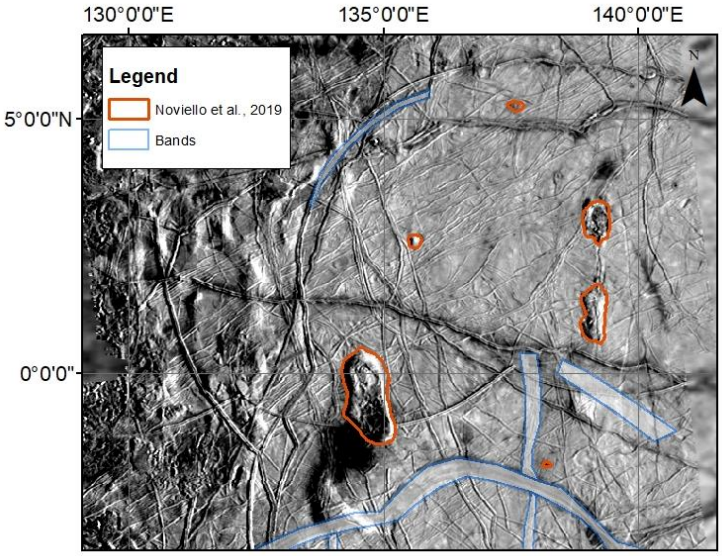


**Figure 2 South-East portion of Europan surface. The two large chaos and hybrid features at ~ 140 E and ~ 25 S are separated by a crack that also appears on top of the southernmost feature as well as below it.**

appear to be orientated in the same direction. By investigating cross cutting relationships, we evaluated if these microchaos orientations had any relationship with the ages of the bands. From the features in Fig. 1, the majority of the mircochaos are orientated parallel to the younger bands, those being the bands which are not cross cut. On the other hand in Fig. 2, the mircrochaos and chaos are orientated with the older of the 3 bands that are present in the surrounding region. With these two examples in mind, we propose four possible mechanisms exist that can explain why mircochaos and chaos appear parallel to bands and cracks:

A) Cracks are opening in the direction of most compressive stress. This would allow for the cracks to be filled liquid material and thus exhibit an elongated shape in the direction of the crack.
B) The crack follows and expands on a preexisting crack. This can potentially explain why we see some of the microchaos and chaos aligned with older bands.
C) Material is filling in preexisting terrain.
D) The feature is being elongated by the regional strain. This would be the most unlikely scenario since this would cause the features to be elongated perpendicular to the bands and cracks.

These methods are summarized and illustrated in Fig. 3. We have also hypothesized that methods B and C can potentially occur semi-contemporaneously to explain how older and younger bands exhibit the same behavior.

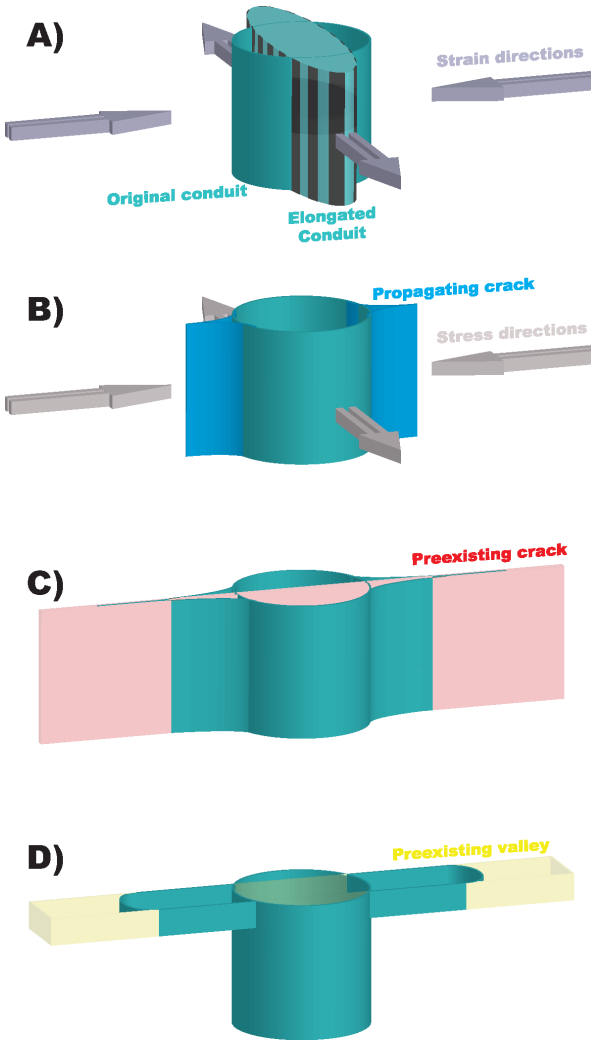


**Figure 3 Four possible origins of elongated lenticulae. In each case we assume transport of a liquid or mush through an initially circular conduit (green), regardless of the origin of the fluid. A) The conduit is elongated (striped green ellipse) following region strain (purple arrows). B) Cracks (blue) open from the conduit in the direction of most compressive stress (brown arrows). C) The conduit follows and possibly widens a preexisting crack (red). D) Surface flow features follow preexisting topography, especially fill preexisting valley (yellow). In case A) through C) intrusive, extrusive, or drainage features will follow roughly the outline of the conduit and the shape develops at depth. In case D) the shape results follows the surface and only extrusive features would be expected to be elongated. The lenticulae would be elongated perpendicular to bands and ridges in case A) and parallel to them in the other three cases.**

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