

# Periodic and quasi-periodic orbits for the spatial isosceles Three-Body Problem

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## Abstract

Using appropriate coordinates, we will prove the existence of 2-dimensional invariant tori for a special case of the spatial three-body problem, the spatial isosceles three-body problem. These tori are filled with either periodic or quasi-periodic orbits and they are not KAM tori. In particular, using the analytic continuation method, we will see that the 2-dimensional invariant tori of the circular Sitnikov problem (an special case of the restricted spatial isosceles three-body problem) can be continued to the spatial isosceles three-body problem for sufficiently small values of one of the masses.

**Key words and expressions:** Isosceles three-body problem, periodic orbits, quasi-periodic orbits, analytic continuation method.

## 1. Introduction

In this work we consider a particular case of the spatial three-body problem, the *spatial isosceles three-body problem* (or simply in this work the *isosceles problem*). Using appropriate coordinates, we reduce the dimension of the phase space of this problem in two units obtaining the *reduced isosceles problem*. We see (in Theorem 1) that the periodic orbits of the reduced isosceles problem with angular momentum different from zero give 2-dimensional invariant tori for the isosceles problem that can be filled with either periodic or quasi-periodic orbits. We note that these tori are not KAM tori. Using the