within the 20° opening of the shear zones (Figure 13*c*). It is important to recognize that 1000 km is a maximum value for the east-west motion of Maxwell that depends upon the assumption of equivalent offset along the north and south bounding shear zones. It is possible that some large-scale rotation could occur in addition to east-west convergence within the bounding shear zones. Such east-west movement, accompanied by large-scale rotation, could account for the observed sense of shear north and south of Maxwell, without requiring 1000 km of convergence. It is not presently possible to determine how much offset has occurred along the northern and southern shear zones, so our maximum estimate of up to 1000 km is based solely on the geometry of proto-Maxwell Montes.

If Maxwell Montes migrated to the west within the shear zones, the material in front of the advancing mountain range could have undergone several different processes or combinations of processes. First, it could have been compressed and folded into additional anticlines and synclines at the front edge of proto-Maxwell Montes. Second, it may have been pushed ahead of proto-Maxwell Montes as a single, undeformed block within the converging shear zones. Finally, the material in front could have been removed through some mechanism similar to underthrusting and/or subduction.

The creation of additional anticlines and synclines ahead of the advancing proto-Maxwell Montes would remove material from in front of Maxwell through crustal thickening and, in effect, create an additional mountain range ahead of proto-Maxwell Montes. Examination of the region far to the west of Maxwell Montes within the shear zones, in central Lakshmi Planum, does not reveal any clear evidence of a subduction zone or a mountain range there (Figure 1). This indicates that crustal materials are not being extensively removed far ahead of Maxwell Montes in Lakshmi Planum. Instead, the removal of material might be concentrated at the edge of, and/or below, the Maxwell Montes mountain range.

A mechanism similar to terrestrial subduction may be able to account for the removal of crustal material ahead of Maxwell Montes. The western slope of Maxwell is the steepest slope on the planet and exhibits regional slope and elevation characteristics similar to active continental margins and zones of continental convergence on Earth [*Sharpton and Head*, 1986]. The removal of surface materials to depth beneath Maxwell Montes could produce an increase in relief from the proto-Maxwell Montes stage to the present. However, the topographic reconstruction (Figure 11*d*) suggests that the strike-slip deformation produced no change in the topography of the mountain belt. This indicates that there could only be limited lateral migration and crutal thickening within the converging shear zones. We suggest that a combination of large-scale rotation (Figure 13*b*) and a limited lateral migration/crustal thickening of Maxwell Montes within the shear zones (Figure 13*c*) could account for the observed morphology, topography, and sense of shear.

Alternatively, we note that the topographic reconstruction (Figure 11*d*), with its steep, continuous western slope and linear crest configuration, indicates that there was no change in the relative relief of the mountain range. In generating this reconstruction, the assumption was made that only strike-slip faulting was affecting the mountain range as a whole. Although we cannot rule out the possibility that some topographic variations occurred during strike-slip deformation, there is no clear evidence to suggest the location or magnitude of these variations. Therefore we can consider only the simplest case. In such a case, it is expected that the actual relief of the mountain range would remain mostly unchanged, and from this we would infer that the initial elevation of proto-Maxwell Montes was up to 11 km. However, the model shown in Figure 13*c* suggests that in addition to large-scale strike-slip faulting, the mountain range was also undergoing some lateral movement within the converging shear zones. If up to 1000 km of lateral transport occurred during movement within the shear zones, then some change in topography would seem likely, as such extensive crustal movement is likely to have been accompanied by thickening in order to conserve crustal mass. In order to preserve the integrity of the topographic reconstruction during this lateral migration and crustal thickening, then the thickening process must have been very homogeneous. If the crustal thickening took place at depth, then we would expect it to be relatively homogenous due to the increased ductility of the rocks. Such homogeneous deformation might be capable of producing constant uplift across the entire mountain range, thus preserving the integrity of the topographic reconstruction. This uniform uplift would be analogous to a model suggested by *Zhao and Morgan* [1985] for the uniform uplift of the Tibetan Plateau.

As described by *Zhao and Morgan* [1985], a very weak layer (a fluid with a viscosity of 10 Pa s or less) is contained at depth by surrounding crustal blocks. As material is added ("injected") to this layer during lateral migration, the hydraulic pressure increases, producing a constant uplift above this layer. If the materials above this fluid layer are strong, then the relative relief should be preserved within the mountain belt, as the strong layers will not deform extensively due to uplift. Instead, the mountain belt will rise as a block. The linearity of ridges in present-day Maxwell Montes (Figure 2) and in the reconstruction (Figure 11) indicates that the ridge-parallel compressional stress, which produced the CSDs and strike-slip faulting, did not extensively deform the ridges. Some lineaments are present within individual domains (Figure 6) and may represent minor offsets of individual ridges, but unlike the CSDs, they are not linearly continuous throughout entire domains and do not appear to represent widespread penetrative horizontal shortening. Instead, the CSDs and strike-slip faulting appear to have accommodated the majority of the strain, while the individual domains between CSDs remained strong and, for the most part, internally undeformed. Therefore the upper crust in the Maxwell Montes region could be considered relatively strong and the topography could be preserved in the reconstruction.

The relatively gentle slope in eastern Maxwell Montes, in the dissected terrain, might be explained using a similar model suggested for Tibet by *Molnar and Tapponier* [1978]. While maintaining the idea of a ductile layer at depth with a constant fluid pressure, they emphasize the presence of a weak crust above it. As material is added at depth and the elevation increases with hydraulic pressure, the weak crust deforms to maintain a uniform elevation, hence the constant, gentle slope of eastern Maxwell Montes in the dissected terrain. The change in crustal strength that we suggest across Maxwell is consistent with the morphology observed across the mountain range. While the continuous ridges of the banded units may represent a strong deformational front, the disrupted ridges of the dissected terrain suggest a weak crustal layer in the hinterland.

In summary, by analogy to Akna Montes, we expect that proto-Maxwell Montes would have had a comparable topographic signature of at least 6 km. Additionally, the