Abstract for HKUST IAS-HKWM-EASIAM Joint Workshop on Recent Advances on Scientific Computing, Random Matrices and Data Science (December 18-20, 2024)

An Energy-stable Mixed Finite Element Method for Rosensweig Ferrofluid Flow Model

Xiaoping Xie

School of Mathematics, Sichuan University, P. R. China

Email: xpxie@scu.edu.cn

We develop a mixed finite element method for the Rosensweig's ferrofluid flow model. First, we establish some regularity results for the weak solution. Next, for the spatial semi-discretization of the model using mixed finite elements we show that energy inequality of the continuous equation is preserved and give optimal error estimates in $L^\infty(L^2)$ and $L^2(H^1)$ norms. For the full discretization using implicit Euler scheme we show the existence and uniqueness of solutions, the unconditional stability and optimal error estimates. Finally, we provide numerical experiments to verify the theoretical results.

This is joint work with Yongke Wu.