ANTICIPATING MAGELLAN: INTERPRETING RADAR IMAGES OF GEOLOGICAL FEATURES. S.B. Yewell, Jet Propulsion Laboratory, California Institute of Technology, Pasadena, California, 91109.

The Magellan mission will provide high-resolution radar coverage of approximately 70-90% of the surface of Venus [1]. Thus, synthetic-aperture radar (SAR) images will provide the basis for the first systematic radar map of an entire planet (Fig. 1). To facilitate the utilization of these radar data, a Magellan-Data Management and Archive Team publication will be published in June, 1989 using radar examples of documented Earth sites to assist planetologists who have an understanding of radar image interpretation.

The publication will be a comparative dataset using radar images obtained in Earth-orbiting missions by Seasat SAR (1978), and Shuttle Imaging Radar, SIR-A (1981), and SIR-B (1984). Images from these missions cover an assortment of terrain surfaces which reflect processes that may have shaped the Venusian surface. Examples of selected sites over well-documented Earth regions are grouped under the general categories of volcanic landforms, aeolian features, impact structures, subsurface imaging, and tectonic landforms.

The publication focuses on similarities and differences between optical imaging, and radar image acquisition, processing, and interpretation. Radar image interpretation is potentially deceptive depending on the illumination geometry, image resolution, surface slope, and small scale roughness. In addition, image anomalies and system artifacts are discussed.

The Magellan radar system will operate from a near polar elliptical orbit with a multimode radar system that was designed to accommodate this orbit constraint. The radar wavelength will be 12.6 cm and the look angle (cross-track angle measured from nadir) will vary as a function of altitude. Pointing will be made by spacecraft movement [2].

Observations of Venus by the Magellan mission will greatly increase our knowledge of the surface morphology of Earth's sister planet since present knowledge of the Venusian surface has been limited by the spatial resolution and regional coverage of prior radar observations. Image resolution will be 120-300 meters as compared to the Venera imaging resolution of 1-2 km. The Magellan SAR will afford a higher resolution and will allow for better accuracy in determining the geology and geophysics of Venus.

Analysis of the Magellan data will increase our understanding of Venusian thermal and tectonic evolution. Identification and interpretation of volcanic landforms will provide information at global, regional, and local scales. Impact crater perception and analysis will be extended. The existence of plate tectonics on Venus may be clarified. The potential observation of sand dunes may be difficult because of their pronounced sensitivity to the imaging geometry of the radar system.

REFERENCES.

[1] Dallas, S.S., and N.L. Nickle (1987) Aerospace Century 21, AAS 86-331, 64.
[2] Johnson, W.T.K., ISPRS, Proc., Kioto, Japan, in press.

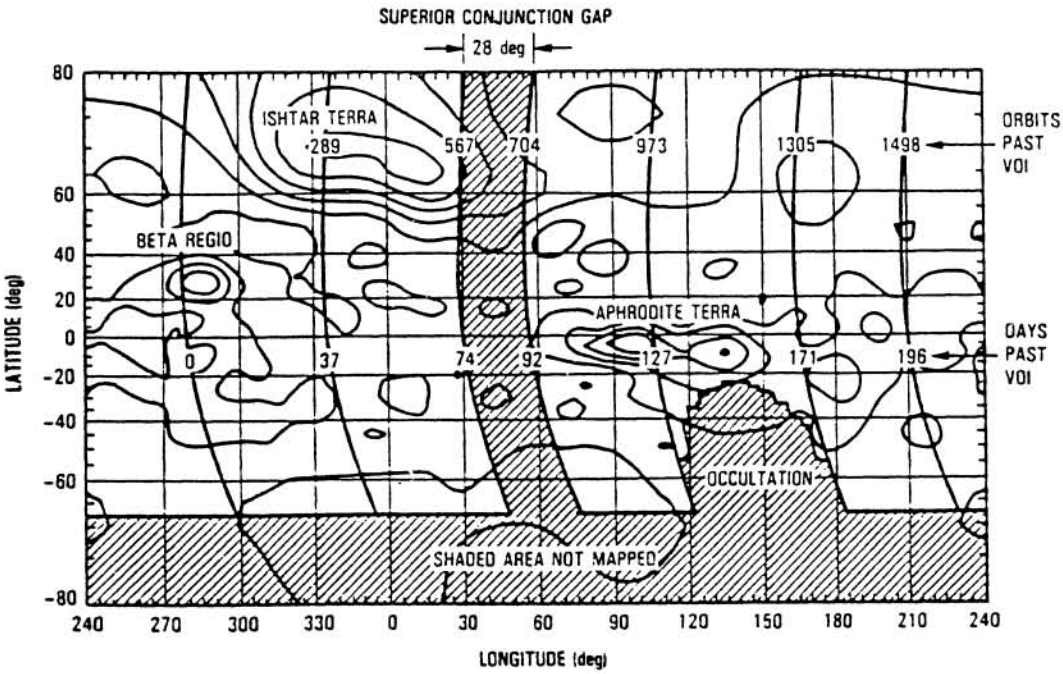

Fig. 1. Magellan planned coverage of Venus. (Courtesy Magellan Project.)

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