THEMATIC SESSION: Dynamical Systems

Asymptotic motions for time-dependent perturbations of Hamiltonian systems having an invariant torus

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Dynamical systems subject to perturbations that decay over time are relevant in the description of many physical models, e.g. when considering the effect of a laser pulse on a molecule, in epidemiological studies, as well as in celestial mechanics. For this reason, in the present talk, we discuss two cases. First, we consider a time-dependent perturbation of a Hamiltonian dynamical system having an invariant torus supporting quasiperiodic solutions. Next, we analyze the case where the orbits associated with the unperturbed system are arbitrary. Assuming the perturbation decays polynomially fast in time in the first case and exponentially fast in the second one, we prove the existence of orbits converging as time tends to infinity to the dynamics associated with the corresponding unperturbed system.

The present work is motivated by the example of the planar three-body problem perturbed by a given comet coming from and going back to infinity asymptotically along a hyperbolic Keplerian orbit, modeled as a time-dependent perturbation.