

The empiric integral of motion in 3:2 resonance

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Here we report about the empiric quasi-integral of motion, bounded proper orbital elements (proper frequency g , eccentricity and semiajor axis) for a special case 3:2 resonance with Jupiter. The dependences between each pairs of orbital elements of known members of Hilda group are approximated. On base these approximations, the expression, contained a , e , and g is obtained. The approximate expression, connecting the proper elements a, e, g is:

$$I_1 = 2g - 109296\delta_a + 165.81/e \approx 502 \quad (1)$$

where $\delta_a = a - 3.9703$ is the distance to nominal resonance in AU. However, non-linear expression is better conserved:

$$I_2 = 2g - 109296\delta_a + 49/e^{3/2} \approx 242 \quad (2)$$

Also, we performed numerical integrations and showed, that test particles with arbitrary initial orbital elements in vicinity 3:2 resonance rapidly migrate to the described dependence. Therefore, we can conclude that only orbits, satisfying the obtained condition, are stable in the vicinity of 3:2 resonance. However, we have detected a group of 9 asteroids that cannot be included in the studied dependence. All of them have small eccentricities $e < 0.07$. Perhaps these objects have recently experienced a collision or were moving under the influence of an extremely strong Yarkovsky effect.

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