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The geology and morphology of Ina

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Abstract—Ina is a unique D-shaped depression located atop a 15-km diameter extrusive dome southeast of the Imbrium basin. It lies in a region that is dissected by lineations radial to both Imbrium and Serenitatis. The rim of Ina is characterized by discontinuous concentric fractures, flows, and a smooth raised border. The floor contains 4 separate units, including smooth, sparsely cratered protrusions or mounds ranging in height from 5 to 25 m. The mounds are compared to the terrestrial lava pillars called Dimmuborgir located in northern Iceland. These pillars are morphologically similar to the Ina mounds and may have formed by the collapse and subsidence of a partially solidified lava lake. However, the distribution of the mounds in Ina, the disparate heights of their summits, and the frequent presence of moats around their bases suggest that the mounds originated as discrete extrusive features.

The dome underlying Ina appears comparable to low terrestrial basaltic shields although it exhibits some morphological differences. The unusual morphology of the Ina structure may have been influenced by its location in a highly fractured region between two of the largest nearside impact basins, and by the composition of the magma.

INTRODUCTION

The lunar feature Ina, an unusual D-shaped depression, is located in Lacus Felicitatis north of Mare Vaporum (Fig. 1). Before being officially named by the International Astronomical Union, it was sometimes informally referred to as "D-Caldera" (El-Baz, 1973). Attention was drawn to the feature because of its strange "blistered" appearance. It was first noticed on Apollo 15 panoramic camera photographs by E. A. Whitaker (1972a) who pointed out its apparently unique character. El-Baz (1972; 1973) proposed that it was a collapse caldera displaying evidence of episodic volcanic activity. Using detailed topographic data available from the Lunar Topographic Orthophotomap (LTO) series, we can now depict the morphology and structure of Ina and the surrounding region more accurately than was previously possible. The maps used in this study are 41C3 and 41C4 at 1:250,000 scale, and 41C3S1 (Ina) at 1:10,000 scale. In addition, profile data were specially produced by the Defense Mapping Agency/Topographic Center.

REGIONAL SETTING

Ina lies in a region between the Apennine Mountains of the Imbrium basin and the Haemus Mountains of Serenitatis. The area is characterized by highland

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