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Resonance in the Motion of a Geo-Centric Satellite Due to the Poynting-Robertson Drag and Oblateness of the Earth

Charanpreet Kaur [1*], Binay Kumar Sharma [2] and Sushil Yadav [3]

[1] *Department of Mathematics, S.G.T.B. Khalsa College, University of Delhi, Delhi-110052, India*
[2] *Department of Mathematics, S.B.S. College, University of Delhi, Delhi-110017 India*
[3] *Department of Mathematics, Maharaja Agrasen College, University of Delhi, Delhi-110096, India*

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Abstract: In this paper, we have investigated resonances in a geo-centric satellite under the gravitational effect of the Sun, the Earth, oblateness of the Earth and the Poynting-Robertson (P-R) drag. It is found that resonances occur due to the commensurability between satellite's mean motion and average angular velocity of the Earth around the Sun, and also between the satellite's mean motion and average angular velocity of the regression angle. Amplitudes and time periods of the oscillation at the resonance points have been determined. Effects of oblateness and P-R drag on the amplitudes and time periods of oscillation at different resonance points have been analyzed graphically. We have also compared the values of the amplitude and time period of oscillations due to the oblateness parameter and P-R drag. We have observed that amplitude as well as the time period decreases as ϕ (an orbital angle of the Earth around the Sun) increases between -90^0 to 90^0, and the effect of the P-R drag parameter is minor on the amplitudes and time periods. Also, the amplitude and time-period decrease as ψ increases between -90^0 to 90^0.

Keywords: *three-body problem; ecliptic plane; orbital plane; resonance; Poynting-Robertson drag; oblateness.*

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* Corresponding author: mailto:syadav@mac.du.ac.in