

Using Density to Test for a Compositional Difference between Pluto and Charon

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Abstract. The New Horizons flyby has gathered a wealth of new information about the Pluto-Charon system¹. New measurements of the radius of Pluto and Charon have allowed for the most precise density estimates of the two bodies to date². These new values confirm that Pluto and Charon have different densities ($\Delta\rho=158\pm 34$ kg m⁻³). We use a combination of modeling to understand if this density contrast necessarily implies a difference in composition. We test many other ideas including the presence of a liquid ocean on Pluto, an extended porous layer on Charon, material compression. We find none of these mechanisms are able to replicate the magnitude of the observed density contrast. From this we suggest that Pluto and Charon must be compositionally different.

	Radius	Density
Pluto	1187 \pm 4	1860 \pm 13
Charon	606 \pm 3	1702 \pm 21

Table 1: Radius and density estimates from the New Horizons encounter^{1,2}.

¹ Stern et al. Science 350, 6258 (2015)

² Nimmo et al. ArXiv preprint 1603.00821 (2016)