

CONTROL ID: 3045651

TITLE: Physical properties of trans-Neptunian objects and centaurs

ABSTRACT BODY:

Abstract (2,250 Maximum Characters): A systematic photometric study of four small icy bodies was performed. This work has been published in four recent peer-reviewed papers, two of them led by Dr. Fernandez-Valenzuela.

The first study focused on the TNO 2008 OG19. The light-curve of this object, with a large amplitude of 0.43 mag, is rather unusual for an object of its size (~ 600 km). There are less than 10 out of 150 TNOs for which rotational light-curves are available that show comparable characteristics. Our photometric analysis enabled the determination of the rotational period, shape and density (assuming hydrostatic equilibrium) of 2008 OG19. These are important results, in particular because the determination of densities of objects of the Solar system is generally quite challenging.

The second and third studies are based on the centaurs Chariklo and Chiron, respectively, and specifically, the discovery of ring systems around them. The variation of the magnitude and amplitude of the light-curve of these bodies as they move around the Sun was modeled, including the effect of the ring systems. The novelty of our approach consisted of accounting for changes of the viewing angle of both the object and the ring systems. From the models, size of the semi-axes of the central body and its pole orientation were obtained. Additionally, the density was also obtained under the assumption of hydrostatic equilibrium.

Finally, the last study was devoted to the analysis of Bienor. New observational data for the light-curve amplitude and absolute magnitude were obtained and fitted together with data obtained from the literature. Several scenarios, including the existence of a ring system, were proposed in order to explain the variation of the photometric results for the absolute magnitude and light curve amplitude, in a simultaneous fit of the data. The scenarios provide the pole orientation, the axes ratio and the density of the body in a well constrained range.

In summary, we demonstrate how photometric data from small bodies can be used to extract information about their rotational state, density, and the presence of rings. This methodology is of special interest to support exploration missions to small icy bodies.

Category: Centaurs and Kuiper Belt Objects: Physical Characterization

Sub-Category: None

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Plain-Language Abstract Synopsis: Some physical properties such as rotational period, density, shape and pole orientation, of one trans-Neptunian object and three centaurs are obtained. We also developed photometric models in order to obtain the physical properties of the ring systems around small bodies.

Contributing Teams: (none)