CONTROL ID: 3050072

TITLE: The Mass, Density, and Figure of the Kuiper Belt Dwarf Planet Makemake

ABSTRACT BODY:
Abstract (2,250 Maximum Characters): The recent discovery and subsequent orbital characterization of Makemake's satellite have provided a means to measure the mass of the dwarf planet for the first time. As Makemake is a fast rotator, it is expected to have a non-spherical equilibrium figure. If the orbital pole of the satellite is aligned with the spin pole of Makemake, then the spin pole is nearly orthogonal to the occultation chords presented in Ortiz et al. (2012). It is difficult to constrain the equatorial radius of a spheroid aligned in such a way; the resulting preferred volume and its uncertainty are larger than previous estimates. The preferred figure has a ratio of equatorial to polar diameters of ~1.13. Combining this new figure estimate and the mass measurement of ~$3.1x10^{21}$ kg, we derive a relatively low density for Makemake of ~1.7 g/cc; adopting the Brown (2013) volume estimate results in a higher density of ~2.1 g/cc. In this presentation, we will describe the existing and upcoming Hubble Space Telescope observations of the system that enable these mass and orbit plane measurements, derivation of the mass, figure, and density of Makemake, and the implications for the internal structure of Makemake. We will also describe possible upcoming opportunities to observe mutual events between Makemake and its satellite.

Category: Centaurs and Kuiper Belt Objects: Physical Characterization

Sub-Category: None

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Plain-Language Abstract Synopsis: Makemake is one of the largest and brightest dwarf planets in our solar system, but until now we had no way of determining anything but its surface properties. In 2015, our team discovered a moon in orbit about Makemake, which gave us our first chance to measure the bulk properties of Makemake itself - including how massive it is, how dense the material that makes it up is. The moon has also let us estimate the overall shape of Makemake better than in the past, which is a squashed spheroid similar to a tangerine. Taken together, these new measurements point the way to determining how the interior of Makemake is structured; smooth and uniform, or layered like the Earth?

Contributing Teams: (none)