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Evolutionary equations of the two-planet three-body problem with variable masses

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Masses of real celestial bodies changes anisotropically [1-2] and reactive forces appear, and they need to be taken into account in the study of these bodies dynamics. We studied the two-planet problem of three bodies with variable masses in the presence of reactive forces and obtained the equations of perturbed motion in the Newton's form equations [3]. The motion equations in the orbital coordinate system, unlike the Lagrange equation [4], are convenient for taking into account the reactive forces. The perturbing force is expanded in terms of osculating elements. The expansion of perturbing functions is a time-consuming analytical calculation and results in very cumbersome analytical expressions. In the considered problem we obtained expansions of perturbing functions by small parameters up to and including the second degree. In the nonresonant case, we obtained evolution equations in the Newton equation form. All symbolic calculations were done in Wolfram Mathematica [5].

Keywords
two-planet three-body problem, variable mass, evolutionary equations.

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