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Dynamical evolution of asteroid 1999 RQ (Bennu). Close approaches to the Earth.

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ABSTRACT

The potentially hazardous asteroid 101955 Bennu 1999 RQ₃₆ was discovered by LINEAR in September 11, 1999 and currently has a minimum intersection distance (MOID) with the Earth's orbit ~ 0.0032228 AU and approaching zero around 2100.

In this paper, we present results on the dynamical evolution of the orbit of 101955 Bennu for 300 years in the future, as well as series of close encounters with the Earth. The aim is to check for possible close encounters with Earth and somewhat to compare our results with the previous work done by Milani et. al (2009).

The simulations were carried out in two sets, first without included non-gravitational forces (Yarkovski effect) and second with the Yarkovski effect taken into account. The aim is to compare the significance of the Yarkovski acceleration on Bennu over a period of 300 years. Furthermore, we account for the gravitational perturbations from all the planets, except Pluto and also allow for their mutual interaction. The orbits of 101955 Bennu and one-thousand fictitious clones were integrated forward in time for 300 years using the RADAU algorithm (Everhart 1985). Close encounters with the Earth are monitored with a precision of one day.

Furthermore, the heliocentric position of each clone, during a close encounter with Earth of less 0.005 AU, is then mapped onto the b -plane, where the dynamics of the particles is examined in terms of geocentric coordinates ξ and ζ (Öpik 1976).