

Spatial Restricted Rhomboidal Five-body Problem and Horizontal Stability of its Periodic Solutions

Marchesin, M.^a, Vidal C.^b

^a Departamento de Matemática, Universidade Federal de Minas Gerais, Campus Pampulha - Belo Horizonte - MG. mdm@mat.ufmg.br

^b Universidad de Bio-Bio, Casilla 5-C, Concepción, VIII-región, Chile clvidal@ubiobio.cl

The spatial restricted rhomboidal five-body problem, or shortly, SRRFBP, is a five body problem in which four positive masses, called the primaries, move two by two in coplanar circular motions with the center of mass fixed at the origin such that their configuration is always a rhombus, the fifth mass being negligible and not influencing the motion of the four primaries.

The Hamiltonian function that governs the motion of the fifth mass is derived and has three degrees of freedom depending periodically on time. Using a synodical system of coordinates, we fix the primaries in order to eliminate the time dependence. With the help of the Hamiltonian structure, we characterize the regions of possible motion. The vertical z axis is invariant and we study what we call the Rhomboidal Sitnikov Problem. Unlike the classical Sitnikov Problem, no chaos exists and the behavior of the fifth mass is quite predictable, periodic solutions of arbitrary long periods are shown to exist and we study numerically their linear horizontal stability.

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