ADMITTANCE SPECTRA AND ELASTIC THICKNESS ESTIMATES FOR VENUSIAN CORONAE

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Coronae arc circular features on Venus that arc defined by their fracture annuli. Many coronae have a moat and outer rise encircling the interior dome, plateau or depression. The topography of these outer rises have been fit with a flexure model to obtain an csti mate of the elastic thickness [1,2]. Such estimates arc potentially of value for constraining both models of coronae formation and the thermal history of Venus. Namiki and Solomon [3] have shown that coronae arc likel y to bc younger than the average surface age of Venus. Elastic thickness estimates for coronae may thus reflect the current state of the lithosphere. The ncw 90 degree and order spherical harmonic gravity field for Venus [4] provides sufficient resolution to estimate elastic thickness in some regions via modeling of the gravity/topography admittance spectrum. Initial estimates of the elastic thickness for Heng-o and Artemis Coronae yield values of-30 km and -23 km, respectivcly. These values of elastic thickness arc at the lower end or smaller than the estimates of 30-4S km and 30-45 km for Heng-o and Artemis, respectivcly, obtained by modeling of the topography alone [1].

Data Analysis. The data sets used the Magellan 360 degree and order spherical harmonic topography field [5] and the 90 degree and order gravity field [4]. In the spectral admittance technique, the two data sets arc ratioed in the spectral domain and plotted as a function of wavelength [e.g. 6]. This approach allows for estimation of thc elastic thickness and provides information on likely compensation mechanisms.

Discussion. The shape of the admittance curves clearly indicate the presence of loading from below, as would bc predicted by models of topographic relaxation in which the spreading of the topographic high pushes up on the elastic plate from below. The estimates of the deep compensation depth arc approximately 100 ktn and 125 km for Artemis and Heng-o Coronae, respectivcly. These estimates arc shallower than previous estimates of the apparent depth of compensation [7]. The difference in the estimates is likely to bc duc to the inclusion of a crustal layer and the elastic plate in this study, as well as the admittance technique rather than a spatial domain approach. Another difference is the usc of the 90 degree and order gravity field rather than the 60 degree and order model. In both regions, the fit to the flexure mode] shown here is reasonable, but not perfect. The scatter in the data probably reflects tbc complexity of the tectonics, especially at Artemis Coronae, as well as the influence of Aphrodite Terra. These initial estimates of elastic thickness require further assessment of the effects of regional gravity trends, the long wavelength portion of the gravity and topography fields, before final estimates of elastic thickness can bc obtained.

References. 1) D.T. Sandwell and G. Schubert (1992) J. Geophys. Res., 97, 16,069; 2) Cl.. Johnson and D.T. Sandwell (1994) Geophys. J. Int., 119, 627; 3) N. Natniki and S.C. Solomon (1994) Science, 265,929; 4) W. I.. Sjogren et al. (1996), submitted to *Venus II*, Univ. Arizona Press; 5) N.J. Rappaport and J.J. Plaut (1994) Icarus, 112, 27; 6) L.M. Dorman and B.T.R. Lewis (1970) J. Geophys. Res., 75, 3357; 7) G. Schubert, W. B. Moore, and D.T. Sandwell (1994) Icarus, 112,130.

Figure 1. Crosses arc admittance spectra with error bars for Artemis (la) and Heng-o (1 b) Coronae. The scatter in the admittance values around wavelengths of 500-600 km indicate that the resolution in the gravity data is decreasing, making the admittance values unreliable at smaller wavelengths. For Heng-o admittance values beyond -1500 km arc probably not directl y related to Heng-o. The curves arc for models that include a crust-mantle interface, an elastic plate (Te), and a deeper density anomaly that causes loading of the elastic plate from below. Curves arc shown for three different deep compensation depths. Crustal thickness and deep compensation depths can bc traded off.

