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Observations of Stellar Occultations by Trans-Neptunian Objects

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Abstract content
   (Max 300 words)

Trans-Neptunian objects (TNOs) are thousands of small icy bodies residing at and beyond the orbit of Neptune, and they represent some of the most primitive material in the Solar System. By combining an observational characterization of these objects with theories, we can hope to understand the early state of this region and reveal how our Solar System might have appeared to a distant, outside observer – as we today observe young stars and associated debris disks in various stages of evolution. Stellar occultations provide a method to (i) accurately measure diameters (to the level of a few km at the distance of 30 AU), (ii) probe for and characterize atmospheres (at the level of a few nanobars), and (iii) possibly detect companions. Although the stellar occultation method is not optimal for characterizing large numbers of objects, it provides detailed insight into a single object for each successful observation. This method has been successfully employed since 1988 to study Pluto's evolving atmosphere (e.g. Elliot et al. 2005, AJ, 129, 1117) and more recently to constrain the size of its largest moon, Charon (e.g. Gulbis et al. 2006, Nature, 439, 48).

Predicting stellar occultations by TNOs is particularly difficult due to the small size of the objects (most have angular radii < 0.02 arcsec) and the accuracy of their positions (typically a few tenths of arcsec). We have conducted multi-year astrometric observations with the goal of accurately predicting stellar occultations for the largest TNOs in angular size. During the last few years, our efforts have paid off with successful occultation observations of 55636, Eris, Varuna, Quaoar, and Chiron (e.g. Elliot et al. 2010, Nature, 465, 897; Sicardy et al. 2011, Nature, 478, 493). We will present our TNO stellar occultation prediction program, observations, results to date, and plans for the future.

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