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On the dynamical evolution of the NEO population

R. Zolotarev^{a,1,*}, B. Shustov^{b,1}

^a Southern Federal University, Bolshaya Sadovaya Str., Rostov-on-Don, 344006, Russia, +78632184000

^b Institute of Astronomy, Russian Academy of Sciences, Pyatnitskaya str, Moscow, 119017, Russia, +74959511279

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We use numerical approach to study the dynamics of population of near-Earth objects (NEOs) over a timescale about 10 Myr. The goals are to improve the estimation of median lifetime of the population and to study the “diffusion of the orbits” effect. We use both synthetic and observed samples of NEOs for analysis. Sample with asteroids observed was taken from the database of Minor Planet Center and includes objects with perihelion distance $q < 1.6$ AU and absolute magnitude $H > 17.5$ (which corresponds the size about 1 km). Synthetic NEO populations was generated using ESA’s NEOPOP distribution. For the numerical integration we use open-source REBOUND code with hybrid integrator scheme. Model takes into account gravity of Sun and planets, close encounters and collisions. Asteroids is considered as test particles due to its negligible influence on overall gravitation potential. It is found that median lifetime for the pure NEO population is about 5 Myr which is consistent with previous estimates in literature. Also we analyze evolution of particular subsets of NEOs in the plane major semi-axis – eccentricity. Starting in different regions in the plane, asteroids demonstrates different evolution and specific lifetime. By integrating sample with NEO and non-NEO objects we study process of asteroids transition between NEO and non-NEO regions through the line of NEO definition $q = 1.3AU$. Estimates shows that the transition process plays an important role when investigating median lifetime and aggregate NEO depletion/replenishment process. Results obtained can be useful for qualitative and quantitative study of different mechanisms of replenishment of the NEO population.

Comments:

Presentation type: poster

Topic area: New NEO Characterization Results – The latest findings related to characterizing NEO physical, dynamical, and orbital properties.

*Corresponding author

Email address: rv_zolotarev@mail.ru (R. Zolotarev)