

LUNAR WREATHS: UNUSUAL, APPARENTLY YOUNG, MARE LANDFORMS

Phil Stooke

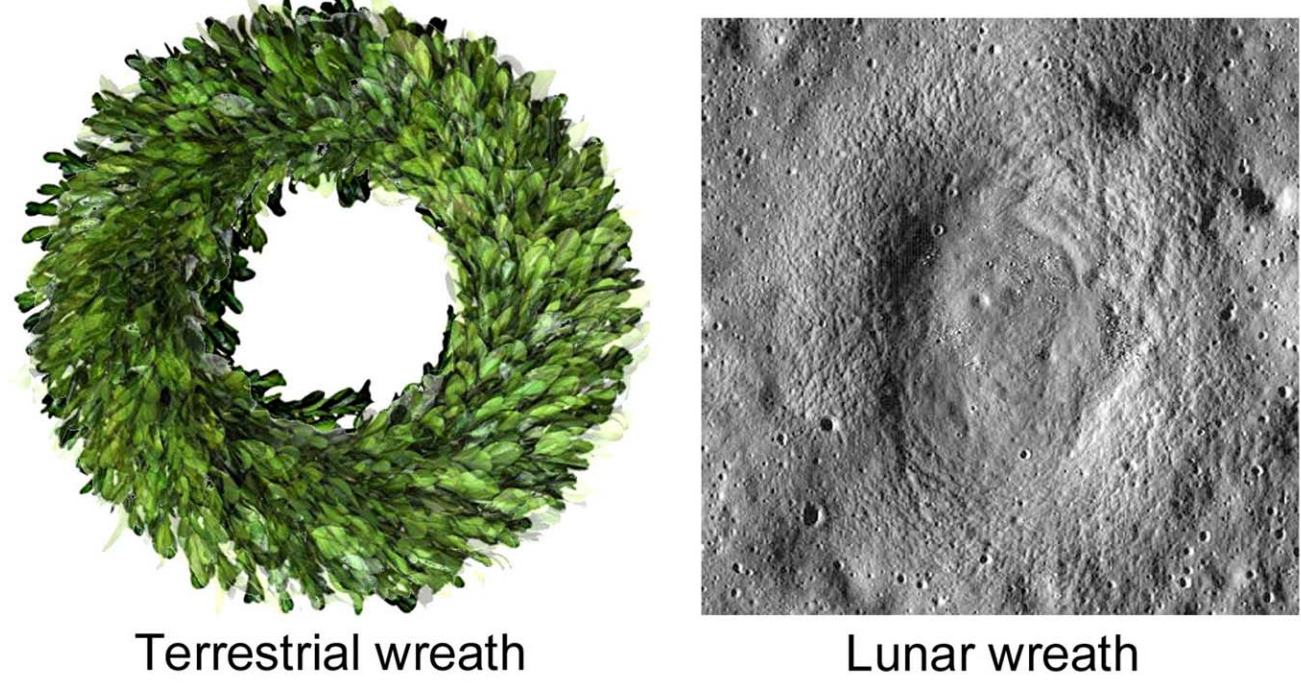
Department of Geography + Centre for Planetary Science and Exploration
University of Western Ontario, London, Ontario, Canada N6A 5C2
pjstooke@uwo.ca, <http://publish.uwo.ca/~pjstooke>.

Introduction

Lunar wreaths (Figure 1) are a newly-recognized landforms in the lunar maria, so far seen only in Mare Imbrium and Mare Insularum. A wreath is a circular or elliptical section of an otherwise typical mare surface, 1 to 2 km across, with a wrinkled texture, significantly reduced small crater density compared with the surroundings, and in most cases a slightly raised rim and depressed interior. Some depressed interiors have higher albedo (or photometric properties making the interior appear brighter) than the surroundings. They appear to be formed by physical disturbance of the existing surface.

This study uses LROC images to characterize four wreaths.

Figure 1. Wreaths.



4. Wreath 2.

Wreath 2 (Figure 6) is centered at 48.14° N, 23.29° W in northern Mare Imbrium. It is elliptical, 3000 by 2000 m across, elongated SW-NE. Depressions about 10 m below the surrounding mare occur at at each end of the elongated floor and the central floor is at the level of the surroundings. The wrinkled texture is found throughout the walls and floor, and the lower areas near each end appear brighter than the rest of the feature, with many blocks exposed near the northern end of the floor. The rim appears raised and the crater density is extremely low compared with the surroundings.

