数学与系统科学研究院

计算数学所网络学术报告

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报告题目：

Mixed Discontinuous Galerkin Method for Brinkman Problem

邀请人： 龚伟 副研究员

报告时间：2021 年 11 月 25 日（周四）

上午 9:30-10:30

报告工具：腾讯会议（ID: 207 227 830）

会议链接：

https://meeting.tencent.com/dm/G0eC6rUYX5lJ

Abstract：

The Brinkman equations can be regarded as a combination of the Stokes and Darcy equations which model transitions between the fast flow in channels (governed by Stokes equations) and the slow flow in porous media (governed by Darcy's law). The numerical challenge for this model is the designing of a numerical scheme which is stable for both the Stokes- dominated (high permeability) and the Darcy-dominated (low permeability) equations. In this talk, we discuss the Brinkman model in n dimensions (n = 2, 3) by using the mixed discontinuous Galerkin (MDG) method, which meets this challenge. This MDG method is based on the stress–velocity formulation and uses a discontinuous piecewise polynomial pair, where the stress field is symmetric. The main unknowns are the stress and the velocity, whereas the pressure is easily recovered through a simple postprocessing. A key step in the analysis is to establish the parameter-robust inf–sup stability through specific parameter-dependent norms at both continuous and discrete levels. Therefore, the stability results presented here are uniform with respect to the permeability. Thanks to the parameter-robust stability analysis, we obtain optimal error estimates for the stress in broken H(div)-norm and velocity in L2-norm. Furthermore, the L2 error estimate for stress is derived under certain conditions. Finally, numerical experiments are provided to support the theoretical results and to show the robustness, accuracy, and flexibility of the MDG method.

报告人简介：

王飞，西安交通大学副教授，博士生导师。**2010** 年 **6** 月获浙江大学计算数学专业博士学位。**2010** 年 **7** 月至 **2012** 年 **1** 月在华中科技大学担任讲师；**2012** 年 **1** 月至 **2013** 年 **5** 月在美国爱荷华大学任 **Visiting Assistant Professor**；**2013** 年 **5** 月至 **2016** 年 **6** 月在美国宾州州立大学任 **Research Associate**；**2015** 年 **9** 月入选西安交通大学青年拔尖人才支持计划。**2017** 年入选陕西省青年百人。研究领域为数值分析与科学计算，主要研究兴趣包括：偏微分方程数值解及其应用，变分不等式的高效高精度数值方法，求解偏微分方程的神经网络方法。已在国际 **SCI** 期刊发表学术论文三十多篇，其中包括计算数学方向的顶级期刊：**SIAM J Numer. Anal.，IMA J Numer. Anal.，Numer. Math.，Comput. Methods Appl. Mech. Engrg.**等。主持国家自然科学基金面上项目 **2** 项，青年项目 **1** 项。

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