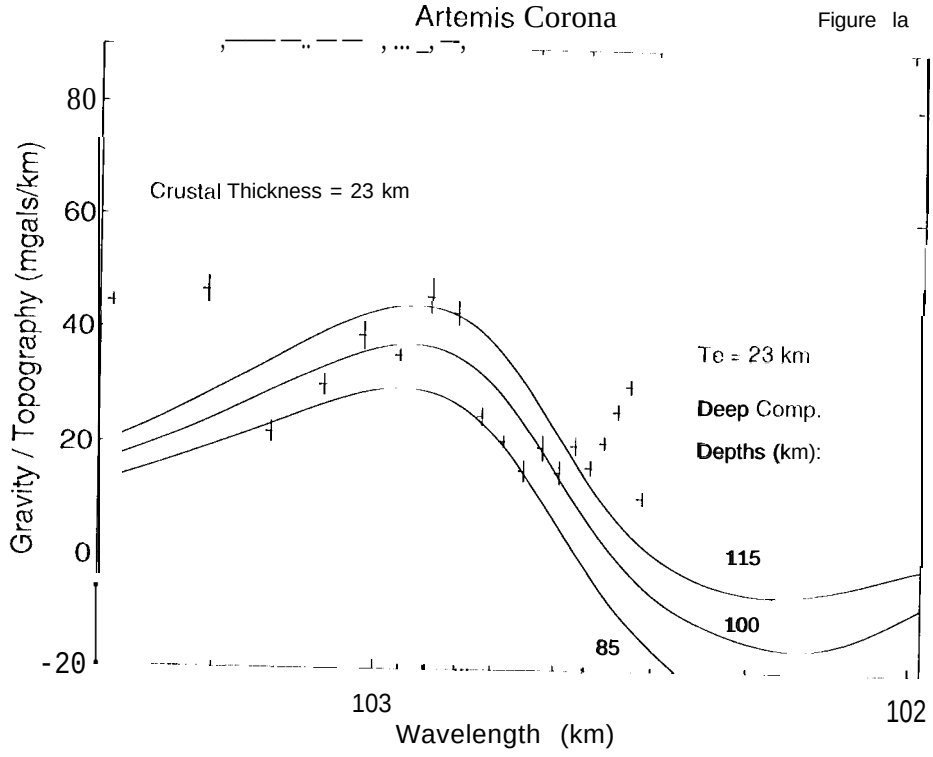

Figure 1a

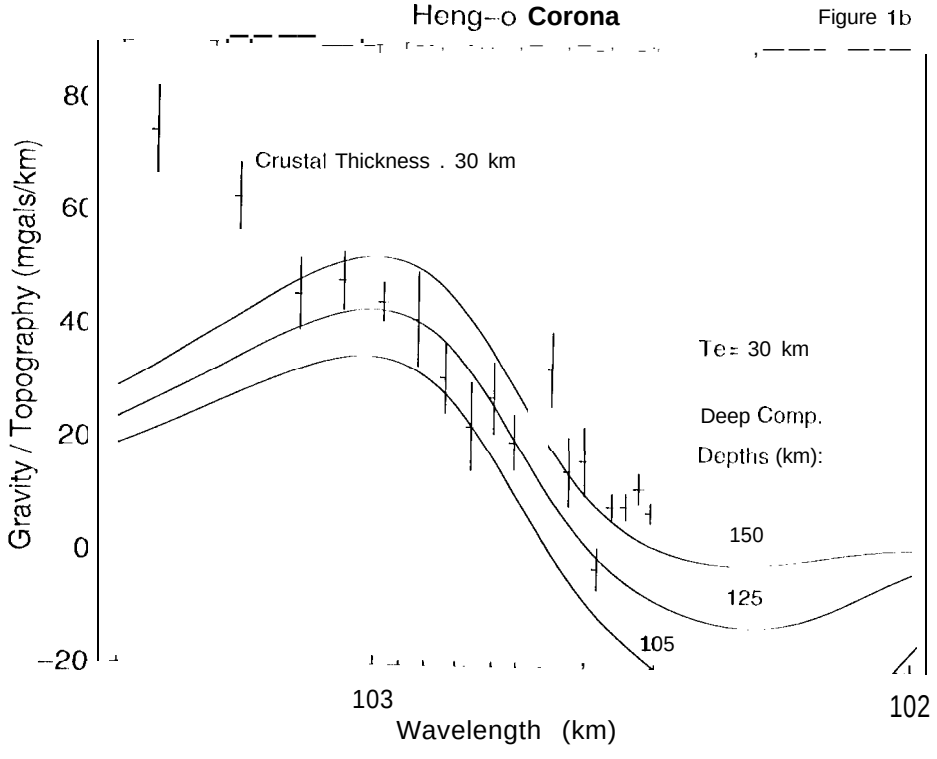

Figure 1b