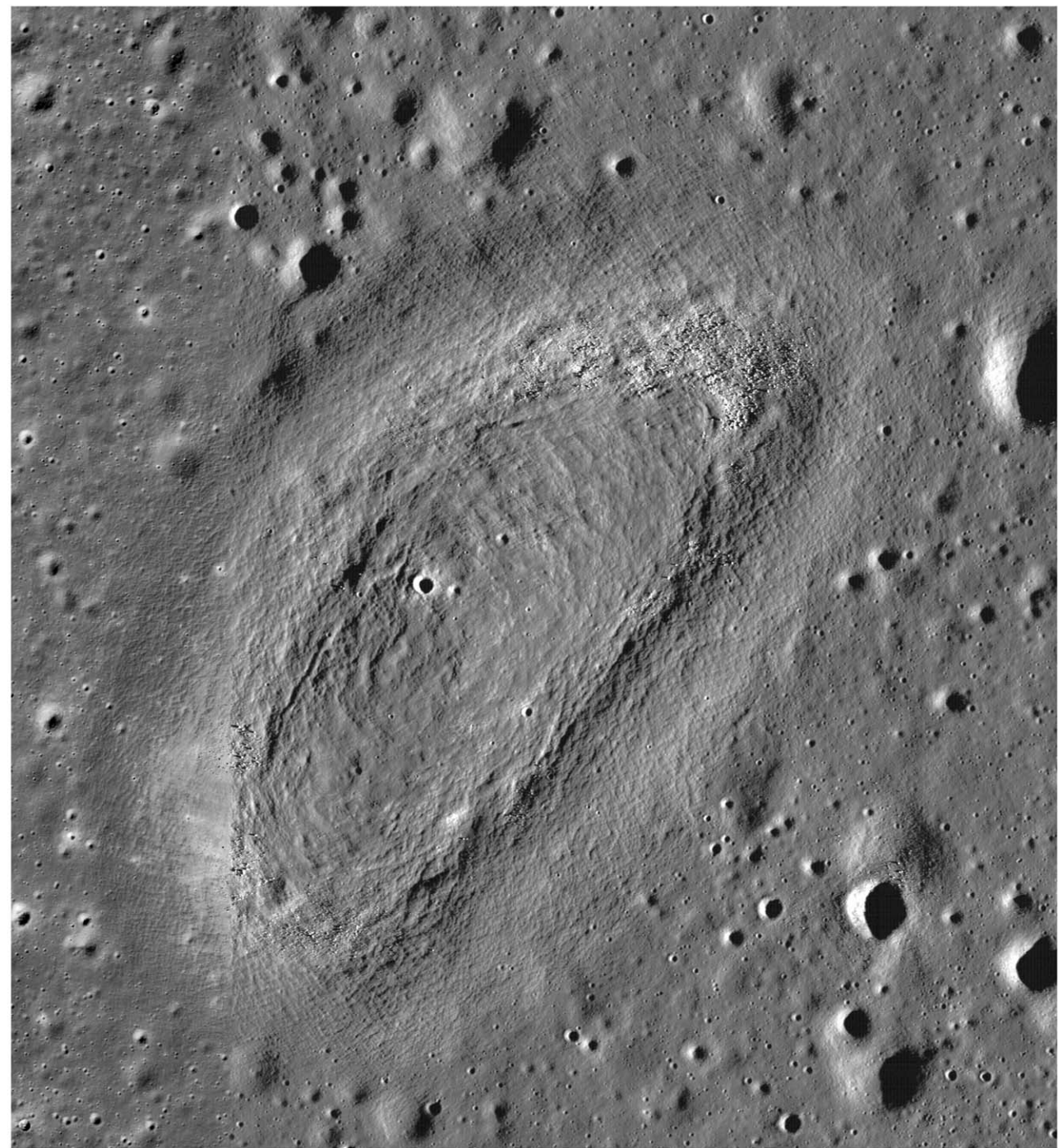


Figure 6. Mosaic of LROC NAC images M1182644923L and M1261428374R. Image width 3000 m.

1. Distribution

The global distribution has not yet been investigated. The only four known examples occur in two pairs, two in northern Mare Imbrium, to in Mare Insularum between the Apollo 12 and 14 landing sites (Figure 2). The two areas are enlarged in Figure 3.

