

CONTROL ID: 3049392

TITLE: The mass and density of the dwarf planet 2007 OR10

ABSTRACT BODY:

Abstract (2,250 Maximum Characters): The satellite of 2007 OR10 was discovered on archival Hubble Space Telescope images in 2017. With new observations taken with the WFC3 camera of the HST in late 2017 we were able to confirm the presence of the satellite and determine the orbit. The orbit's notable eccentricity, $e=0.31$, may be a consequence of an intrinsically eccentric orbit and slow tidal evolution, but may also be caused by the Kozai mechanism. Dynamical considerations also suggest that the moon is small, $D < 100$ km. Based on the newly determined system mass of 1.75×10^{21} kg, 2007 O10 is the fifth most massive dwarf planet after Eris, Pluto, Haumea and Makemake. We also revisited the radiometric size estimate of the primary using the assumption that the moon orbits in the equatorial plane of the primary. This approach provides a size range of $1210 \text{ km} < D < 1295$ km, and a bulk density of $1.72 \pm 0.16 \text{ g cm}^{-3}$ for the primary. A previous size estimate that had assumed an equator-on configuration ($D = 1535^{+75}_{-225}$ km) provides a density of $0.92_{-0.14}^{+0.46} \text{ g cm}^{-3}$, unexpectedly low for a 1000 km-sized dwarf planet. 2007 OR10 and the satellite have the largest color difference, $\Delta(V-R)=0.43 \pm 0.17$ among binary transneptunian objects.

Category: Centaurs and Kuiper Belt Objects: Physical Characterization

Sub-Category: None

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Plain-Language Abstract Synopsis: We confirmed the presence of the satellite of the dwarf planet 2007 OR10, determined the orbit and derived important properties (mass, density) for the main body. These physical characteristics help us to understand how dwarf planets formed in the early Solar system.

Contributing Teams: (none)