

# Some results of the magneto-hydrodynamic system in Besov spaces

Baoquan Yuan

School of Mathematics and Information Science, Henan Polytechnic University, Henan, 454000, P.R. China. bqyuan@hpu.edu.cn

## Abstract:

In this talk, we present the global well-posedness of solutions to the Cauchy problem of incompressible magneto-hydrodynamics system for large initial data in homogeneous Besov space  $\dot{B}_{p,r}^{\frac{2}{p}-1}(\mathbb{R}^2)$  for  $2 < p < \infty$  and  $1 \leq r \leq \infty$ . In the case spatial dimension  $n \geq 3$  we establish the global well-posedness of solution for small data and the local one for large data in Besov space  $\dot{B}_{p,r}^{\frac{n}{p}-1}(\mathbb{R}^n)$ ,  $1 \leq p < \infty$  and  $1 \leq r \leq \infty$  or  $1 \leq r < \infty$  (in the local case). Moreover, we also prove the weak-strong uniqueness of solutions with data in  $\dot{B}_{p,r}^{\frac{n}{p}-1}(\mathbb{R}^n) \cap L^2(\mathbb{R}^n)$  for  $\frac{n}{2p} + \frac{2}{r} > 1$

## References:

- J. Bergh and J. Löfstrom, Interpolation spaces, an introduction, Springer-Verlag, New York, 1976.
- J.M. Bony, Calcul symbolique et propagation des singularités pour les équations aux dérivées partielles non linéaires. *Ann. de l'Ecole Norm. Sup.* **14** (1981), 209-246.
- M. Cannone, Harmonic analysis tools for solving the incompressible Navier-Stokes equations, In: *Handbook of Mathematical Fluid Dynamics Vol. 3* (eds. S. Friedlander and D. Serre), Elsevier, 2004, pp. 161-244.
- J.-Y. Chemin and N. Lerner, Hyperbolic operators with non-Lipschitz coefficients, *Duke Mathematical Journal*, **77** (1995), 657-698.
- G. Duvaut and J.L. Lions, Inéquations en thermoélasticité et magnétohydrodynamique, *Ach. Rational Mech. Anal.* **46** (1972), 241-279.
- Y. Giga, Solutions for semilinear parabolic equations in  $L^p$  and regularity of weak solutions of the Navier-Stokes system, *J Differ. Equations* **61** (1986), 186-212.
- I. Gallagher and F. Planchon, On infinite energy solutions to the Navier-Stokes equations: global 2D existence and 3D weak-strong uniqueness, *Arch. Ration. Mech. Anal.* **161** (2002), 307-337.

- C. Miao, Harmonic analysis and application to partial differential equations, Science Press, Beijing, 2004, second edition.
- C. Miao and Y. Gu, Space-time estimates for parabolic type operator and application to nonlinear parabolic equations, *J. Partial Differ. Equations* **11** (1998), 301-312.
- C. Miao, B. Yuan and B. Zhang, Well-posedness of the Cauchy problem for the fractional power dissipative equations, 1-31, 2005, preprint.
- R. O'Neil, Convolution Operators and  $L_{p,q}$  Spaces. *Duke Math. J.* **30** (1963), 129-142.
- M. Sermange and R. Temam, Some mathematical questions related to the MHD equations, *Comm. Pure Appl. Math.* **36** (1983), 635-664.
- E. Stein and G. Weiss, *Introduction to Fourier Analysis on Euclidean Spaces*, Princeton Univ. Press, 1971.
- H. Triebel, Theory of function spaces, monograph in mathematics, Vol.78, Birkhauser Verlag, Basel, 1983.