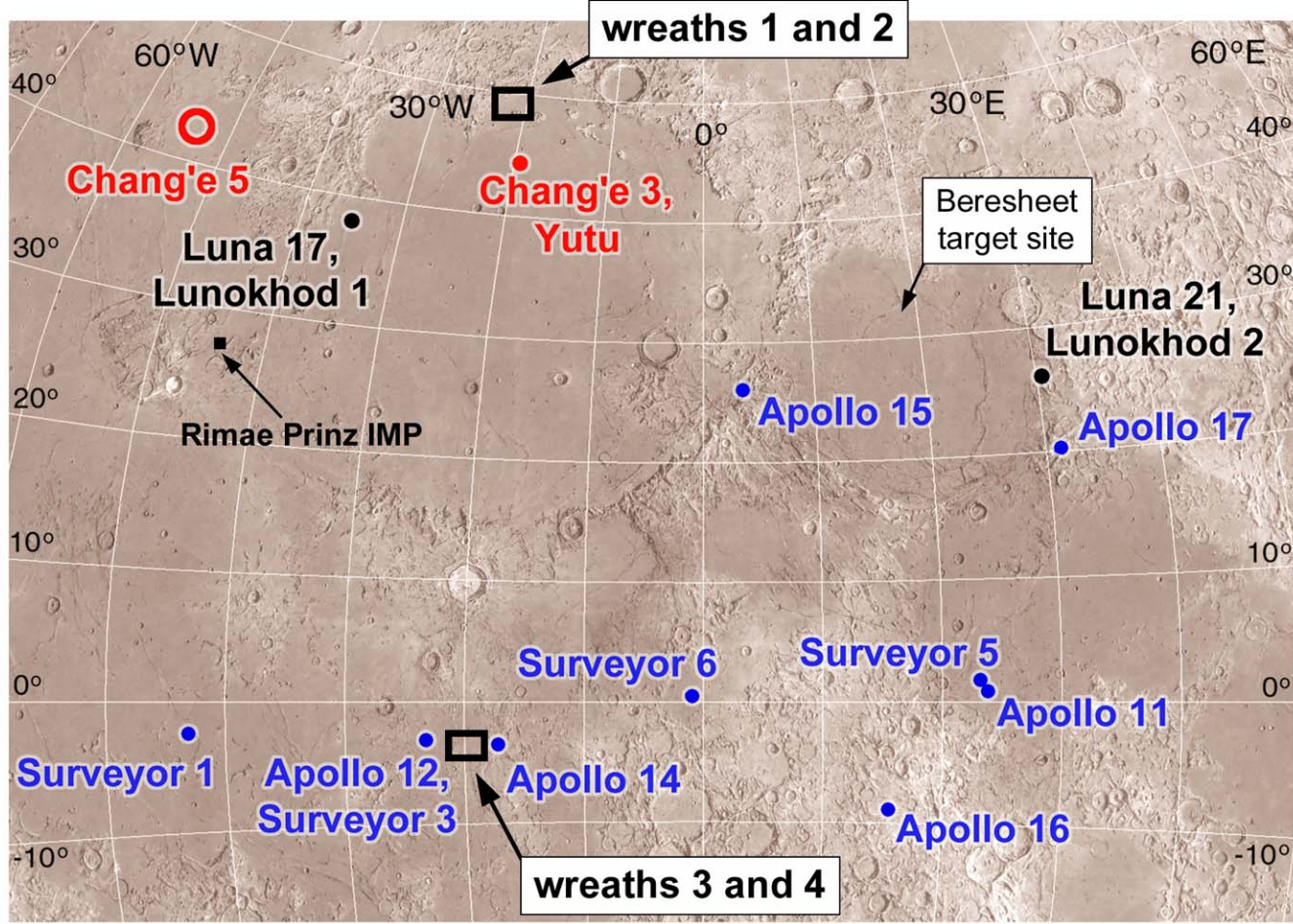


Figure 2. Locations of the two pairs of known wreaths. For scale, each grid cell extends 300 km N-S.

