THE GEOLOGY AND STRATIGRAPHY OF DIONE REGIO, VENUS. S.T. Keddie and J.W. Head, Dept. Geological Sci., Brown University, Providence, RI, 02912.

Abstract: Detailed regional mapping of the Magellan gap (20°-45°S, 315°-340°) missed on Cycles 1 and 2 has been completed and reveals that Dione Regio is an area that experienced early tectonic activity in the form of tessera and tectonized plains. Only small inliers of this old terrain remain today, having been flooded by several periods of plains formation. Late stage volcanism at several volcanoes and limited rifting completes the regional stratigraphic sequence. The stratigraphy determined here is similar to that identified elsewhere on the planet.

Introduction: In the fall of 1992 Magellan imaged the final, large portion of the planet. Dione Regio is located in the southern hemisphere (20°-45°S, 315°-340°) and separates the lowland plains of Lavinia Planitia from the rifted and volcanic regions of Phoebe and Themis Regiones. Preliminary mapping of a portion of this region confirmed the observations from Arecibo data [1]: Dione Regio is a regional highland with extensive volcanism. During the past year, regional mapping of the entire thermal gap-fill and its surroundings has been performed. In this paper we outline the geology and stratigraphy of Dione Regio. Elsewhere we discuss the characteristics of this rise in relation to other volcanic rises on the planet [2].

Observations: Dione Regio is an irregular-shaped topographic high that is elongate in a north-south direction. The mean elevation of the high is approximately 6052 km and superposed on this are several local highs (6053.6-6054.4 km) which correlate with volcanic constructs. Superposed on the high and the plains immediately surrounding it (Figure 1) are 11 impact craters ranging in size from approximately 5 km diameter to 49 km (Danilova, one of two of the craters from the 'crater farm' mapped in this study). The craters have a density of 2.19 craters per 10^6 km^2, a value similar to the planetary average of 2.0 craters per 10^6 km^2 [3]. We have identified nine major units (including six plains subdivisions). On the basis of embayment and superposition relationships, their stratigraphic sequence has also been determined and is shown in the legend for Figure 1.

Tessera (t): This highly tectonized unit occurs in small (few-10's km across), isolated patches generally peripheral to the rise and predominantly in the northern half of the region. At least two directions of deformation are observed and no or little internal patches of undeformed plains are visible.

Tectonized plains (p_t): In contrast to the tessera, there is evidence for the preservation of small, internal patches of undeformed plains, which are uniformly brighter than the surrounding, embaying plains. In many cases only one direction of deformation occurs in these plains. The ridge belt in the SE is included within this unit.

Ridged plains (p_r): The most common unit, particularly in the south, are relatively dark plains which are mottled in large patches (few hundred km) but which were then uniformly deformed. The narrow, sinuous ridges that characterize these plains are spaced about 15-20 km apart (though the density is not constant) and frequently turn gradually and become concentric to the local high topography. The ridging of early stages of eruption from an unnamed volcano to the south of Hathor Mons suggests that centralized volcanism and plains formation were contemporaneous in at least one location and that the ridges were formed slightly after emplacement of the plains.

Other plains (smooth: p_s; dark: p_d; shielded p_{sh}; and fractured: p_f): Following what seems to be a fairly regional resurfacing by the p_r, there were many episodes of smaller patches (few hundred km) of resurfacing which, because of their separation in space, cannot be more tightly stratigraphically constrained. The most abundant of these are the shielded plains which are characterized by hundreds of small shields (most with central pits). Although in very few cases is it possible to trace a flow to one of these shields, there are clear contact relationships surrounding concentrations of shields which suggests that resurfacing by flows as well as shield construction occurred.

Corona (**c**): Several small (and now quite degraded) corona formed at approximately the same time as many of these young plains units. They are quite small (50 -100 km diameter), with well-developed tectonic annuli and limited volcanism.

Volcanic edifices (**v**): The most recent event in the region (along with cratering) is the emplacement and rifting of large volcanic centers. Four major and four minor volcanoes are located in the region. Ushas, Innini, and Hathor Montes (described in detail in [1]) dominate the rise and another large volcano is located on an extension of the rise, 900 km WNW of Innini. Smaller volcanoes occur to the SW of Hathor, the NW of Hathor (cut by rifting), west of Innini, and SW of Ushas. Hathor has a well-developed rift zone, cutting the lower flanks of the volcano on a NW-SE trend, fracturing south of Innini is of limited extent, and radial fracturing at Ushas is likely related to dike emplacement.

