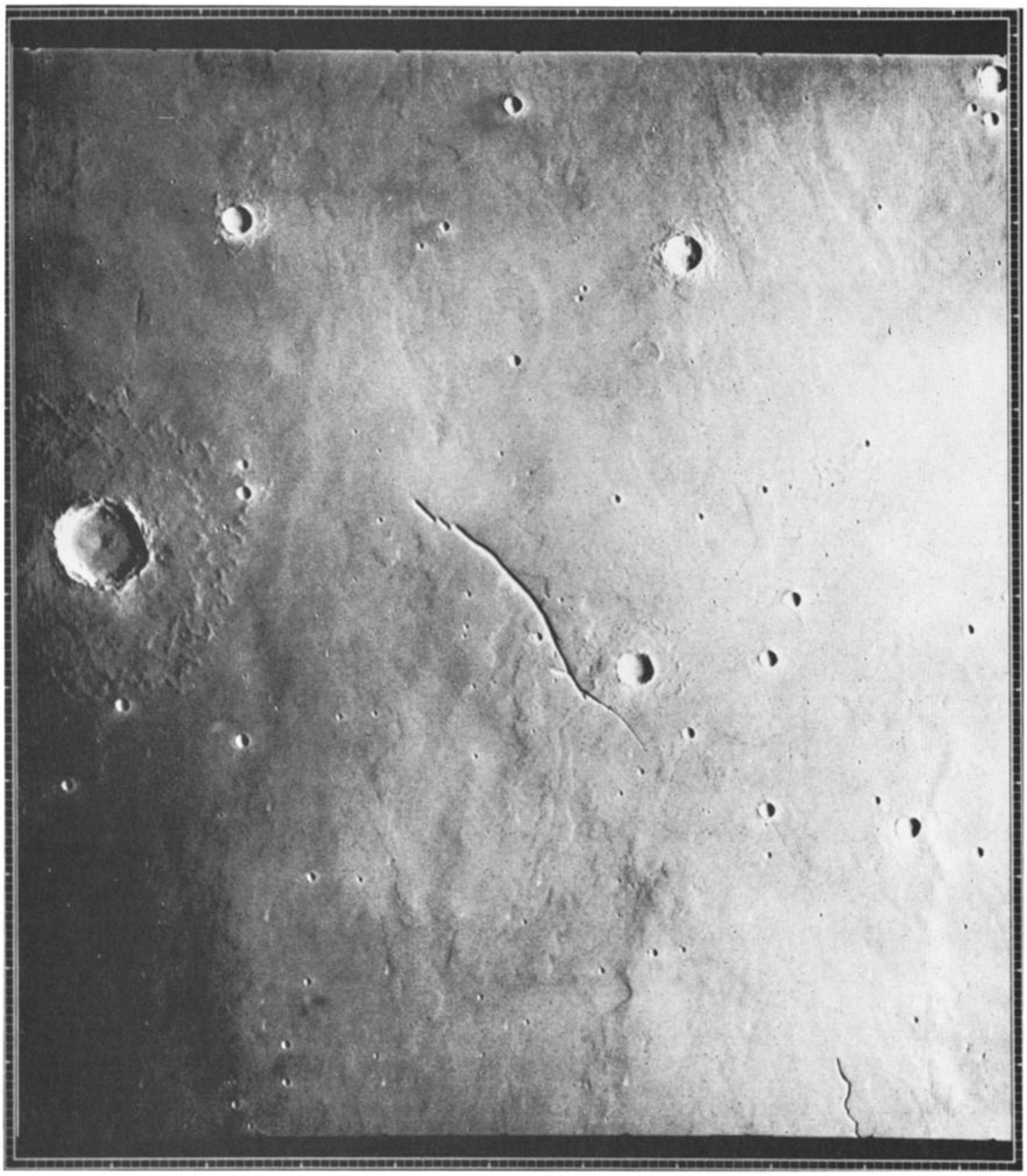

Fig. 3. Viking orbiter view of narrow linear depressions south of Elysium Mons. Frame V0844A21; width of image is 320 km.

ably erosional or fluvial in origin [*Sharp*, 1980; *Carr*, 1981; *Baker*, 1982; *Mouginis-Mark et al.*, 1984]. Because these sinuous features do not likely have a significant tectonic component to their origin, they are not considered further here.

STRESS MODELS

Our working hypothesis is that the tectonic features of the Elysium region are the result of stresses caused by loading of the lithosphere from above or below. The hypothesis that large-scale tectonic features associated with volcanic regions of the terrestrial planets are products of the flexural response to loading of the lithosphere has proven to be a fruitful approach for constraining the tectonic history of lunar mare basins [*Melosh*, 1978; *Solomon and Head*, 1979, 1980; *Comer et al.*, 1979] and the regions surrounding individual Martian volcanoes [*Thurber and Toksoz*, 1978; *Comer et al.*, 1985]. As noted earlier, this hypothesis can also account for the distribution and origin of many of the tectonic features in the Tharsis province [*Willemann and Turcotte*, 1982; *Banerdt et al.*, 1982; *Sleep and Phillips*, 1985].

We consider as specific models the load imposed by Elysium Mons, regional loading on the scale of Elysium Planitia and the other volcanoes, and the quasi-global loading of the Tharsis rise. For the loads of individual volcanoes we employ the theory of *Brotchie and Silvester* [1969] and *Brotchie* [1971] for flexure of a thin elastic shell overlying an inviscid fluid interior in response to an axisymmetric load. Because the flexure equation is linear, the stresses due to any distributed load can be represented by the superimposed stresses due to an equivalent distribution of circular loads. We use this ap-