3 d.o.f. Hamiltonian dynamics in neighborhoods of separatrix manifolds: integrable Hamiltonians and perturbations

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Abstract

I'm going to discuss the structure of integrable Hamiltonian systems in neighborhoods of separatrix manifolds of simple singular points. As is well known, there are 6 types of simple singular points for a 3 d.o.f. Hamiltonian, among them 5 have stable and unstable manifolds which are merged usually, if the related level of the Hamiltonian is compact and do not contain other singular points. It will be presented bifurcation diagrams for all types of points, isoenergetical invariants, examples of integrable Hamiltonians with two parametric families of nonorientable two-dimensional saddle tori, the topology of merged stable and unstable manifolds, bifurcations, when varying values of integrals, monodromies for several types of points will be also discussed.

For some types of points perturbations of integrable Hamiltonians will be discussed. In particular, we present results on the existence of homoclinic orbits to singular points, periodic orbits and invariant tori. The related complicated dynamics will be also one of the topics.