

YARKOVSKY EFFECT AND THE ORBITAL EVOLUTION OF ASTEROID 2012 DA14

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Asteroid 367943 Duende (2012 DA14) holds the record as the one of Aten population with $H \leq 24$ that had experienced deep close encounter event to the Earth ($0.09 \times$ Earth-Moon distance) prior to March 14, 2017 as appeared in <http://neo.jpl.nasa.gov>. In this work we study the orbital evolution of 120 asteroid clones and the nominal up to 5 Myears in the future using SWIFT integrator package with and without the Yarkovsky effect inclusion. At the end of orbital integration with both integrators, we found as many as 17 asteroid clones end their live as Earth impactor. The prediction of maximum semimajor axis drift for this subkilometer-sized asteroid from diurnal and seasonal variants of Yarkovsky effect is $\sim 9 \times 10^{-3}$ AU/Myr and $\sim 3 \times 10^{-4}$ AU/Myr respectively. By using MOID (Minimum Orbital Intersection Distance) data from each integrator package of entire virtual and nominal asteroids, we obtained the value of impact frequency with the Earth of 3.68×10^{-9} per year (with Yarkovsky effect) and 4.07×10^{-9} per year (without Yarkovsky effect), which corresponds to a mean lifetime of 272 Myears and 246 Myears, respectively. The Wilcoxon Rank Sum test with a confidence level of 95% shows that the MOID data generated by both integrators do not have a significant difference. This may explain why no significant difference found for the calculated asteroid mean lifetime. We can infer that the presence of Yarkovsky effect on asteroid 2012 DA14 is negligible compared to the effects of the close encounters with planets in the inner Solar System.