

保持n-形式系统的Lie对称群约化及应用

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摘要 该文考虑保持n-形式(面积、体积的高维推广概念)的n维向量场,应用Lie群方法对其约化问题进行了系统性研究,得到了下列结果.第一,如果保持n-形式的n维向量场具有一个单参数保持n-形式的空间对称群,则可具体地构造出一个与向量场无关的变换,使得原向量场约化掉一维,并且该约化向量场保持相应的(n-1)-形式.第二,上述n维向量场如果具有一个r参数保持n-形式的空间Abelian对称群,则原系统可被约化成一保持(n-r)-形式的(n-r)维向量场.特别n=4,r=2时,约化向量场有较简单的形式,于是可具体地讨论该类四维扰动系统的一些重要动力学性质.最后以著名的L-K模型及ABC流为例阐述了文中提出的一般方法的应用.

关键词 [群,曲面,Lie群,不变环面](#)

分类号

LIE SYMMETRY GROUP REDUCTION OF THE SYSTEMS PRESERVING n-FORM AND ITS APPLICATIONS

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Abstract In this paper,n-dimensional vectorfields preserving n-form (a high dimensional generalization of area,volume) are considered.By the mean of Lie group the reduction of this kind of vectorfields is studied systematically,and the following results are obtained.Firstly if a n-dimensional vectorifields preserving n-form admits a one-parameter symmetry group that is spatial and preserving n-form,then it can be reduced into a (n-1)-dimensional vectorfield preserving the corresponding (n-1) form by constructing a concrete transformation independent of the vectorfield.Secondly,if the above n-dimensional vectorifield admits a r-parameter symmetry group that is spatial,Abelian and preserving n-form,then it can be reduced into a (n-r)-dimensional vectorifield preserving (n-r)-form.In particular,when n=4 and r=2,some important dynamical behavior in this kind of four-dimensional perturbed systems can be discussed in detail.Finally the applications of the method proposed in this paper are illustrated by two examples:the famous L-K model and ABC flow.

Key words [group](#) [surface](#) [Lie group](#) [invariant torus](#)

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