COMPOSITIONAL HETEROGENEITY AND LATE-STAGE DEFORMATION IN MAXWELL MONTES, VENUS; A. T. Basilevsky, Vernadsky Institute, 117975, Moscow, Russia.

Photogeologic mapping of the Magellan stereo images has revealed within the Maxwell Montes several patches (66.5 N, 359 W) of darker material whose darkness is evidently a compositional effect (low iron content). The patches are noticeably offset by the NE-trending curvilinear scarp which dissects the NW-trending ridges of the Maxwell massif. To the SE, the scarp merges into the Lakshmi plateau sinuous ridges which, in turn, merge into Auska ridge belt deforming the Sedna plains. To the NE, the scarp merges into Semuni ridge belt deforming Snegurochka plains and the adjacent part of Fortuna Tessera. The scarp is interpreted as an upthrust fault with a sinistral strike-slip component formed at the time of ridging the surrounding plains. This means that Maxwell massif has existed at least since that time, that is, for several hundred million years.

We have photogeologically mapped an area within 54-80 N and 350-25 E. (Fig.1) using Magellan 1st and 3rd cycle C1- and F-MIDRP images forming stereopairs. Five terrain types were distinguished: 1) Mountain range (M), 2) Tessera terrain (Tt), 3) Densely fractured terrains of plains and coronae (Pdf and COdf), 4) Undivided Plains with fractures and wide ridges and Plains with wrinkle ridges (Pfr/Pwr), and 5) Smooth and lobate plains (Ps/Pl). All these units except Unit M are decribed elsewhere (1, 2). In the area under study their characteristics and stratigraphic relations are essentually similar to the described in (1, 2). A stratigraphic sequence from oldest to youngest is: Tt - Pdf/COdf - Pfr/Pwr -Ps/Pl. Unit M represents the Maxwell Montes terrain, which morphology is dominated by NW-trending subparallel ridges. Unit M merges gradually eastward into tessera terrain of Fortuna Tessera. This fact and the fact that mountain ranges of Maxwell, Frejya, Akna, and Danu Montes are structurally aligned with the adjacent areas of Fortuna, Itzpapalotl, Atropos, and Clotho Tesserae, forming giant concentric circum-Lakshmi structure, suggest that either Units M and Tt are simultaneously formed structural facies of the same material complex or that Unit M is the earlier and Unit Tt is the younger facies of the complex. At the foot of western slope of Maxwell Montes the Unit M looks as embayed by the Pfr/Pwr plains of Lakshmi plateau.

The surface of Unit M typically looks very bright on the images evidently due to the cover of material with very high radar reflectivity which is believed to be a result of altitude-dependent surface weathering (5, 6). It is not clear yet what mineral phase is responsible for the effect but there is almost a consensus that it should be iron and/or titanium phase formed as the result of reaction of surface material with the atmosphere component(s) (3). At the NW part of Maxwell Montes there are several patches of relatively dark surface (centered at 66.5 N, 359 E) with quite sharp boundaries. The altitude range of the patches is the same as the altitude range of neighboring radar-bright areas so the altitude effect can not be the reason for the darkness. Another possible reason for this could be erosion of the supposed weathering products by high altitude winds. In stereo, however, these radar-dark patches of NW Maxwell do not appear to have the properties of deflation areas. So we conclude that these patches are the areas where the surface material has significantly lower iron content than the surrounding areas and the weathering there does not produce significant enough amounts of the radar-bright products.

The radar-dark areas show notable sinistral offset along the NW-facing, NE trending, sinuous scarp which is clearly seen in the stereo images. The stereo gives the impression that the the major part of Maxwell massif is upthrust here onto its NW part (Fig. 1). The scarp is also the boundary to the NW of which the ridges are offset or their trends are drastically changed. The SE termination of the scarp, where the scarp comes to the Lakshmi plateau, merges into the collection of sinuous ridges going south along the foot of the western slope of Maxwell massif. Further south these ridges merge into the Auska ridge belt deforming the surface of the northern part of Sedna plains. The NE termination of the scarp merges into Semuni ridge belt deforming the surface of Snegurochka plains and the adjacent part of Fortuna Tessera. The previously mentioned ridge belts are believed to be the result of compressional deformation (4, 9) and all the scarp-ridge belts system appear to be formed from regional E-W compression which resulted in the formation of the N-S trending ridge belts on Snegurochka, Lakshmi, and Sedna plains and in deformation of the Maxwell massif by the NW trending thrust with a sinistral strike-slip component.

If so, this means that Maxwell massif already existed at the time of ridge formation in the plains. Because the ridged plains occupy more than 70% of the surface of Venus (2) and the crater population is distributed around the planet in a manner indistinguishable from a random one (7, 8, 10), the estimation of average retention age of Venus surface as about 300 or 500 m.y. (8, 10) is actually the estimation of the age of the ridged plains. This means that the Maxwell massif existed at least for several hundred million years. This supports the idea that on water-depleted Venus high and steep slopes can be maintained for a geologically long time (11).

