

The dramatic event of the 2029 close encounter (CE) between the Earth and the asteroid (99942) Apophis on April 13th.,2029 at a minimum distance of roughly 38 400 km constitutes an opportunity to deepen investigations concerning the orbital and rotational changes of an asteroid during such an event.

Here, after summarizing the changes undergone by the asteroid orbital elements during the CE we evaluate the rotational changes of Apophis caused by tidal gravitational effects. In particular we take into account not only the effects due to the dynamical flattening of Apophis but also the effects due to its triaxial form, on the precession-nutation motion of the axis of rotation in space. Moreover we compute what should be the modifications of the angular rate of rotation due to tidal deformation. Our method is based on the determination of the disturbing potential due to the Earth, depending both on the asteroid flattening and triaxiality. Moreover we estimate what should be the zonal deformation of the asteroid due to the tide exerted by the Earth.

As results, we show that the variations of obliquity and precession in longitude of Apophis during the 2029 close encounter can reach very large values, at the level of 10° or more, depending on the initial values of a few physical and geometrical parameters. On the contrary, variations of the spin rate should be relatively small, but not negligible in view of the expected radar observations

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