



Fig. 2a

Fig. 2. Images of the three major Isidis-centered tectonic systems referenced in this study. Scale bar in each image is 100 km. (a) Fractures and graben of the Nili Fossae (I-NF) between Syrtis Major Planum and the northern plains; Isidis Planitia lies to the southeast. Most of these features are less than 5 km wide, but the central structure ranges from 10 to 30 km in width. Lavas from Syrtis Major Planum bury the system to the south and floor the central graben. (central part of subquad MC 13NE). (b) Fractures and graben of the Amenthes Fossae (I-AF) extending from the fretted terrain of Nepenthes Mensae into cratered terrain southeast of Isidis. The majority of fracturing is concentrated near the edge of Isidis Planitia, although a single, well-defined trend lies 200 km farther east. Fracture widths

are mostly less than 5 km. Plains units bury the system both to the north and in a trough extending through the center of the system toward the Amenthes Rupes. (central part of subquad MC 14SW). (c) Scarps and trough-filling plains delineating the Amenthes Rupes trough (I-AT) in a region ~1600 km southeast of the Isidis basin center. The Amenthes Rupes scarps are best expressed in this region, which is the same distance from the basin center as the basin scarp observed southwest of Isidis. Low-lying plains units and subtle scarp structures can be followed west from this region into Isidis, and strongly modified features appear to continue the trend eastward away from the basin. (corner mosaic from subquads MC 14SW, MC 14SE, MC 22NW, and MC 22NE).

Large impact basins on Mars, however, typically contain thick, friable, incoherent deposits [Schultz, 1988a; Grizzaffi and Schultz, 1989] that largely mask the early record of basin-filling flood basalts. Because the central basin plains regions in Hellas and Isidis are obscured by these later nonvolcanic deposits, this study focuses on volcanic sequences outside the low-lying central basins. Thin intercrater plains units are found locally near the I-AT and HC systems; however, only three major volcanic plains (Figure 1) occur outside the massif rings of the Isidis and Hellas basins: Hesperia Planum, Syrtis Major Planum, and Malea Planum.

Hesperia Planum (HP) is nearly equidistant from the two basins near Tyrrhena Patera and is a relatively thin ridged plains unit, less than 500 m thick for most of its area [DeHon, 1984]. As shown in

Figure 1, the planum is elongated radial to Isidis and approximately concentric to Hellas at a radial distance of ~2300 km from the basin center [Schultz, 1984].

Syrtis Major Planum (SMP) and Malea Planum (MP) are unlike the other ridged volcanic plains of Mars: they possess central caldera structures and resemble large, low-relief shield volcanoes [Schaber, 1982]. They cover the basin massif rings and outer scarps west of Isidis and southwest of Hellas, respectively, and on the basis of placement we refer to them as basin "rim plana." The rim plana of both Hellas and Isidis are closely associated with massif ring graben and bury the southernmost graben extensions. Observable volcanic centers within the rim plana (two central calderae on SMP and perhaps Amphitrite Patera on MP) also occur on extrap-