GEOLOGY OF MAXWELL MONTES, VENUS. J. W. Head, Dept. of Geol. Sci., Brown University, Providence, RI 02912, D. B. Campbell, Arecibo Observatory, P. O. Box 995, Arecibo, Puerto Rico 00612, A. R. Peterfreund, Brown Univ., and S. A. Zisk, Haystack Observatory, Westford, MA 01886.

Maxwell Montes represent the most distinctive topography on the surface of Venus, rising some 11 km above mean planetary radius. The mountainous structure superposed on Ishtar Terra has been attributed to numerous geological processes, including a fault-bounded massif of volcanic origin (1) and a domed or folded uplift (2). The nature of major mountain ranges on the planets is important evidence concerning the types of surface process and the major modes of lithospheric heat transfer (3). The purpose of this contribution is to analyze the multiple data sets of the Pioneer mission and Earth-based radar observations to characterize Maxwell Montes.

Maxwell Montes is a pork-chop-shaped feature (Fig. 1a) located at the eastern end of Lakshmi Planum. The main massif trends about N20W for approximately 1000 km and the narrow "handle" extends several hundred km WSW from the north end of the main massif, descending down toward Lakshmi Planum. The main massif is rectilinear and approximately 500 km wide. The southern and northern edges of Maxwell Montes coincide with major topographic boundaries defining the edge of Ishtar Terra. The eastern and western boundaries separate two distinct subprovinces within Ishtar Terra (4). Maxwell Montes is the most prominent of several linear mountain belts on Ishtar Terra (1,5). The central part of the massif rises over 11 km above mean planetary radius and over 7 km above Lakshmi Planum. The topography is markedly asymmetric, with the steepest slopes toward the west (Fig. 1b). At the existing 100 km resolution, most slopes average less than 3° but locally exceed 5-7° along the western flanks. Radar images from Arecibo (5) at 3-6 km resolution reveal more detailed characteristics of Maxwell (Fig. 1c). The radar image can be subdivided into several units (Fig. 1d) including: 1) Banded - a distinctive set of linear to curvilinear bands with an average separation of 10-20 km. These bands parallel the long axis of the massif and are best developed on the central high plateau. Bands are seen on other mountain ranges on Ishtar. 2) Mottled areas developed primarily on the southern and northern slopes of the main massif. 3) Patchy areas of low backscatter less than about 80 km in diameter. The banded terrain terminates at the edges of these irregularly outlined patches. 4) A circular region which consists of three superposed circular features of differing backscatter; the intermediate structure is approximately 105 km in diameter, the outermost is about 200 km diameter, and the innermost feature is of low backscatter, about 40-50 km diameter and offset to the NW. Topographic data suggest that this 100-200 km circular feature may be a depression but the resolution is insufficient to define its detailed structure.

Radar data show that the slopes of Maxwell Montes are extremely rough at the centimeter to meter scale (6,7,8,9). At 12.6 cm wavelengths, the signal scattered back from Maxwell is about 50 times the intensity of that received from the surrounding terrain and is heavily depolarized. RMS slopes often exceed 4.5° (1,6). However, the highest backscatter is not correlated with the highest elevations on Maxwell. Rather, highest backscatter appears correlated with the mottled units occurring on the steep slopes at the northern, southern, and western flanks of Maxwell. Maxwell Montes is also a region of very high reflectivity (10). The high reflectivity has been interpreted to indicate the presence of significant amounts of a conducting mineral (such as pyrite) as inclusions in rock exposed at the surface (10).

Geology of Maxwell Montes

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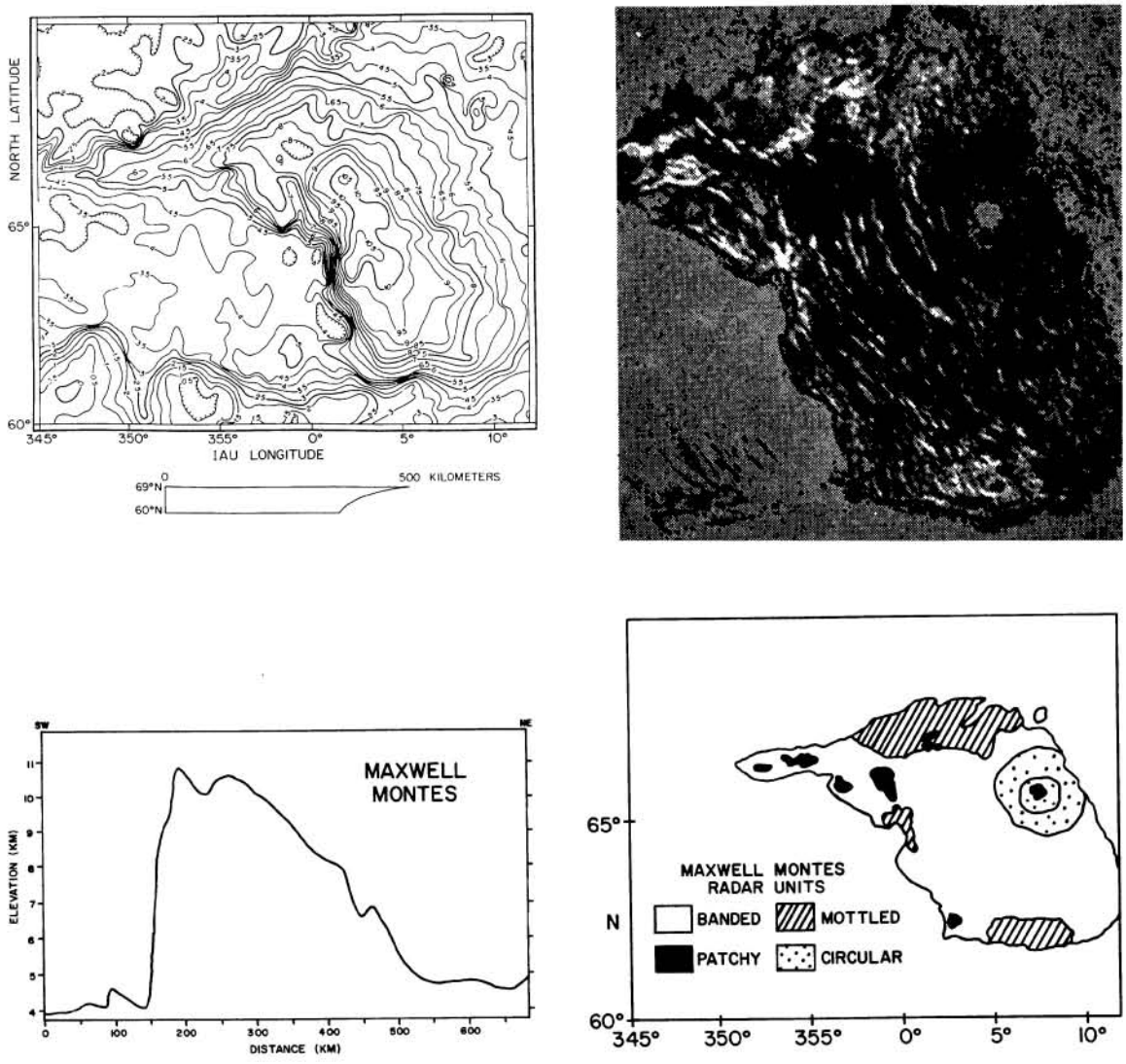

Figure 1. a. Topography of Maxwell Montes (1,2,6). Contour interval 500m. b. Topographic profile of Maxwell Montes. c. Radar image of Maxwell Montes with a two-tier stretch (black is a higher backscatter than the gray background). d. Radar reflectivity unit map.