observed in the Venera image (Figure 2*b*) are almost identical to those of ridges in the adjacent banded units on Maxwell Montes, so they are also interpreted to be compressional in origin. However, two observations distinguish these ridges from others on Maxwell Montes: (1) The dark ridges unit is located on a relatively flat plain at 4-5 km elevation, in contrast to the steep relief associated with ridge units on Maxwell; and (2) the roughness and reflectivity of this unit (Figure 2*a*) more closely resemble those of the adjacent plains units than they do the banded units on Maxwell. The similarity in backscatter between the dark ridges and the Lakshmi plains units can be attributed to the formation of these ridges through the folding and thrusting of the volcanic plains materials, and the lack of large-scale relief associated with these ridges (unlike on Maxwell) indicates that they probably have accommodated minimal strain with little crustal thickening.

Additional tectonic deformation of the smooth plains in Lakshmi is observed to the southwest of Maxwell Montes in the form of long, arcuate troughs which *Ronca and Basilevsky* [1986] identified as extensional "joints." These troughs are not embayed by plains materials but appear to disrupt them. While *Ronca and Basilevsky* [1986] attributed these features to extension associated with motion along a shear zone south of Maxwell, an alternative explanation is that these fossae represent extension due to loading and flexure associated with the mass of Maxwell Montes. However, if loading and flexure were responsible for these chasmata, then one might expect them to be present all around Maxwell. Since these features are not observed elsewhere, we favor the interpretation that they are associated with relative motion along that shear zone. Whatever their origin, their disruption of the plains unit indicates that they are relatively younger than the plains.

The style of deformation in the various units and their distribution in and around Maxwell Montes provides some insight into the processes affecting the mountain range as a whole. The ridges and valleys of the banded units in western Maxwell Montes result from compressional deformation along a N70°E axis, as do the ridges and valleys in the dissected terrain unit to the east. *Head* [1990] has described a similar pattern in Freyja Montes, with a banded unit and an adjacent ridged and domed unit also interpreted as resulting from compressional deformation. The increased roughness and disruption in the dissected terrain (and likewise in the ridged and domed unit) suggest further deformation affecting this region and possibly involving faulting, transpression, and tectonic segmentation that may not necessarily be associated with the primary compressional phase. The "transitional units" may have been affected by gravitational influences and interaction with the north and south bounding shear zones, in addition to the compressional phase. Finally, the relatively low backscatter cross section of some of the smooth units and their correspondence to local lows suggests that these units may represent volcanic flows or impact ejecta and melt. Their lack of deformation indicates that they were not subjected to the compressional deformation that disrupted the surrounding units and thus postdate the tectonic events.

Interpretation of Maxwell Montes as an orogenic belt. We interpret the large-scale configuration of Maxwell Montes in the unit map and topography (Figure 2) to be the result of east-west convergence of crustal materials accompanied by crustal thickening through processes of folding, thrusting, and buckling. This deformation is best characterized by the NNW trending ridges and valleys across central Maxwell Montes. A similar pattern characterizes the Akna and Freyja Montes orogenic belts [*Campbell et al.*, 1983; *Crumpler et al.*, 1986; *Head*, 1990], but the steep northern and southern flanks of Maxwell exhibit patterns of deformation not observed in the other orogenic belts. In particular, a simple model of east-west convergence cannot account for the complex deformation in the transitional units. Further deformation involving either gravitational effects along the steep slopes or interaction with shear zones in these regions must be responsible for the observed morphology.

On Earth, linear mountain belts with great relief are often characterized not only by compressional features, but extensional ones as well [*Molnar and Tapponnier*, 1978; *Dalmayrac and Molnar*, 1981; *Burchfiel and Royden*, 1985; *Armijo et al.*, 1986]. The great relief of these mountain belts leads to gravitational relaxation, which generally takes the form of normal faulting. Some of these normal faults strike parallel to the compressional features, often reactivating former thrust faults as extensional features [*Dalmayrac and Molnar*, 1981; *Burchfiel and Royden*, 1985], while other normal faults strike perpendicular to compressional features, parallel to the axis of maximum principal stress [*Molnar and Tapponnier*, 1978; *Armijo et al.*, 1986]. Although the former type of normal fault is often difficult to recognize in the field, the latter features often form fault-bounded graben that are easily identified from orbit [*Molnar and Tapponier*, 1978]. The resolution of the Arecibo and Venera data sets will not permit recognition of fold-parallel normal faulting along reactivated thrust faults such as those observed in the Himalaya only after considerable field work [*Burchfiel and Royden*, 1985]. However, fold-perpendicular graben with widths that exceed the spatial resolution of the Venera and Arecibo data should be recognizable if present. There is no obvious evidence of extensional graben formation perpendicular to the ridges or the strike of the mountain range in the banded units, although some such features may be present in the form of troughs in the transitional units as discussed above. The lack of obvious extensional features in central Maxwell, the highest region on the planet, and the potentially minimal extension represented by the troughs on the north and south slopes suggests that Maxwell Montes has not yet undergone extensive large-scale gravitational relaxation perpendicular to its strike.

Age of Maxwell Montes. The high surface temperature on Venus should make gravitational relaxation of high topography an important factor in the creation of tectonic features there [*Weertman*, 1979], and recent studies of Tellus Regio have supported this hypothesis [Bindschadler, D.L., et al., unpublished manuscript, 1989]. The time scales for such gravitational relaxation should be relatively short, leading to the relatively rapid removal of topographic relief [*Solomon et al.*, 1982]. The lack of impact craters in the Maxwell Montes region (with the possible exception of Cleopatra), and Venus as a whole, also attests to the relative youth of this region in comparison to the smaller terrestrial planets [*Basilevsky et al.*, 1986; *Schaber et al.*, 1987*b*]. In terms of absolute time, *Stephens et al.* [1983] predict that if only gravity acts on Maxwell Montes through a process of viscous relaxation, then the relief of Maxwell Montes will be removed in less than 1 b.y. Using this same model and assuming that Maxwell Montes may be relaxed today from even greater relief, *Stephens et al.* [1983] find that Maxwell Montes must be less than 200-600 m.y. old, making it a very recent geological event. However, the lack of evidence for large-scale gravitational relaxation in