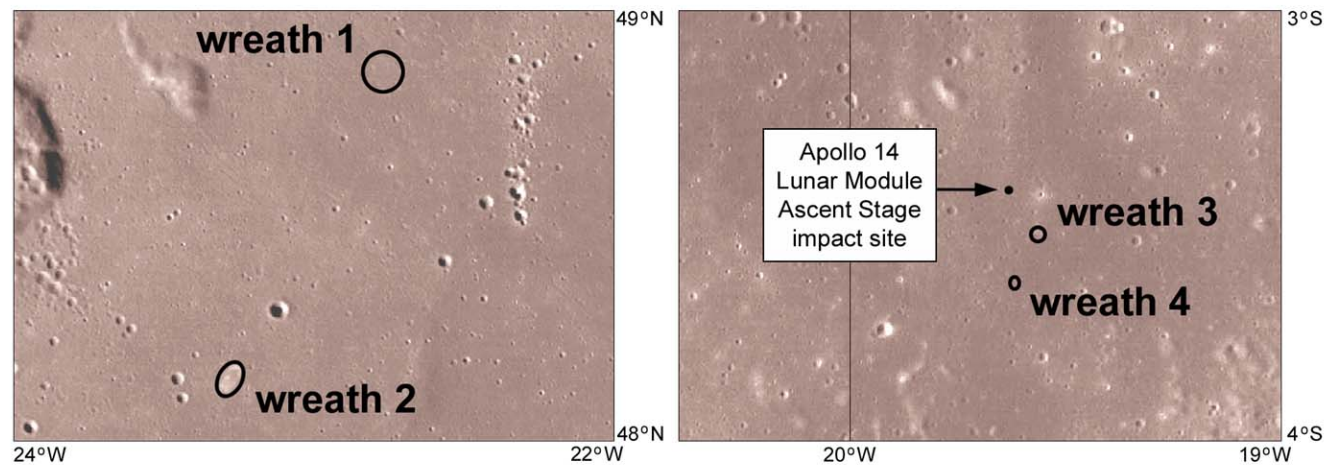


Figure 3. Locations of the wreaths described in this poster. For scale, each map extends 30 km N-S.

2. Wreath 1.

Wreath 1 (Figures 4, 5) is centered at 48.87° N, 22.79° W in northern Mare Imbrium. It is circular, 2000 m in diameter, with a concentric trough roughly 2 m deep inside its rim and a raised region west of center about 8 m above the average level of the surrounding mare, a very low relief feature. The wrinkled texture is observed throughout. Two depressions, each about 300 m across, occur in the central region, one on top of the highest part of the feature. A few small craters (maximum 50 m diameter) occur on the wreath, but the density of small craters appears very much lower than in the surrounding mare. The 300 m depressions could be degraded impact craters or features associated with the formation of the wreath. NAC stereo coverage would reveal the topography better than sparse LOLA shots.

