# Empirical Structure Models of Uranus and Neptune

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Uranus and Neptune are still poorly understood. Their gravitational fields, rotation periods, atmosphere dynamics, and internal structures are not well determined. In this paper, we present empirical structure models of Uranus and Neptune where the density profiles are represented by polytropes. By using these models that are set to fit the planetary gravity field, we predict the higher order gravitational coefficients J6 and J8 for various assumed rotation periods, wind depths, and uncertainty of the low-order harmonics. We show that faster rotation and/or deep winds favour centrally concentrated density distributions. We demonstrate that an accurate determination of J6 or J8 with a relative uncertainty no larger than 10 per cent could constrain wind depths of Uranus and Neptune. We also confirm that the Voyager II rotation periods are inconsistent with the measured shapes of Uranus and Neptune. We next demonstrate that more accurate determination of the gravity field can significantly reduce the possible range of internal structures. Finally, we suggest that an accurate measurement of the moment of inertia of Uranus and Neptune with a relative uncertainty of ~ 1 per cent and ~ 0.1 per cent, could constrain their rotation periods and depths of the winds, respectively.