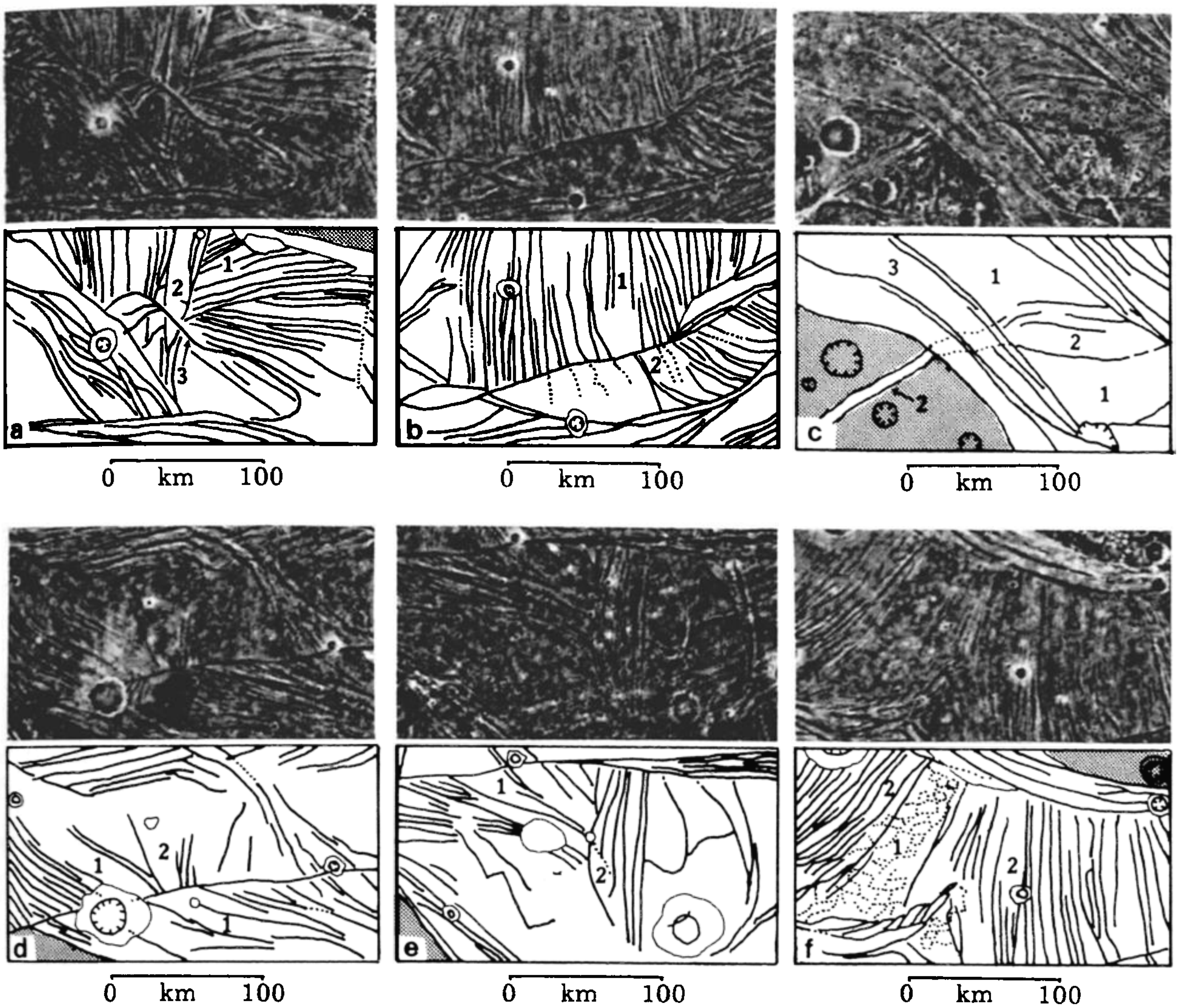

Fig. 10. Images and schematic maps of superposition and cross-cutting relations at representative sites in Uruk Sulcus. Finer lines are material contacts, heavy lines are troughs, and dotted heavy lines are buried troughs. Crater rims are shown in medium-weight lines. In all images north is up. (Voyager 2 image 20637.20.)

polygonal basin rings, and by *Murchie and Head* [1986*b*] on the basis of the global orientation of groove lanes. Both groups of researchers proposed global tectonic histories including tidal despinning to explain the origin of the relict zones of weakness. The latter researchers proposed that groove lanes developed preferentially where the relict despinning fractures are parallel to one of the furrow-related sets of zones of weakness.

Consistency of results with photometric data. In a separate study, *Helfenstein* [1986] used differential photometry to map spatial variations of photometric properties of the regolith in the area of Uruk Sulcus. This work provides an independently derived framework for comparing the mapped locations, areal extents, and styles of emplacement of separate types of grooved terrain. Trends in physical and albedo properties of grooved terrain surfaces were recognized, and Helfenstein interpreted these to indicate maturation and devolatilization of regolith. Based on these trends in regolith properties, he determined relative age units of grooved terrain that correspond very closely to the relative age units recognized using superposition and cross-cutting relations and crater-density measurements. Helfenstein's results corroborate the results of this study, and suggest the usefulness of differential photometry in identifying relative age units of grooved terrain where superposition and cross-cutting relations are insufficient for this purpose.

Relationship to Global Processes and Style of Rifting

Terrestrial rifting has been proposed to be driven by updoming and fracture of the lithosphere (active rifting) and by extension of the lithosphere by regional stresses (passive rifting) [*Sengor and Burke*, 1978]. In each of these cases, intrusion of warm fluids or asthenosphere into cooler lithosphere is, respectively, the cause of rifting or a response to rifting. Because of the complexity of terrestrial geologic processes and because of the intrusion of warm fluids or asthenosphere into both types of rifts, any distinctions between active and passive rifts may be obscured as the rifts evolve [*Morgan and Baker*, 1983]. It is possible that on a relatively less evolved body such as Ganymede, where rifts may not have evolved as extensively as have terrestrial rifts, these distinctions may be preserved so that active and passive rifts may be distinguished.

Because of the apparent pervasive nature of Ganymedean extensional tectonics, the global process most frequently evoked