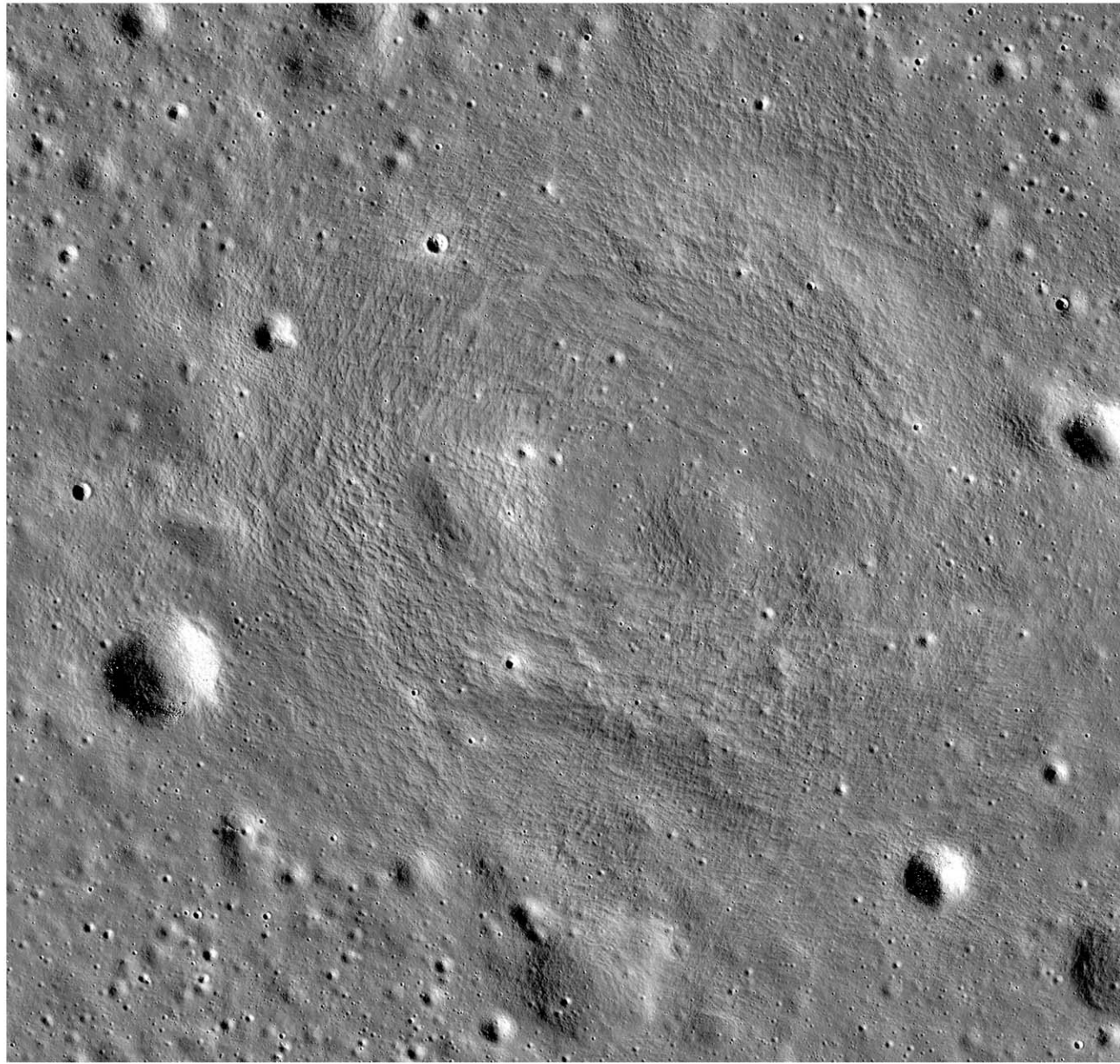


Figure 4. LROC NAC image M165991213L. Note low relief and low crater density. Image width 2500 m.

3. Wreath 1 (continued)

This very low sun angle image emphasizes the very low relief of the wreath and its distinctive surface texture.

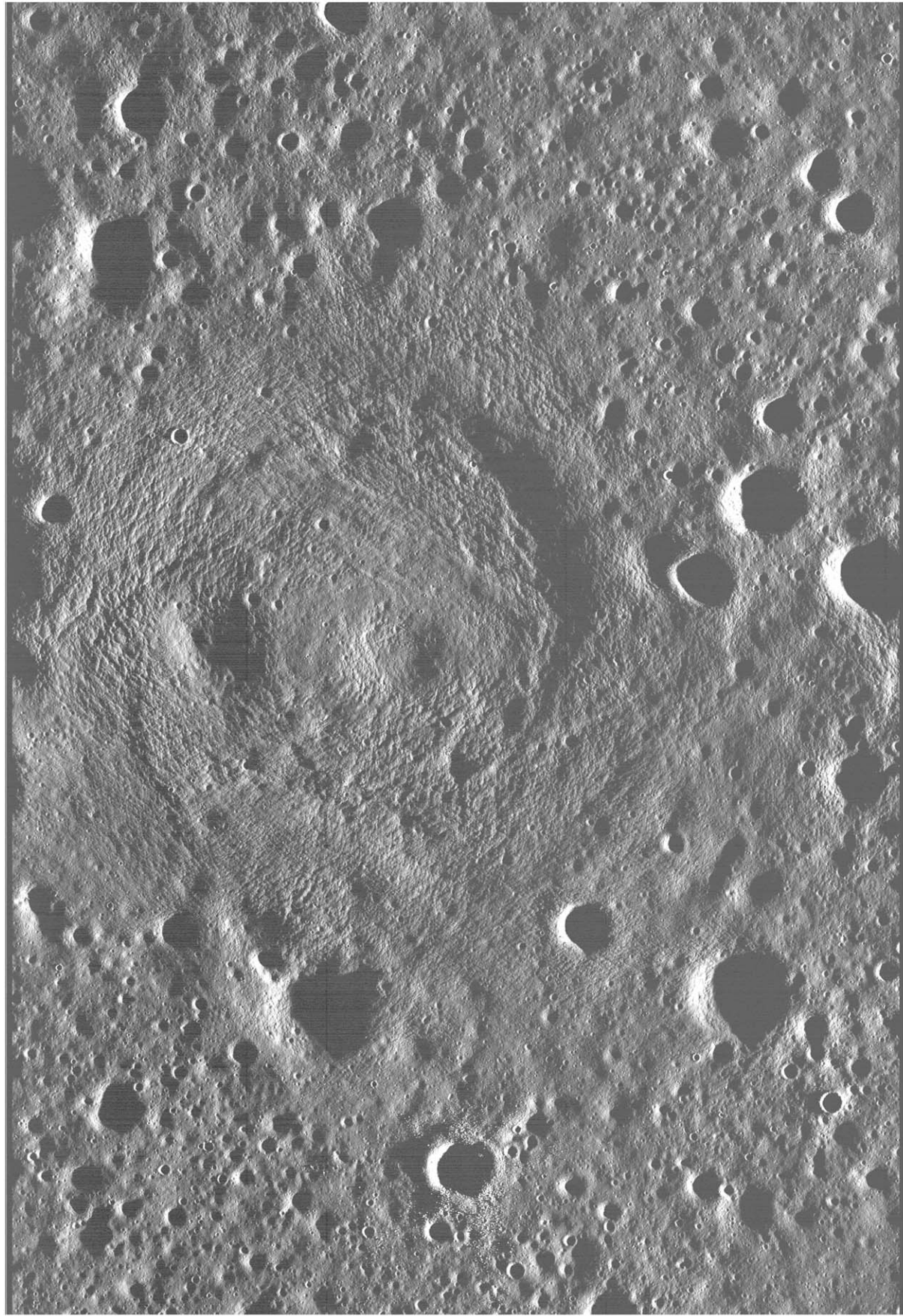


Figure 5. LROC NAC image M116465524R, width 2500 m.

