THE REGIONAL GEOLOGY OF CONAMARA CHAOS, EUROPA. D. A. Senske, Jet Propulsion Laboratory, California Institute of Technology, 4800 Oak Grove Dr., M/S 321-560, Pasadena, CA 91109.

Introduction: Much of the previous geologic analysis of Conamara Chaos has focused on the history and reconstruction of the disrupted crust within the chaos itself [1]. To better understand the geologic context of this relatively young outcrop of disrupted terrain, its relation to regional geologic events, and the evolution of the entire area over time, we have performed comprehensive mapping of the Conamara Chaos region.

Geologic Mapping: Using image data centered at 10° N, 271° W with a resolution of 180 m/pixel collected during the Galileo E6 orbit and covering an area of approximately 90,000 km^2, stratigraphic relations between tectonic structures and cryovolcanic units are established (Figure 1). Specific tectonic terrains include the following: *Wide Bands* that are composed of parallel ridges spaced between 550 m and 1.25 km apart. The overall width of the band assemblages ranges from 4- to 10-km; *Bands* that are made up of several sets of parallel ridges spaced between 525 m and 950 m apart with individual bands ranging in width between 2- and 4-km (narrower than Wide Bands); *Double Ridges* that are composed of two distinct parallel ridges separated by a central trough; and *Fractures* that are single troughs that lack discernable raised rims. Fractures are typically linear, throughgoing in nature and cross cut most other units. Cryovolcanic geologic terrains include the following: *Chaos* which are complex region 10s to over 100 km across composed of disrupted pre-existing crustal blocks and a smoother "matrix" material between the outcrops; and *Lenticulae* which are localized subcircular to elongated regions of crustal deformation and disruption 10s of kilometers across. Numerous occurrences of lenticuale are surrounded by a halo of smooth, dark material that appears to embay the surrounding terrain. Our analysis shows that in addition to Conamara Chaos (~75 x 100 km), there are over 80 additional smaller (10's of km across) outcrops of chaos/lenticulae.

By identifying key cross cutting and superposition relations (Figures 1 and 2), it is possible to identify a set of distinct trends in the formation of tectonic features. The two lineae, Astenus and Agave bound the Conamara Chaos to the north and west and north and east respectively. The identification of a single fracture that cross cuts older regional units but is preserved in some of the larger crust blocks within Conamara indicates that the chaos postdates both Astenus Linea and Agave Linea. The youngest feature in the mapped region is a double ridge striking ~N 45° E.

The stratigraphy as revealed by cross cutting and superposition relations shows an alternating and cyclical pattern with one set of ~N10°E tectonic features subsequently superposed by ~N30°W bands and ridges. These regional-scale tectonic patterns are consistent with those mapped at previously over more limited areas [2,3] and has been suggested to possibly be related to non-synchronous rotation. The observed sequence appears to repeat three times over the history of the region.

Our mapping shows little or limited emplacement of cryovolcanic deposits in the earliest part of the history of this region. On the contrary, cryovolcanism appears to be a marker of later activity. The restriction of extrusive events to the latter part of the history suggests a possible change in geologic setting and crustal structure with time.

Conclusions: Stratigraphically, the emplacement of wide bands appears to be restricted to the early history of the region with later tectonic activity resulting in the emplacement of narrower belts of parallel ridges and individual fractures. The variation in morphologic signature of tectonic terrains over time may reflect the magnitude of extensional stresses required for deformation. That is, the crust might possibly have been thinner, and more ductile, early on facilitating crustal spreading-like processes. Subsequently crustal thickening, becoming more ridged, may reflect the need for larger stresses needed to deform the crust. As noted, cryovolcanic units were emplaced primarily later in the history of the region. The later cryovolcanic activity might be suggestive of the onset of convention in the ice shell as it thickened over time.

To test these and other hypotheses, data to be collected by the Europa mission, now in formulation, will allow: (1) geologic contacts to be examined in greater detail, providing deeper insight into stratigraphic and timing relations; (2) the extension of regional-scale mapping to adjacent unimaged parts of Europa will allow the generation of a global map at regional scales; and (3) the sounding of the interior by Ice Penetrating Radar (IPR) will provide insight into the vertical structure of the crust aiding in establishing better understanding cryovolcanic and other subsurface processes.

References: [1] Spaun, N. A., J. W. Head, G. C. Collins, L. M. Prockter, and R. T. Pappalardo (1998), *J. Geophys. Res.,* 25, 4277-42890; [2] Spaun, N. A., R. T. Pappalardo, and J. W. Head (2003), *J. Geophys. Res.*, 108(E6), 5060, doi:10.1029/2001JE001499; [3] Kattenhorn, S. A., *Icarus* 157, 490–506 (2002) doi:10.1006/icar.2002.6825.

Figure 1. General geologic map of the Conamara Chaos region. Unit descriptions are provided in the text and time stratigraphic relations are shown in the correlation chart below.

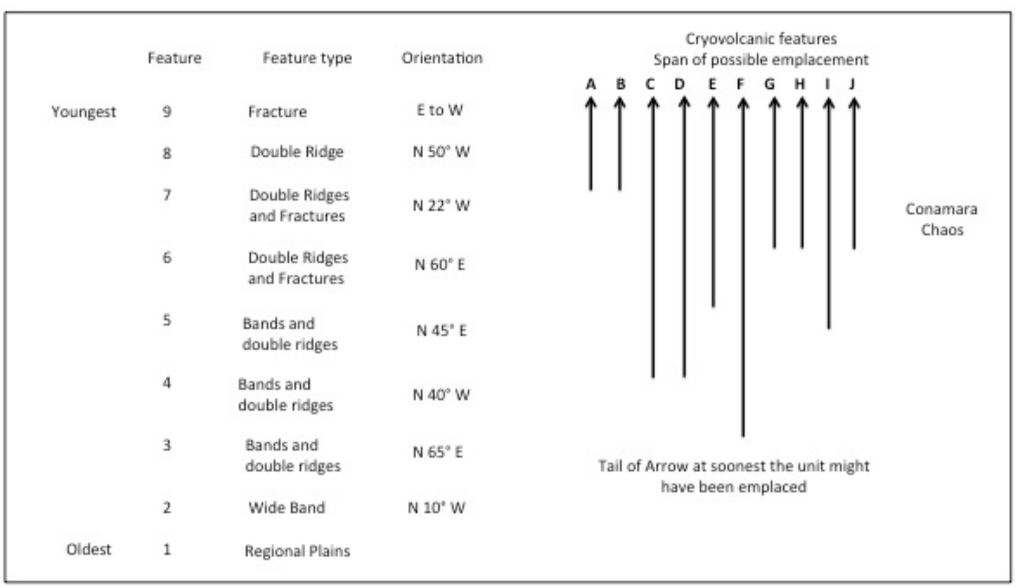

Figure 2. Correlation chart summarizing unit assemblages and stratigraphic relations.