

***Normal forms for volume preserving maps  
and bifurcations of invariant circles***

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I will show that for volume preserving maps in dimension 2 and 3 with nilpotent linearisation there exists an optimal normal form with the following properties: The truncation of the formal normal form expansion at any order gives a map that is exactly volume preserving with an inverse that is also polynomial and has the same degree. The result is achieved by a non-standard choice of the complement of the image of the homological operator.

Using the unfolding of this normal form we study the Saddle-Node-Hopf bifurcation in which an invariant circle is created. A numerical study of the normal and transverse rotation numbers of these invariant circles under parameter variation reveals new types of bifurcation when resonances are encountered.