In this talk we consider the coupling of two piecewise-defined Hamiltonian systems, each obtained as a generalization of a model of the rocking block, and study certain properties related to instabilities caused by energy accumulation under periodic perturbations.

The rocking block is not only a paradigm of a mechanical system with impacts, but also it is used to model the behaviour of slender structures under an external forcing, such as water tanks or nuclear fuel rods under earthquake excitation. In addition, the stacked coupling of such blocks is also of interest for the modeling of structures in civil engineering or nano carbon tubes under small vibrations.

When coupling two rocking blocks through a generic Hamiltonian perturbation which also includes the non-autonomous periodic forcing, we obtain a 5-dimensional piecewise-defined Hamiltonian system with two switching manifolds. We then focus on the configuration given by large amplitude oscillations for one block while the other one oscillates with higher frequency and smaller amplitude. For the unperturbed case, this mode of operation is associated with 4-dimensional $C^0$ heteroclinic manifolds between 3-dimensional manifolds that are only continuous.

By means of the impact map onto the switching manifold associated with the fast rocking block, we prove the persistence of these manifolds, derive sufficient conditions for the existence of heteroclinic transversal intersections and construct the scattering map. It associates asymptotic dynamics on the 3-dimensional manifolds through heteroclinic connections. The properties of this map allow us to show that, under certain conditions, for any arbitrarily ing block at every large oscillation of the slow motion rock. This allows us to construct an heteroclinic skeleton that, when shadowed, the system becomes unstable in large time scales by further accumulating energy, hence leading to Arnold diffusion.

We also illustrate the theoretical results with numerical computations of heteroclinic connections between tori whose averaged energies fit with the given by first order properties of the scattering map.