

Formation scenarios for the dwarf planet 2003 EL61 (Haumea)

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Abstract

The dwarf planet 2003 EL61 (Haumea) was discovered to have two satellites (Hi'iaka and Namaka) in 2005 and is associated to a group of some tens of TNOs clustered in the orbital elements space about Haumea's values. This circumstances aimed speculations about formation mechanisms for this TNOs system. Brown et al. (2007, *Nature*, 446, 294) claimed this to be a collisional family "I" asteroid-belt Hirayama families, while Schlichting & Sari (2009, *AJ*, 700, 1242) and Leinhardt et al. (2010, *ApJ*, 714, 1789) proposed different mechanisms for that. In this work we analyze the likelihood of each proposed formation scenario, based on calculations performed by means of the Asteroid-Like Collisional AND Dynamical Evolution Package (ALICANDEP) that has recently shown to reproduce most observables of the trans-neptunian region (Campo Bagatin & Benavidez, 2011, *MNRAS*, submitted), in the frame of the Nice model (Gomes et al. 2005, *Nature*, 435, 466; Levison et al. 2008, *Icarus*, 196, 258). We derive probabilities for the different collisional events reported in the literature, within the dynamical phases described by the Nice model and test those models against found probabilities. New formation scenarios are then proposed for the Haumea system, based on likely collisional probabilities and physical considerations that are tested by means of collisional numerical simulations (Ortiz et al., 2011, *A&A*, submitted).

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