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Near-Reversible 1 : 1 Resonance

This talk explores the interface between reversible and non-reversible dynamical systems, near 1 : 1 resonance; that is, the near-reversible limit. The linearization of these systems has double, nonsemisimple purely imaginary eigenvalues. The unfolding of the codimension-3 nonreversible case leads to a Whitney umbrella of classical Hopf bifurcations. The codimension-1 reversible case corresponds to the “handle” of this umbrella. Families of periodic solutions exist as centers at points along this handle, in the reversible case. We show that, along rays emanating from this handle, there is a one-to-one correspondence between hyperbolic periodic orbits arising by Hopf bifurcation in the nonreversible case and particular orbits in the centers of the reversible case. We also explore the relationship between quasiperiodic families in the reversible case and invariant tori in the nonreversible case. This work provides some justification for using reversible mathematical models for physical systems which are only close to being reversible.

This is joint work with G. Iooss, INLN–CNRS, France.