

TABLE 1. Basin Radii of Identified Tectonic Features

Feature	Distance From Basin Center, km	Orientation	Structure Type
Hellas			
Massif Ring	900-1150	concentric	uplift
HMG	960-1090	concentric	graben, horst
Basin Scarp	-1600	concentric	scarps
PR	1700-1880	concentric	ridge, scarp
HC	1780-2520	concentric	scarp system
Isidis			
Massif Ring	750-950	concentric	uplift
I-AF	680-800	concentric	graben system
I-NF	730-975	concentric	graben system
AR	1350-1900	radial	scarps/trough
Basin Scarp	-1600	concentric	scarps

I-NF west of Isidis (Figure 2a) are superposed by plains units to both the north and south, but scarp and ridge trends in Syrtis Major Planum to the south indicate a southward continuation there of the graben beneath the volcanic deposits. The shorter Amenthes Fossae (I-AF) are also buried by plains north of the dichotomy and in the region of the Amenthes Rupes southeast of Isidis (Figure 2b). A similar structural extension to the south is expressed in the Isidis interring region by a series of structurally controlled, rectilinear channels approximately radial to Hellas. Grabens around Hellas in the Hellespontes Montes (HMG) also occur 200-300 km from the central plains. These structures are expressed as a series of horsts in certain locations and have a softened or mantled appearance (Figure 3). They fade to the north but develop into well-defined scarps to the south before disappearing under the broad ridged plains units of Malea Planum.

The distant-concentric "canyon" systems (H1, H2, H3 of Figure 1a, collectively termed HC) occur west and northwest of the Hellas basin at radial distances between -1900 and -2500 km from the basin center, well outside the 1600-km radius boundary scarp most similar to the Cordilleran scarp of the lunar Orientale basin. Individual troughs (Figures 4 and 5) range from 30 to 100 km in width, with narrower structures nearer the basin scarp and to the northwest. The bounding canyon scarps are generally rectilinear in plan and heavily furrowed in appearance, with relief of the order of 0.5 km [L.E. Roth *et al.*, unpublished manuscript 1987]. To the south, the canyon scarps lose relief and merge into the cratered plains. To the northwest, the trend is lost approaching crater Huygens and may have been overprinted by Huygens-related fractures. The troughs have been flooded by intercrater plains, but a back slope away from the trough is suggestive of block rotation or relaxation after "canyon" formation.

Radial patterns centered on both Hellas and Isidis are delineated by troughs, scarps, and drainage patterns very distinct from the radial ejecta-scoured furrows on the Moon [Schultz, 1984]. The best developed of these patterns is the trough and scarp system radial to Isidis (I-AT) which extends over 1000 km southeast of Isidis past the Amenthes Rupes to beyond the basin scarp (Figures 2b and 2c). Inside the basin scarp this feature is delineated by infilling plains units that have buried part of the I-AF fractures and that constitute the base level for channeling in the region. Near the trough-basin scarp intersection, a parallel series of radial scarps are preserved and confine plains emplacement (indicated in Figure 2c). Although the Amenthes Rupes differ in appearance from the lower relief scarps to the south (and morphologically resemble some of the lobate scarps on Mercury), the coincidence in both trend and location with the broader trough structures indicates a common origin. Reactivation and modification of the Amenthes Rupes apparently occurred later during formation of northwest-southeast oriented wrinkle ridges. Low relief continuations of the trough structure beyond the basin scarp appear to be heavily modified and become less well defined among other more recent ridge trends. In Hellas, a similar trough breaches the northeastern boundary scarp and massif ring, extending past Hadriaca and Tyrrhena Paterae into Ilesperia Planum [Schultz, 1984]. It is mostly buried by patera-associated volcanism, but like the I-AT trough, it controls local drainage and has been channeled by several outflow events. Finally, although the Nili and Amenthes fossae are concentric to the Isidis basin, their overall trends also reflect radial extensions from Hellas [Schultz, 1984]. Thus they resemble similar graben systems on the Moon radial to the Imbrium basin, which are deflected into curves around Grimaldi and Humorum [Mason *et al.*, 1976; Lucchitta and Watkins, 1978].

Finally, one system of structures in the Hellas-Isidis region does not completely match the faulted or scarp-bounded nature of the features discussed above. Southwest of Hellas, a set of high-relief, asymmetric ridges, typically with steep western faces and shallower basin-facing slopes, comprises the Pityusa Rupes (H-PR) system. This set of ridges is roughly concentric to Hellas at a radius of -1700 km with an overall length of some 450 km. Highest relief occurs nearest the basin, decreasing to the west with the westernmost structures resembling graben. To the north the ridges fade into scarp-like features in Malea Planum, whereas the system is obscured to the southeast by a region of ridge formation and/or volcanism [Peterson, 1978] centered on the H-PR trend near (325°, -67°).

Volcanic Features

Volcanic activity on the Moon is dominated by voluminous flood basalts inundating the low-lying interiors of large impact basins [Stuart-Alexander and Howard, 1970; Head, 1976; Wilhelms, 1987].