Time evolution of the Jacobi integral of the elliptic restricted three-body problem

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In our previous studies, we investigated the conditions for the temporary capture of asteroids around a planet. For permanent capture of asteroids as stable satellites, so-called irregular satellites, energy dissipation is required. Interactions of temporarily captured asteroids with a hypothetical gas disk or atmosphere around Mars, the tidal force from the host planet, and the split-up of binary asteroids have been considered as the mechanism of energy dissipation. For all these mechanisms require fine-tuning of parameters for reasonable results. As new research, I investigate the effect of the eccentricity of the host planet on energy dissipation in the framework of the elliptic restricted three-body problem. Jacobi integral, which is a well-known conservational quantity in the circular restricted three-body problem, is no longer conserved in the elliptic restricted three-body problem. However, the behavior of the non-conserved part could tell us the behavior of the asteroids temporarily captured. In the presentation, I will analiticaly and numericaly show if the region on the orbital parameter space exists, where the Jacobi integral keeps changing toward a value that is suitable for satellites.

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