Contribution Title: DISSIPATIVE UNFOLDING OF 1:1 SEMI-SIMPLE RESONANCE WITH DEFINITE AND MIXED KREIN SIGNATURE
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We consider a linear Hamiltonian system in 1:1 semi simple resonance and study the unfolding of the double eigenvalues in the presence of non-Hamiltonian dissipative and non-conservative perturbations. It is known that interaction of eigenvalues for the unperturbed Hamiltonian is completely described by the one-parameter slices of the two-parameter MacKay's eigenvalue cones (MacKay, 1986). Since there are only two possible spatial orientations of the cones corresponding to either definite or mixed Krein signature, all one has to do to predict the unfolding into avoided crossings or into bubbles of instability is to calculate the signatures of the appropriate eigenvalues at the resonance. Developing the MacKay's theory further we find the generic deformation of the MacKay's cones due to non-Hamiltonian perturbations and its dependence on the Krein signature of the eigenvalues in the 1:1 resonance. One of the new eigenvalue surfaces known in the crystal optics as the "double coffee filter" (Berry and Dennis, 2003) is typical in the case of the definite Krein signature. The theory is applied to the problems of wave propagation in the gyroscopic elastic continua in the presence of non-Hamiltonian perturbations. Hamiltonian perturbations like mass and stiffness modifications are not enough to cause instability at low speeds where the interacting waves have the same Krein signature. Unstable interaction of waves with the same Krein signature can only be caused by dissipative and non-conservative perturbations originated at the frictional contact. Since the typical unfolding scenarios of the 1:1 semi-simple resonance do not depend much on the details of the modeling of the frictional contact with the rotating elastic continuum, we are able to establish the fundamental reasons for the onset of friction-induced instabilities in flexible rotors that cause, e.g., a brake to squeal, as well as to develop new means for the control of the friction-induced instabilities.