

Dynamical aspects of multi-round horseshoe-shaped homoclinic orbits in the RTBP

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Abstract We consider the planar restricted three-body problem and the collinear equilibrium point L_3 , as an example of a center $\times$ saddle equilibrium point in a Hamiltonian with two degrees of freedom. We explore numerically the existence of symmetric and non-symmetric homoclinic orbits to L_3 , when varying the mass parameter μ . Concerning the symmetric homoclinic orbits (SHO), we study the multi-round, m -round, SHO for $m \geq 2$. More precisely, given a transversal value of μ for which there is a 1-round SHO, say μ_1 , we show that for any $m \geq 2$, there are countable sets of values of μ , tending to μ_1 , corresponding to m -round SHO. Some comments on related analytical results are also made.

Keywords Invariant manifolds · Multi-round homoclinic orbits · Restricted three-body problem · Symmetric homoclinic orbits · Homoclinic connection to L_3

1 Introduction

It is well known that homoclinic and heteroclinic connections of hyperbolic objects play an important role in the study of dynamical systems from a global point of view. They are also

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