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# The Shape of Saturn

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We report on the shape of isobaric surfaces in Saturn's atmosphere, derived from thirty-five Cassini radio-occultation soundings that probe from 0.1 mbar to $\sim$1 bar between 70 S and 60 N. The retrieval of pressure vs. planetary radius requires knowledge of the shape of the atmosphere. To determine this, we use the gravitational coefficients given by Jacobson et al. (2006) and the angular velocities at the cloud-top level from the Voyager winds reported by Sanchez-Lavega et al. (2000). To keep the ray-tracing inversion tractable, we assume that the atmosphere is locally axisymmetric and that its angular velocities are functions of the cylindrical radius from the planetary rotation axis; except for near the equator, this is equivalent to assuming that the winds are barotropic. This permits the use of a geopotential incorporating both gravity and differential rotation and ensures that surfaces of constant gopotential, density, and pressure coincide. Note that the "barotropic" assumption need only apply in the atmospheric shell probed by the occultations. The retrieved isobaric surfaces show evidence of moderate baroclinicity. For example, the deviations of the 1-bar and 100-mbar surfaces from the geopotential surface assumed are of order 10-20 km, less than a pressure scale height.

References

[1] Jacobson, R. A., et al., Astron. J., 132, 2520-2526, 2006.
[2] Sanchez-Lavega, A., et al., Icarus, 147, 405-420, 2000.