

Convergence and Stability of the MAC scheme for Stokes/Darcy coupling problems based on finite difference methods

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Abstract

In this talk, to begin with, Stokes/Darcy coupling flows which arise from physical models such as biology, engineering and geophysical fluid dynamics are considered. In the literature, there are many numerical methods related to finite element methods applied to solve this coupling problem. Unlike finite element methods, due to that there is lack of natural variational formulation, in general, the analysis of the scheme based on finite difference methods becomes complicate. In this work, the MAC scheme for this coupling problem based on finite difference methods is used. Convergence and stability of the scheme will be presented. The second part will present the development of numerical schemes for Navier-Stokes and Darcy coupling problems based on projection methods. Numerical simulations demonstrate the results which match the case of only Navier-Stokes equations that also are computed using the projection method. These are joint research works with Ming-Chih Lai and Kian Chuan Ong.