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Is the Jacobi theorem valid in the singly averaged restricted circular three-body problem?
(English. Russian original) [Zbl 1476.70022]

Summary: C. Jacobi found that in the general $N$-body problem (including $N = 3$), the negativity of the
total energy of the system was necessary for the Lagrangian stability of any solution. For the restricted
three-body problem, this statement is trivial, since a zero-mass body makes zero contribution to the
system energy. If we consider only the equations describing the motion of a zero-mass point, then the
energy integral disappears. However, if we average the equations over the longitudes of the main bodies,
the energy integral appears again. Is the Jacobi theorem true in this case? It turns out that it is not.
For arbitrarily large values of total energy, there are bounded periodic orbits. At the same time, the
negativity of the energy turned out to be sufficient for the boundedness of an orbit in the configuration
space.

MSC:
70F07 Three-body problems

Keywords:
restricted circular three-body-problem; Jacobi theorem on stability; averaging

Full Text: DOI

References:
[1] Subbotin, M. F., Introduction to Theoretical Astronomy (1968), Moscow: Nauka, Moscow

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