Dynamics of axially symmetric perturbed Hamiltonians in 1:1:1 resonance

Dante Carrasco, Claudio Vidal, Jhon E. Vidarte
Departamento de Matemática
Facultad de Ciencias
Universidad del Bío-Bío.

Jesús F. Palacián, Patricia Yanguas
Departamento de Ingeniería Matemática e Informática
Institute for Advanced Materials (INAMAT)
Campus de Arrosadía
Universidad Pública de Navarra. *

April 6, 2016

Abstract

This communication presents a study on the dynamics of a family of perturbed three-degree-of-freedom Hamiltonian systems which are in 1:1:1 resonance. The perturbation consists of axially symmetric cubic and quartic polynomials. The analysis is performed by normalization, reduction and KAM techniques. First, the system is reduced by the axial symmetry and then, from certain relative equilibria, periodic solutions and KAM 3-tori of the departure system are calculated. Next, the oscillator symmetry is extended by normalization up to order 4, the normalized system is truncated, relative equilibria are computed and periodic solutions and KAM 3-tori of the original system are obtained. Finally, the reduction of the two symmetries leads to a one-degree-of-freedom system that is completely analysed in the twice reduced phase space. All the relative equilibria, together with the stability and bifurcations are determined and the corresponding invariant tori of the departure system are computed.

*{dcarrasc, clvidal, jvidarte}@ubiobio.cl, {palacian, yanguas}@unavarra.es