

两个旋转球之间粘性不可压缩流动的Lorenz系统

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Lorenz Systems for the Viscous Incompressible Flows Between Two Concentric Rotating Spheres

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摘要 两个不同角速度旋转球之间粘性流动问题是地球外部大气流动的简化模型. 通过引入球Bessel函数的有理表达式, 得到Stokes算子特征值与特征函数的有理表达式. 利用Stokes算子特征函数作为基函数系, 对两个旋转球间流动问题进行谱Galerkin逼近. 由三模态的Galerkin逼近方程得到一个类Lorenz系统, 我们对此系统进行分岔问题和吸引子的讨论, 从而得到原问题的稳定性判定.

关键词: 球Bessel函数 Stokes算子特征函数 粘性不可压缩流动 类Lorenz系统 湍流

Abstract: The incompressible viscous flow problem between two concentric rotating spheres is a simple model for the geophysical flow around the earth. Firstly, we obtain rational expression of eigenvalue and eigenfunction of Stokes problem by using rational polynomial form of spherical bessel function in this case. Secondly, we obtain spectral approximate solutions of Navier-Stokes equation, and if we take three model as bases functions in spectral approximate, a quasi-lorenz system is obtained. In this paper, the bifurcation phenomena and attractors are discussed.

Key words: spherical Bessel function eigenfunction of Stokes problem viscous incompressible flow quasi-Lorenz system turbulence

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