Dust Dynamics in the Rings of Chariklo

Juliet Pilewskie, Mihaly Horanyi

Two years ago, the centaur Chariklo was discovered to have two rings, which made it the first known non-planetary object to have a ring system. The uniqueness of this situation calls for an examination as to how a two-ring system can be sustained around a relatively small interplanetary object. We simulate a two-body system with solar radiation pressure forces perturbing the dust particle's orbit around a Chariklo-sized object. The lifetime of orbiting dust particles is estimated by integrating their orbits as function of their size and initial position. Current results show that for a water-ice particle of 100 μm in radius, its simulated orbit lasts for only about 20 years. This short lifetime suggests that there may be external forces keeping the ring particle in place, and/or the presence of additional sources of these particles. It is also found that the dust particle's simulated orbital lifetime is longest when it is positioned where Chariklo's rings are located, which agrees with the observations already made of Chariklo's ring system. This research is the first step in better understanding the formation and sustainability of non-planetary ring systems, which can then be applied to ring systems on larger scales.