5. Wreath 3.

Wreath 3 (Figure 7) is centered at 3.52° S, 19.57° W in southern Mare Insularum. It is circular, 1000 m in diameter with a smooth floor 10 m below the mare level, wrinkled walls and blocks around the edge of the floor. The crater density is again very low. Features like this may be mistaken for old, subdued impact craters, of which there are many in almost any area of the maria. This is distinguished by its apparently young age (either of formation or resurfacing).

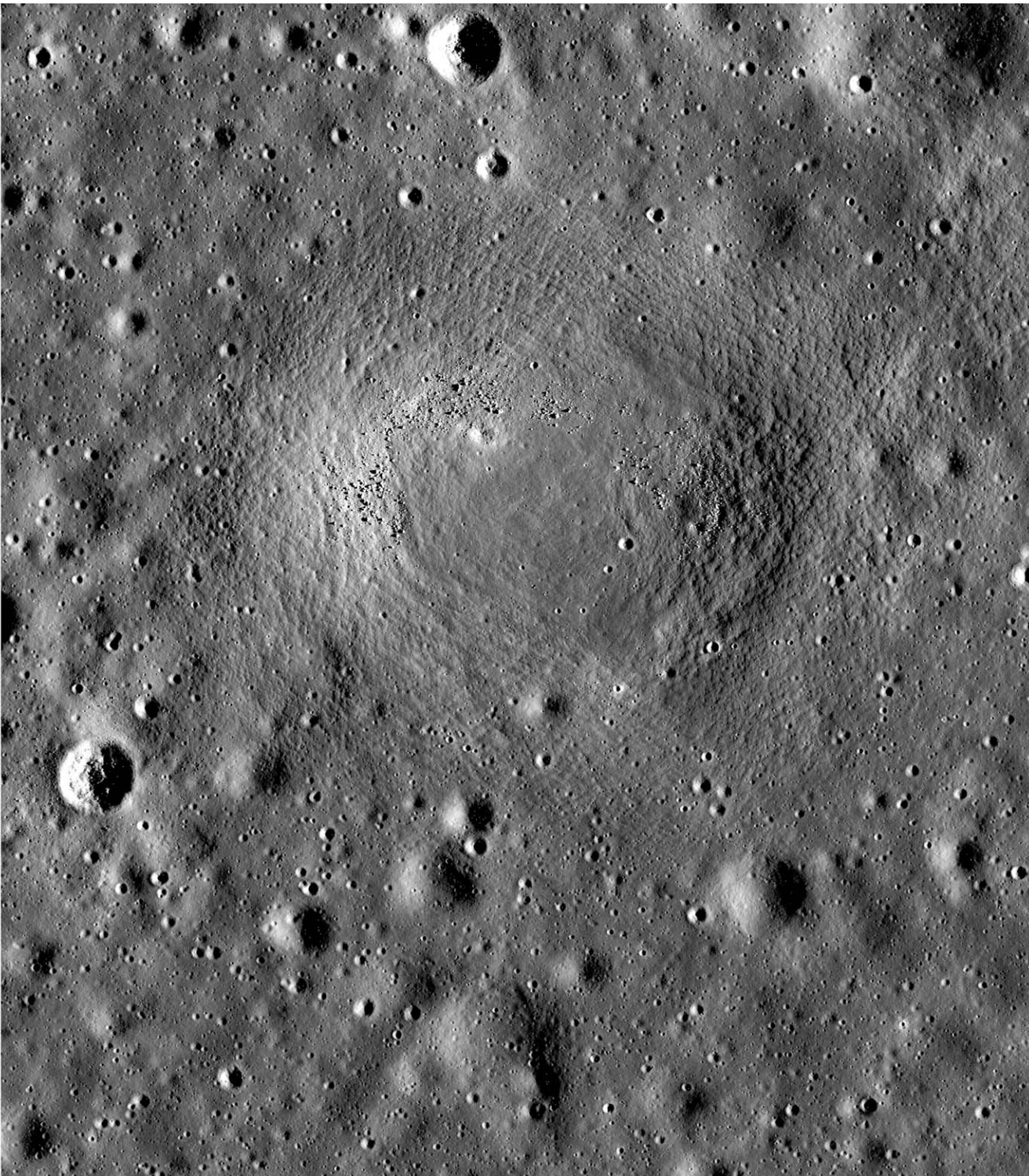


Figure 7. LROC NAC image M162439605R. Image width 1500 m.

