Abstract Submitted
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Higher-order effects in the dynamics of hierarchical triple systems. Quadrupole-squared terms[1] CLIFFORD WILL, University of Florida — We analyze the secular evolution of hierarchical triple systems to second-order in the quadrupolar perturbation induced on the inner binary by the distant third body. In the Lagrange planetary equations for the evolution of the instantaneous orbital elements, second-order effects arise from obtaining the first-order solution for each element, consisting of a slowly varying piece and an oscillatory perturbative piece, and reinserting it to obtain a second-order solution. After an average over the two orbital timescales to obtain long-term evolutions, these second-order quadrupole (Q^2) terms would be expected to produce effects of order R^6, where R is the ratio of the semimajor axes. However we find that the orbital average actually enhances the second-order terms by a factor of the ratio of the two periods, $\sim R^{-3/2}$. For systems with a low-mass third body, the Q^2 effects are small, but for systems with a comparable-mass or very massive third body, , such as a Sun-Jupiter system orbiting a solar-mass star, or a $100\,M_\odot$ binary system orbiting a $10^6\,M_\odot$ massive black hole, the Q^2 effects can completely suppress flips of the inner orbit from prograde to retrograde and back that occur in the first-order solutions.

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