Conclusions: Dione Regio and its surrounding plains show a complex history of tectonic activity, followed by areally significant flooding and, most recently, extensive centralized volcanism with limited rifting. The stratigraphy detailed here is similar to the general stratigraphic sequence identified at 36 locations around the planet [4].

References: [1] Keddie, S.T., 1993, *LPSC XXIV*, pp. 771-772. [2] Keddie, S.T., and Head, J.W., 1994, *LPSC XXV*, this volume. [3] Schaber, G.G., et al., 1992, *Jour. Geophys. Res.*, 97, pp. 13257-13301. [4] Basilevsky, A.T., and Head, J.W., 1993, *EOS Trans AGU*, v. 74 no. 43, p.378.

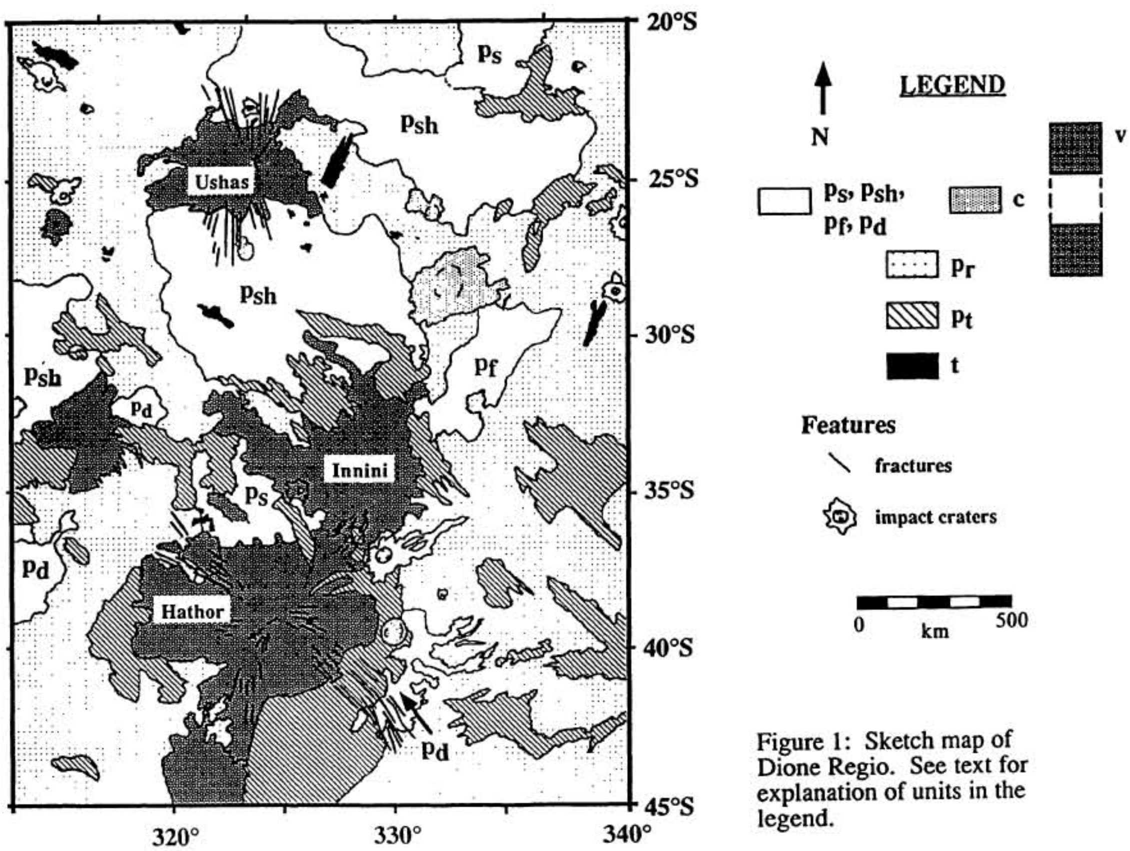

Figure 1: Sketch map of Dione Regio. See text for explanation of units in the legend.