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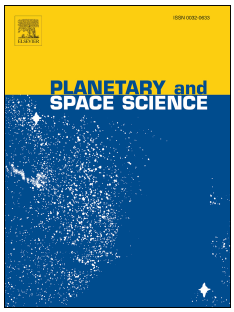

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Application of metrics in the space of orbits to search for asteroids on close orbits

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Abstract

Here, we apply natural metrics defined in the space of Keplerian orbits to search for asteroids in close orbits. First, we use as a metric the distance between two orbits in the five-dimensional space of Keplerian orbits. Then, we apply the distance in three-dimensional factor-space of positional orbital elements. We have identified new asteroid pairs with a possible common origin. Once the asteroid pairs candidates are identified, we analyze their dynamical evolution. We find that the Yarkovsky effect must be taken into account when carrying out high-accuracy numerical simulations of the orbital evolution of asteroid pairs. Finally, we consider the planning of follow-up astrometric and photometric observations of the candidate asteroid pairs to determine their rotational parameters, needed to modeling the Yarkovsky effect.

Keywords: asteroids, metric, asteroid pairs, asteroid families

2010 MSC: 70F15

1. Introduction

The distribution of asteroid orbits in the Solar System is the result of various processes that shaped it over time (see e.g. Deienno et al., 2016; Granvik et al., 2017). It has been showed by Vokrouhlický & Nesvorný (2008) that a large number of asteroid pairs exist in the main belt. In these cases, both asteroids in

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