POSSIBLE POINT SOURCE OF MANTLE UPWELLING, GALILEO REGIO, GANYMEDE; James R. Underwood, Jr., Alex Woronow*, Ruggero Casacchia**, and Michael J. Teeling, Department of Geology, Kansas State University, Manhattan, KS 66506; * Geosciences Department, University of Houston, Houston, TX 77004; ** Instituto di Astrofisica Spaziale, Reparto Planetologia, Viale dell'Università 11, 00185, Roma, Italia

LOCATION AND DESCRIPTION. An unusual circular structure near the center of the Galileo Regio quadrangle (Jg-3) of Ganymede, is almost perfectly centered at the intersection of northeast- and northwest-trending furrows, creating a subtle "cross-hairs" pattern. The circular structure, centered at lat 41° and long 143°, has a diameter of 250-275 km; the outer limits of the feature, not well defined, are represented by arcuate ridges and grooves, some of which have distinctly higher albedo than surrounding material.

The structure does not have the relatively high-albedo signature of palimpsests, nor does it have the ring spacing characteristic of multiring basins. Although the structure is vaguely concentric, few of the arcuate features can be traced through more than a quadrant of the structure. Although it is older than the furrow systems superposed on it, arcuate ridges-grooves appear to cut the northwest- and northeast-trending furrows at the northwest and northeast margins, respectively, of the structure.

The indistinct concentric pattern created by arcuate ridges and grooves extends unbroken farther eastward than in any other direction, but 375 km to the northwest, isolated segments of grooves and ridges concentric to the structure can be identified. The structure does not appear, on the several images on which it has been studied (Voyager 2 PICNO's 0106J2-001, 0437J2-001, 0440J2-001, 0452J2-001), to be significantly higher or lower than the surrounding area. Based on visual examination and when compared with crater densities determined by Shoemaker and others (1), the area of the circular structure within 125 km radius of the center is deficient in 10-km diameter craters compared to the average for most areas of Galileo Regio.

DISCUSSION. The large circular structure in central Galileo Regio does not have the high albedo nor the generally smooth texture of most palimpsests. Its indistinct, closely spaced, incomplete arcuate ridges and grooves do not resemble the more widely spaced rings of multiring basins. Almost certainly, its location at the intersection of two furrow systems is related to its origin.

Although within the size range of the "coronae" or "ovoids" identified on radar images of Venus returned by the Soviet Venera 15 and 16 spacecraft, and possessing a surface texture similar to the coronae, the structure is not elliptical as are the coronae of Venus reported by Barsukov and others (2). The structure in Galileo Regio also does not have identifiable flow features associated with it as do the coronae on Venus, interpreted by the Russians as volcano-tectonic features.

Squyres (3) identified two domes on Ganymede, both approximately 260 km in diameter, and suggested two possible origins for them: (1) "ice volcanism triggered by impact," and (2) "isostatic upwarping of an impact crater formed in a thin crust." The Galileo Regio structure, however, does not appear to be domal.

CONCLUSIONS. The unusual circular structure in Galileo Regio may have originated by:

1. Impact and subsequent relaxation of the crust sufficiently early in crustal history for the albedo to have been lowered to that of the surrounding region, i.e. the structure may be a very old palimpsest.
2. Doming of the type described by Squyres but followed by relaxation of the uplift that produced the arcuate ridges and grooves and , perhaps, associated faults.
3. Tidal stresses weakening a thin area of the crust and triggering thermally driven upwelling of subcrustal material, as suggested by Casacchia and Strom (4).

The intriguing possibility exists that the structure may represent the locus of early upwelling of mantle material, creating a system of arcuate ridges and grooves as the crustal and mantle material moved radially outward from the center of the upwelling plume. The furrow systems were superposed on the structure later, although renewed movement along some of the arcuate features, including possible faults, may have resulted in the cross-cutting of the northwest- and northeast-trending furrows. The point of upwelling, as a zone of weakness, may have influenced the location of the furrows and of their intersection.

REFERENCES.

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