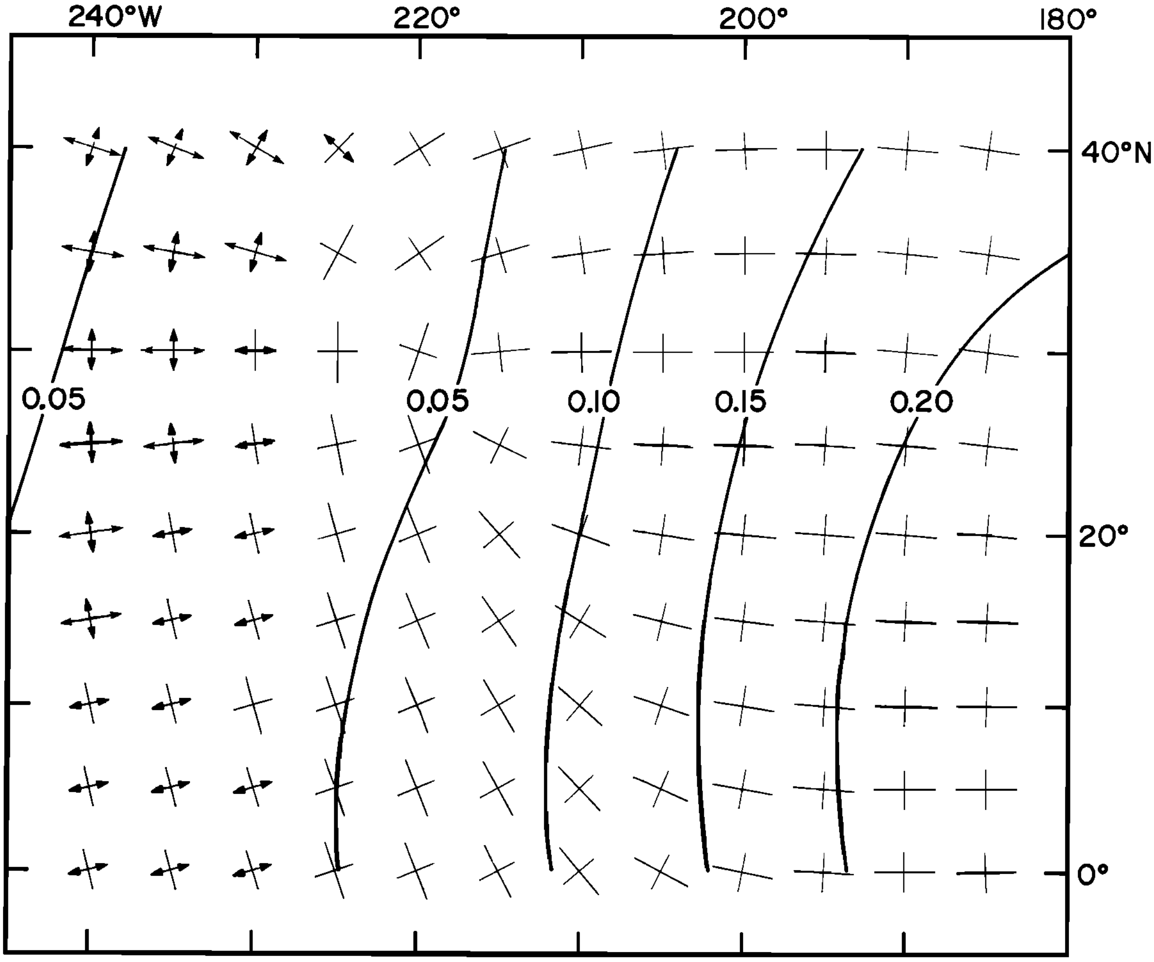

Fig. 10. Principal horizontal stress orientations and maximum stress differences at the surface of the lithosphere in the Elysium region predicted by the isostatic model for Tharsis of *Banerdt et al.* [1982]. See Figure 8 for further explanation.

Surface stresses in the Elysium region for the isostatic model for compensation of Tharsis topography [*Banerdt et al.*, 1982] are shown in Figure 10. This isostatic model, taken from *Sleep and Phillips* [1979], has a mean crustal thickness of 150 km and a (thermal or compositional) lithosphere 400 km thick. The stress distribution predicted for this model in the Tharsis region was shown by *Banerdt et al.* [1982] in their Figure 3*b*; these workers argued that the predicted stresses provide a good match to the observed distribution of tectonic features in the central Tharsis region. In the Elysium region this model yields surface stresses that are compressive over the entire area shown in Figure 10 except for the portion west of about 230°W. The magnitude of the predicted stress difference $\Delta\sigma$ decreases from 200–250 bars between 180° and 195°W to less than 100 bars for the region west of about 210°W. In eastern Elysium the direction of maximum compressive stress is nearly E-W; such a stress field might be a contributor to the formation of the N-S trending ridges in the area (Figure 1). In western Elysium the stress differences are too small to have a significant effect on the formation of tectonic features.

Surface stresses in the Elysium region for the Tharsis flexural loading model of *Banerdt et al.* [1982] are shown in Figure 11. This model is based on an assumed 150-km thickness for the crust and a 200-km thickness for the elastic lithosphere; the predicted stress distribution in the Tharsis region was shown by *Banerdt et al.* [1982] in their Figure 3*c*. In the Elysium region this model predicts large extensional surface stresses in the eastern portion of Figure 11, with maximum extensional stresses oriented approximately N-S to NE-SW. Although these stresses are not consistent with the ridge system in eastern Elysium, they are of an orientation and a magnitude to have contributed to the formation of linear extensional features in southeastern Elysium, including Cerberus Rupes (Figure 1), a possibility first suggested by *Carr* [1974]. In western Elysium the flexural loading model predicts compressive horizontal stresses, with the direction of greatest compressive stress oriented NW-SE. Such a stress field would not yield the NW-SE trending extensional features observed in this region, but it might have contributed to the formation of the ridges in southwestern Elysium (Figure 1).

In principle, the attribution of tectonic features in Elysium to lithospheric stresses generated by Tharsis might help to resolve the temporal sequence of compensation mechanisms for the Tharsis province. The relative ages of the generally isolated tectonic features in the Elysium area (Figure 1), however, cannot readily be determined.

Combined Models

It is, of course, unlikely that only one stress field (local, regional, or global) would be operating in the Elysium region during the time interval in which the tectonic features now visible were formed. Despite the greater surface age of the