



Fig. 5. Tectonic patterns in grooved terrain. The areas marked (A) are reticulate terrain, (B) are grooved polygons, and (C) is a polygon of smooth terrain. Note similar sizes and shapes of the polygons. The dark patch (D) is a portion of the dominantly smooth polygon that was not resurfaced. The groove lanes marked (E) and (G) have surfaces younger than do adjacent grooved and reticulate polygons, and those marked (F) have surfaces younger than does the smooth polygon (C). The groove lane marked (G) is a clear example of a repeatedly reactivated zone of weakness. Note the bounding troughs of most of the narrow groove lanes. North is up. (Voyager 2 image 20637.17, centered near 3°N, 167°W.)

topographic lows and pervasive groove formation in interrift blocks, as relief of stress is concentrated in the thinned lithosphere. Groove formation again is dominated by reactivation of preexisting zones of weakness. This second stage is similar to the third stage ("tertiary grooves") of *Golombek and Allison's* [1981] model; however, an important difference is that we envision burial of the topographically low, older throughgoing grooves by resurfacing material, as is seen in Figure 3d. The third stage, occurring as the lithosphere cools and thickens again, is repeated formation of groove lanes largely by reactivation of the throughgoing grooves, as relief of stress now becomes concentrated at the initial zones of weakness.

Testing of Emplacement Model

Geologic mapping. Three areas in the anti-Jovian hemisphere were mapped stratigraphically to determine relative age units, as described in the "Procedure" section. The test areas

were chosen because they (1) contain diverse terrain types and superposition relations, (2) were imaged at highest resolution and favorable viewing geometry, and (3) contain a laterally confined area of grooved terrain in which complex age relations must be deconvolved. The three areas are Elam Sulci (40°-60°N, 180°-210°W), western Anshar Sulcus (20°-35°N, 205°-220°W), and central Uruk Sulcus (5°S-12°N, 145°-160°W) (Figure 7). The results of the mapping of Uruk Sulcus are presented below in detail, and the results from the other two areas are summarized.

A lineation map of Uruk Sulcus is shown in Figure 8, and a map of relative age units is shown in Figure 9. Because of the large number of superposition and cross-cutting relations in the map area, it is not practical to mention each of them in the format of this paper. However, to provide support for the relative age units mapped in Figure 9, 13 sites with representative relations are discussed. These sites are indicated by the letters "A"