

Dynamics of Large Fragments in Active Asteroid P/2010 A2

The active asteroid P/2010 A2 was discovered in January 2010 by the LINEAR Sky Survey. It displayed a long, narrow dust tail, but has the orbit of an inner Main Belt asteroid. High resolution imaging with the Hubble Space Telescope (HST) showed that the dust in the tail seemed to emerge from a bright cross-shaped pattern of large dust grains rather than from the main nucleus, which appeared almost detached from the tail. Dynamical analysis of the tail's position angle on the sky revealed that the dust was emitted from the nucleus during a very short time span about nine months before the discovery of P/2010 A2. We therefore concluded that, in February or March 2009, P/2010 A2 either was impacted by a second asteroid or disrupted due to rotational break-up.

Here, we report a new study of the orbital paths of the larger fragments at the head of the dust tail of P/2010 A2. We follow the positions of individual fragments over a series of HST images taken during the first half of 2010. The orbital evolution of each fragment allows us to constrain its velocity relative to the main nucleus after leaving its sphere of gravitational influence. We reconstruct to which direction the fragments have been emitted from the nucleus, and we derive a lower limit for their size from the low sensitivity to radiation pressure that we infer from our model.