6. Wreath 4.

Wreath 4 (Figure 8) is centered at 3.63° S, 19.62° W in southern Mare Insularum. It is 700 m by 900 m across, elongated N-S, with wrinkled walls and rim and a smoother floor. It is poorly sampled by GLD100 but appears to be 3-4 m deep, and again has few superposed craters.

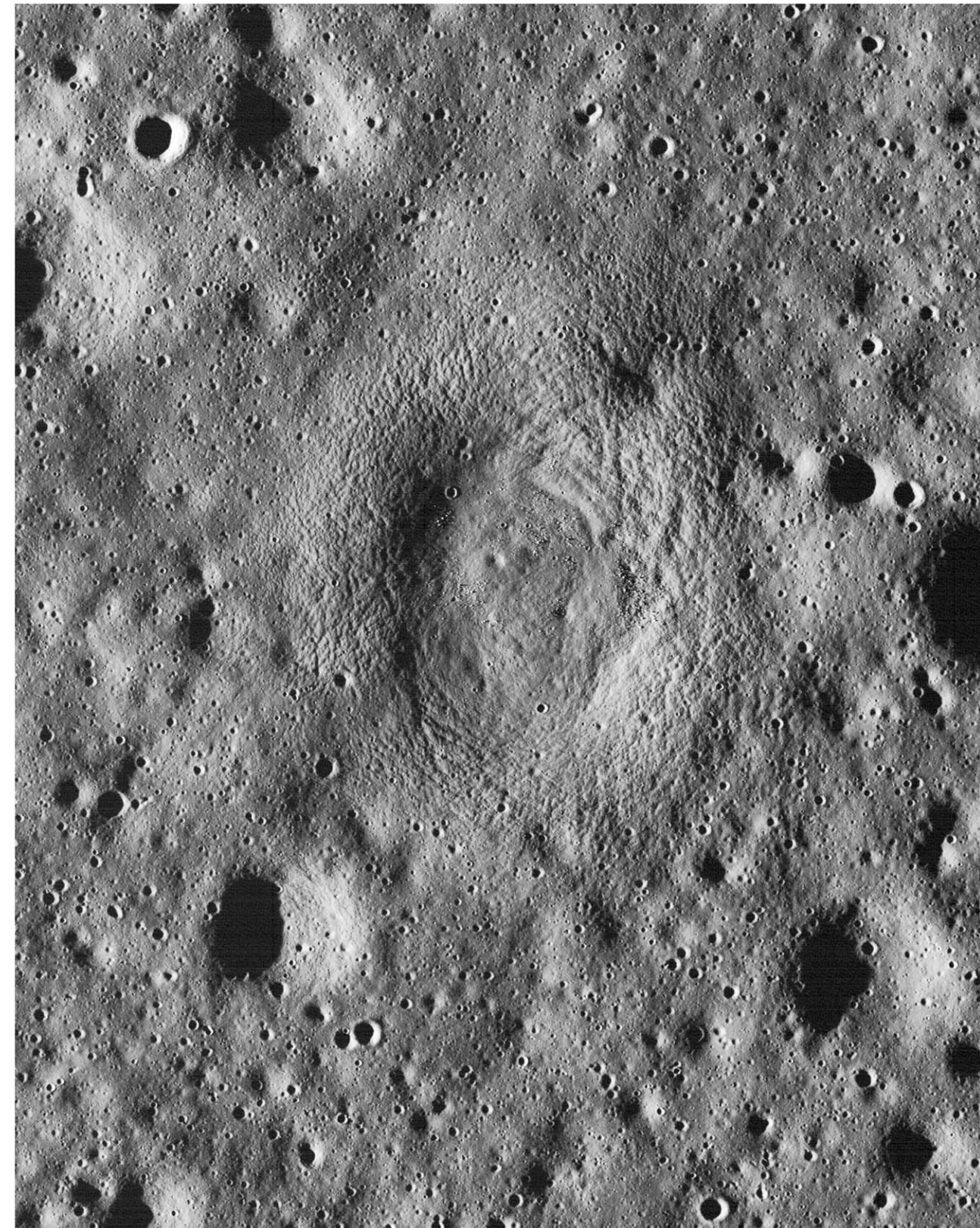


Figure 8. LROC NAC image M162439605R. Image width 1200 m.