References: 1) A. Basilevsky and J. Head (1994) LPSC XXV, 65; 2) A. Basilevsky and J. Head (1994) EMP, (in press); 3) K. Klose et al. (1992), JGR, 97, 16353; 4) V. Kryuchkov (1992) Venus Geology, Geochemistry, and Geophysics, U. Az. Press, Tucson, p. 96; 5) G. Pettengill et al. (1988) JGR, 93, 14881; 6) Pettengill et al. (1992) JGR, 97, 13091; 7) R. Phillips et al. (1992) JGR, 97, 15923; 8) G. Schaber et al. (1992) JGR, 97, 13256; 9) S.

Solomon et al. (1992), JGR, 97, 13199; 10) R. Strom et al. (1994) JGR, 99, 10899; 11) S. Mackwell and D. Kohlstedt (1993) EOS, 74, 378.

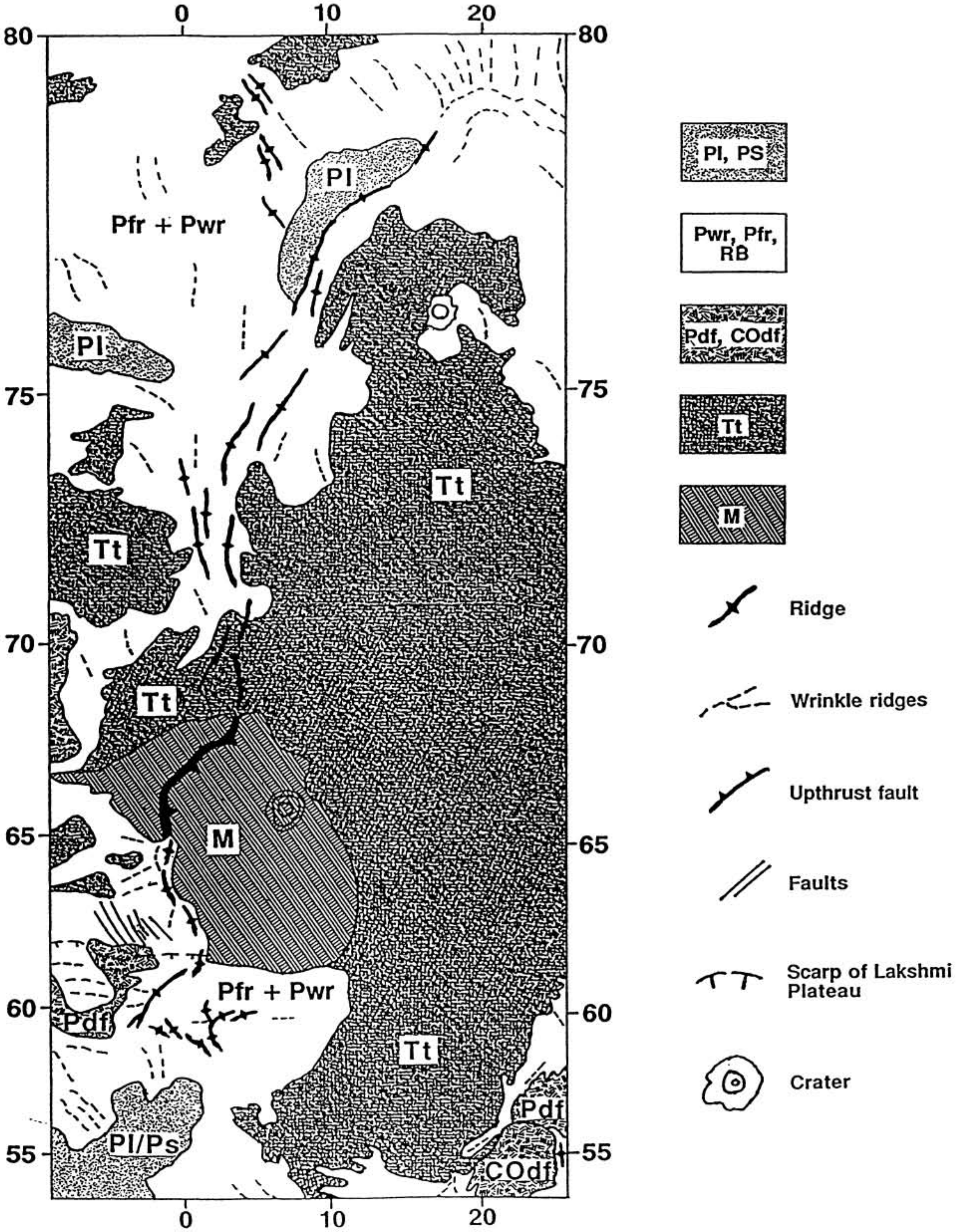

Figure 1. Simplified geologic map of Maxwell Montes and adjacent areas. Units are designated in the text.