

STRUCTURE-PRESERVING AND ENERGY-STABLE FINITE ELEMENT METHODS FOR MHD SYSTEMS

Kaibo Hu¹, Xiaozhe Hu², Yicong Ma³, and Jinchao Xu⁴

¹ School of Mathematics, Peking University, Beijing, China, hukaibo02@gmail.com

²Department of Mathematics, Pennsylvania State University, University Park, PA16802, USA,
hu_x@math.psu.edu and www.math.psu.edu/hu_x

³Department of Mathematics, Pennsylvania State University, University Park, PA16802, USA,
ma_y@math.psu.edu

⁴Department of Mathematics, Pennsylvania State University, University Park, PA16802,
USA, xu@math.psu.edu and www.math.psu.edu/xu

Key words: *MHD; Mixed Formulation; Divergence-free*

In this presentation, we report some structure-preserving and energy-stable finite element methods for solving the incompressible MHD systems. One goal is to preserve some key divergence-free conditions strongly on the discretized level by means of appropriate mixed formulations and appropriate finite element spaces for various physical variables. Furthermore, we establish the energy estimate on the discretized level and show that the proposed numerical scheme is an energy-stable discretization for the incompressible MHD system.