

Ganymede, implications for bright terrain formation from topographic data

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Abstract

We have used Galileo G28 stereo-derived topography at the boundary of Nicholson Regio (NR) to Harpagia Sulcus (HS) to study the processes that have shaped these regions and, in particular, to find implications for bright terrain formation on Ganymede. Bright terrains were suggested to have formed by tectonism [1], cryovolcanism [2], or both in interactions [3], but their relative roles at the formation of bright terrains have remained open [4]. Our topographic data here (Figure 1) suggest that the formation of bright terrain in HS is likely related to tectonism accompanied by isostatically driven rise of warm mobile ice flooding lower-lying portions of extended terrain. In detail, HS is relatively smooth with relief <100 m consistent with mobile ice flow (dark terrain in NR features relief of typically 200 m), and unlike lower-lying cryovolcanic terrains identified by other researchers elsewhere on Ganymede [5], bright terrain of HS is at about the same topographic level as neighboring dark terrain of NR. Several factors indicate that extension has affected the study area: 1) a ~ 5 km wide and up to 400 m deep bounding trough along the margin of the bright terrain, 2) an elevated flanking ridge within the bright terrain, and 3) high-standing fault blocks (with ~300 m of relief) within the dark terrain adjacent and parallel to the boundary. The saw-tooth shape of these blocks is indicative of tilt-block normal faulting, and their high elevation over surrounding terrain may be explained by block rotation at large strains.

References

- [1] Head, J.W. et al. (1997) *Lunar Planet. Sci. Conf. XXIV*, abstract #535.
- [2] Kay, J.E. and J.W. Head (1999) *Lunar Planet. Sci. Conf. XXX*, abstract #1103.
- [3] Parmentier, E. M. et al. (1982) *Nature*, 295, 290-293.
- [4] Head, J.W. et al. (2002) *Geophys. Res. Lett.*, 29(24), 2151.
- [5] Schenk, P. M. et al. (2001), *Nature*, 410, 57-60.

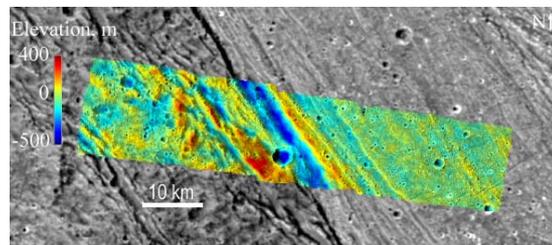


Figure 1: Topography at the boundary of Nicholson Regio (west) to Harpagia Sulcus (east) derived from G28 stereo images. Horizontal resolution is 0.6-1.2 km, and vertical accuracies are 15-30 m.