

THEORY OF MOTION OF JUPITER'S GALILEAN SATELLITES

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ABSTRACT

The final results for the theory enabling one to calculate the positions of the Galilean satellites and their partial derivatives are presented, following the techniques outlined in earlier papers. Extensive use of algebraic manipulation software on a digital computer is employed to generate the final expressions. The new theory is, in effect, a revitalization of Sampson's theory in which we (a) remove algebraic and mathematical errors existing in Sampson's work, (b) introduce some neglected effects due to solar interactions and the 3-7 commensurability, (c) allow for non-zero amplitude and phase of the free libration, (d) express the final results as analytic functions of variations in 49 arbitrary constants of integration and physical parameters, (e) construct the theory in a manner which readily allows for future revision, and (f) provide analytic expressions for the partial derivatives with respect to the 49 parameters.