

Physical and dynamical properties of a quasi-Hilda comet, 212P/2000YN₃₀

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Introduction:

A small population of asteroidal-like objects have orbits of large eccentricities which are typical of comets. Some of them are temporarily locked by the 3:2 MMR of Jupiter for a few ten kilo-years and so-called quasi-Hilda objects. From the statistic result of the database from Minor Planet Center, the ratio between asteroid and comet in this region is almost unity. Their dynamically unstable nature is a great environment to study the physical and dynamical evolution of short period comets.

212P is also a quasi-Hilda member. The outburst of 212P was first detected on Jan. 2, 2009^[1] and keep activity until the end of March. The tail structure is significant in the first week after the outburst (see Figure 1.). It is an unusual object because in the last orbit of this comet 9 years ago, it appeared as an asteroid without activity^[2], so we believed that 212P is a dormant or quasi-active comet. Our multi-color observation shows that 212P has a typical color trend such like other Jupiter Family Comets^[3] ($B-V = 0.807$ and $V-R = 0.527$).

The dynamical half-lifetime of 212P is about 0.2 Myrs according to our clone particle orbital integration (Figure 2.). The high eccentric Jupiter-crossing orbit make 212P can no longer stay in their current orbit and will scattered by gravitation of Jupiter in a very short timescale. Figure 3. shows a ‘footprint’ of the evolution of 212P clones within 1 Myrs simulation. All the clones will trapped and disturbed by the gravitation of Jupiter and Saturn. Our result is different from the footprint of Centaur objects^[4].

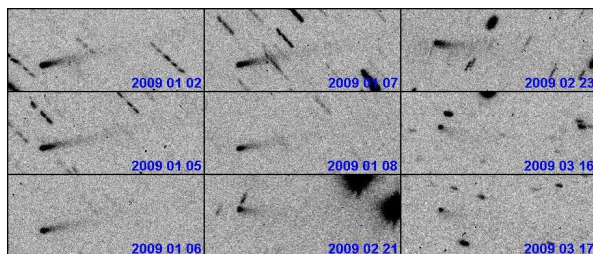


Figure 1. Daily images after the outburst

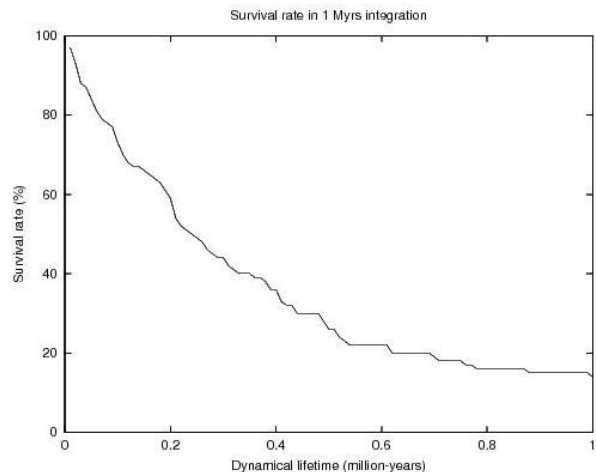


Figure 2. Survival rate in our 1 Myrs orbital simulation

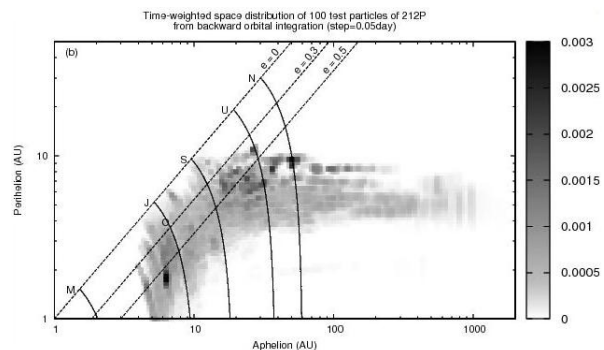


Figure 3. Space distribution of the orbital evolutionary track

References:

- [1] Y. C. Cheng and H. Y. Hsiao (2009) IAUc 9010.
- [2] Fernandez et al., (2005) *Astro J.*, 130, 308-318.
- [3] K. J. Meech et al. (2009) *Icarus*, 201, 719.
- [4] M. S. Tiscareno and R. Malhotra (2003) *Astro J.*, 126, 3122-3131

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