7. Discussion.

Wreaths differ from nearby degraded impact craters, which typically have the same interior crater density as their surroundings. The wrinkled texture somewhat resembles that seen on slopes (e.g. rim of Flamsteed P) despite the very low slopes of most parts of these features. The rims often appear raised by a few meters but they are not resolved in GLD100 and NAC stereo mapping has not yet been done. Possible formation mechanisms are impact and volcanism, though impact seems unlikely for this morphology. Outgassing of residual volcanic volatiles or radiogenic argon might be a possible explanation. An unusual irregular mare patch at 26.79° N, 42.97° W near Rimae Prinz (Figure 9) may possibly be a transition landform. It was first described by Peter Schultz in *Moon Morphology* (1976).

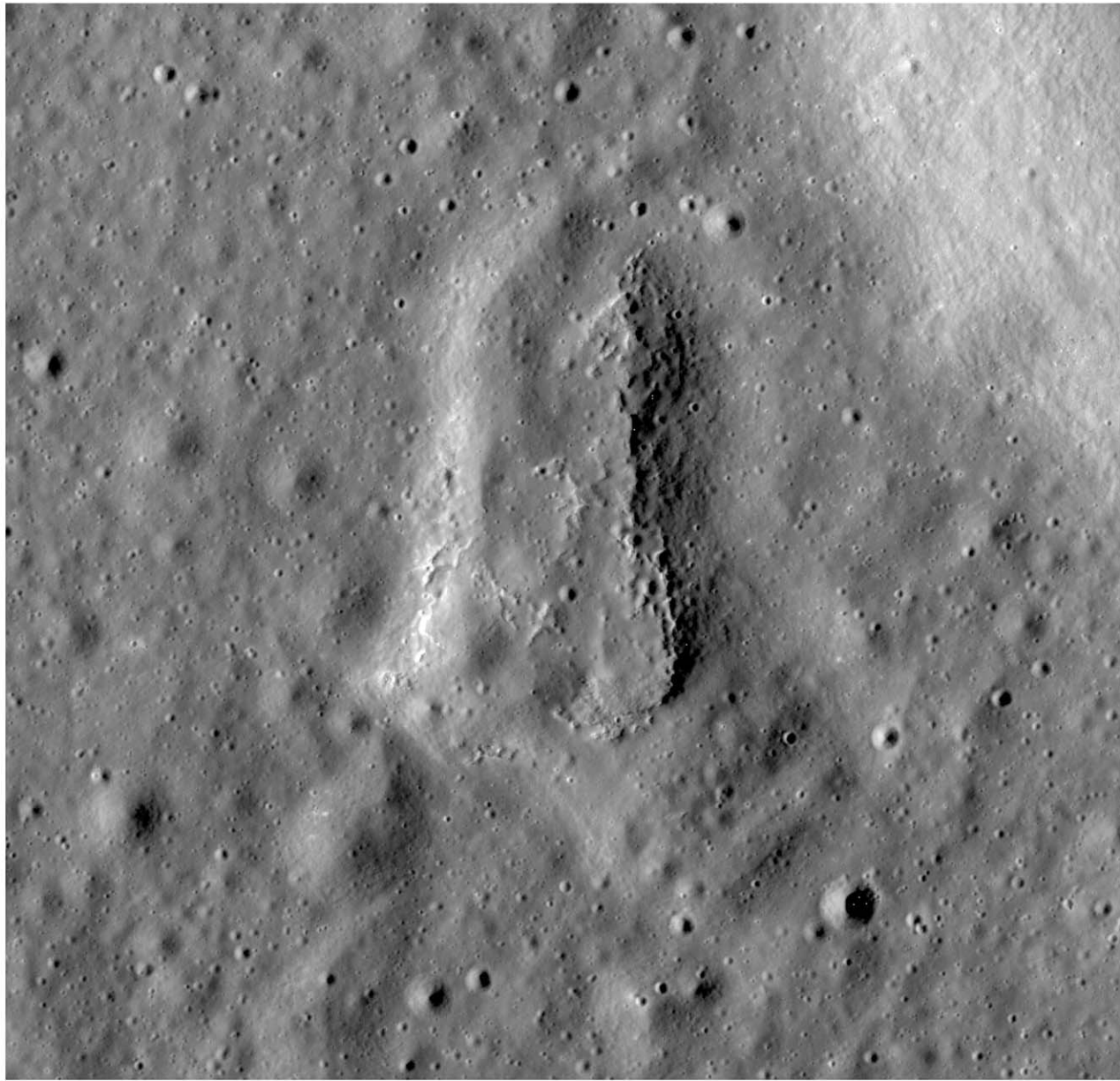


Figure 9. LROC NAC image M1123882552L. Image width 1500 m.