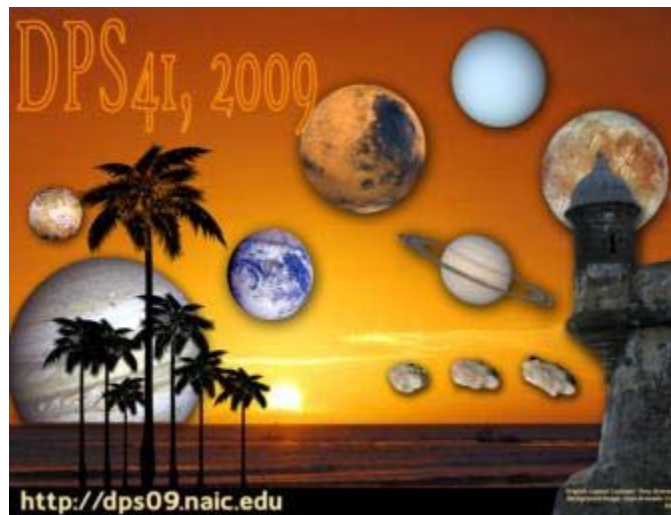


[Print this Page](#)

## Presentation Abstract

**Title**      **Graze and Merge: The Formation of the Haumea Collisional Family**

**Author**    **Zoe Leinhardt**<sup>1</sup>, R. A. Marcus<sup>2</sup>, S. T. Stewart<sup>2</sup>

**Block**      <sup>1</sup>*University of Cambridge, United Kingdom,* <sup>2</sup>*Harvard University.*

**Abstract** The Kuiper belt object Haumea (2003 EL61) is one of the most interesting objects in the solar system: 1) it is large but has a fast spin period of around 4 hours; 2) it appears to be closely associated with many other smaller Kuiper belt objects both spectroscopically and dynamically; 3) the small bodies associated with Haumea have very low relative velocity. If Haumea and its associated bodies were formed in a collision (Brown et al. 2007), they are different from collisional families found in the asteroid belt. Asteroid belt families, which are thought to have formed via catastrophically disruptive collisions, tend to have velocity dispersions close to the escape speed, but the velocity dispersion of the proposed Haumea family members is far less than the escape speed from Haumea. However, using numerical simulations, we find that a system with characteristics similar to Haumea can be produced via a new category of family formation: “graze and merge”. In a graze and merge impact, the projectile and target initially graze each other with a large impact parameter. The projectile is decelerated and subsequently recollides and merges with the target, producing a fast spinning oblate body. Depending on the initial impact parameter, it is possible to create a primary body that spins so quickly that it sheds material from the ends in many small clumps. Some of this material is gravitationally bound and some escapes from the primary. In this scenario, the family members do not originate from the initial collision; instead, they are spun off after the formation of the primary. As a result, the relative velocity of the family members can be smaller than the escape velocity of the primary. We suggest that Haumea is the first collisional family observed that was produced by a graze and merge impact event.