LIMB TOPOGRAPHY OF URANIAN SATELITES

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Coordinates of points on the limbs of the Uranian satellites provide radii and shapes as well as topographic envelopes over different geologic provinces. Oberon, Titania, and Umbriel cannot be distinguished from spheres; Ariel and Miranda appear to be triaxial ellipsoids. Because most images of the satellites were taken from high latitudes, the short (c) axes are not well determined. 1985U1 is an irregular object, consistent with its small size (average radius ∼75 km).

Local topographic envelopes can be generated from the residuals of fitting ellipses to the limb profiles. The resulting plots (Fig. 1) are envelopes of the highest points and are useful for measuring such extremes as troughs, peaks, and ridges, given a proper orientation of the feature. Fig. 1 shows limb topography of the best image of Titania; measurement resolution is about 1 km. The slopes near 1550 km on the profile are nearly a direct cross section of a scarp, ~4 km high. From this and other profiles Titania shows considerable tilting and vertical uplift/depression of blocks of amplitudes 2-5 km over horizontal distances of 100-500 km.

Oberon shows mostly random limb topography with one exception: a 10 km peak of unknown origin. Umbriel also shows the topography expected of a heavily cratered object, but has a global dichotomy of elevations of about 6 km. Inclusion of some lower resolution data may reveal how globally typical this profile is. Ariel's limb topography shows the relief of 1-3 km caused by multiple troughs and ridges. Miranda shows the most relief at the edges of the ovoid tectonic features: troughs up to ~7 km deep bounded by ridges ~5 km high. The satellite as a whole, however, is a relaxed ellipsoid.

These very preliminary results are being refined by better determination of satellite centers in the images and location of limb profiles on specific features seen in other images. Limb profiles will provide good quantitative checks on some tectonic models of the Uranian satellites.

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Limb profile of Voyager 2 image of Titania; FDS = 26843.15. The profile is the residuals to an ellipse fit to the limb profile. It is not a real topographic profile except on extreme features or where orientation is fortuitous, as at 1500-1600 km, where a scarp is parallel to the viewing direction.