

Ye, Zhuan; Zhao, Xiaopeng

Global well-posedness of the generalized magnetohydrodynamic equations. (English)

Zbl 1404.35374

Z. Angew. Math. Phys. 69, No. 5, Paper No. 126, 26 p. (2018).

Summary: In this paper, we establish the global existence of mild solutions to the n -dimensional generalized MHD system provided that the norms of the initial data are bounded exactly by the minimal value of the viscosity coefficients and the fractional powers. In addition, we also establish the existence of the global small solution in the Fourier-Herz spaces. Finally, we prove the long time decay of the global solutions in the corresponding spaces.

MSC:

- 35Q35 PDEs in connection with fluid mechanics
- 35B65 Smoothness and regularity of solutions to PDEs
- 76W05 Magnetohydrodynamics and electrohydrodynamics
- 35R11 Fractional partial differential equations

Cited in 1 Document

Keywords:

generalized MHD equations; global regularity; long time decay; Fourier-Herz spaces

Full Text: DOI

References:

- [1] Benameur, J., Long time decay to the lei-lin solution of 3D Navier-Stokes equations, J. Math. Anal. Appl., 422, 424-434, (2015) · Zbl 1303.35054
- [2] Caffisch, RE; Klapper, I.; Steele, G., Remarks on singularities, dimension and energy dissipation for ideal hydrodynamics and MHD, Commun. Math. Phys., 184, 443-455, (1997) · Zbl 0874.76092
- [3] Cannone, M.: Ondelettes, Paraproducts et Navier-Stokes. Diderot Editeur, Arts et Sciences, Paris (1995) · Zbl 1049.35517
- [4] Cannone, M.; Chen, Q.; Miao, C., A losing estimate for the ideal MHD equations with application to blowup criterion, SIAM J. Math. Anal., 38, 1847-1859, (2007) · Zbl 1126.76057
- [5] Cannone, M.; Wu, G., Global well-posedness for Navier-Stokes equations in critical Fourier-Herz spaces, Nonlinear Anal., 75, 3754-3760, (2012) · Zbl 1238.35083
- [6] Chen, Q.; Miao, C.; Zhang, Z., On the regularity criterion of weak solution for the 3D viscous magneto-hydrodynamics equations, Commun. Math. Phys., 284, 919-930, (2008) · Zbl 1168.35035
- [7] Coifman, R., Meyer, Y.: Au delà des opérateurs pseudo-différentiels, Astérisque, vol. 57, p. 185. Société Mathématique de France, Paris (1978) · Zbl 0483.35082
- [8] Duvaut, G.; Lions, JL, Inéquations en thermoélasticité et magnétohydrodynamique, Arch. Ration. Mech. Anal., 46, 241-279, (1972) · Zbl 0264.73027
- [9] Fan, J.; Alsaedi, A.; Hayat, T.; Nakamura, G.; Zhou, Y., A regularity criterion for the 3D generalized MHD equations, Math. Phys. Anal. Geom., 17, 333-340, (2014) · Zbl 1308.35205
- [10] Fujita, H.; Kato, T., On the Navier-Stokes initial value problem I, Arch. Ration. Mech. Anal., 16, 269-315, (1964) · Zbl 0126.42301
- [11] Gallagher, I.; Iftimie, D.; Planchon, F., Non-blowup at large times and stability for global solutions to the Navier-Stokes equations, C. R. Acad. Sci. Pairs Ser., 1334, 289-292, (2002) · Zbl 0997.35051
- [12] He, C.; Xin, Z., On the regularity of solutions to the magnetohydrodynamic equations, J. Differ. Equ., 213, 235-254, (2005) · Zbl 1072.35154
- [13] Iwabuchi, T., Global well-posedness for Keller-Segel system in Besov type spaces, J. Math. Anal. Appl., 379, 930-948, (2011) · Zbl 1223.35193
- [14] Kato, T., Strong L^p -solutions of the Navier-Stokes equations in \mathbb{R}^m with applications to weak solutions, Math. Z., 187, 471-480, (1984) · Zbl 0545.35073
- [15] Koch, H.; Tataru, D., Well-posedness for the Navier-Stokes equations, Adv. Math., 157, 22-35, (2001) · Zbl 0972.35084
- [16] Konieczny, P.; Yoneda, T., On dispersive effect of the Coriolis force for the stationary Navier-Stokes equations, J. Differ. Equ., 250, 3859-3873, (2011) · Zbl 1211.35218

- [17] Kozono, H.; Taniuchi, Y., Bilinear estimates in BMO and the Navier-Stokes equations, *Math. Z.*, 235, 173-194, (2000) · [Zbl 0970.35099](#)
- [18] Lei, Z.; Lin, F., Global mild solutions of Navier-Stokes equations, *Commun. Pure Appl. Math.*, 64, 1297-1304, (2011) · [Zbl 1225.35165](#)
- [19] Lei, Z.; Zhou, Y., BKM criterion and global weak solutions for magnetohydrodynamics with zero viscosity, *Discrete Contin. Dyn. Syst.*, 25, 575-583, (2009) · [Zbl 1171.35452](#)
- [20] Li, J.; Zheng, X., The well-posedness of the incompressible magnetohydrodynamic equations in the framework of Fourier-Herz space, *J. Differ. Equ.*, 263, 3419-3459, (2017) · [Zbl 1375.35383](#)
- [21] Liu, Q.; Zhao, J., Global well-posedness for the generalized magneto-hydrodynamic equations in the critical Fourier-Herz spaces, *J. Math. Anal. Appl.*, 420, 1301-1315, (2014) · [Zbl 1300.35098](#)
- [22] Liu, Q.; Zhao, J.; Cui, S., Existence and regularizing rate estimates of solutions to a generalized magneto-hydrodynamic system in pseudomeasure spaces, *Ann. Mat. Pura Appl.*, 191, 293-309, (2012) · [Zbl 1239.35033](#)
- [23] Miao, C.; Yuan, B.; Zhang, B., Well-posedness for the incompressible magneto-hydrodynamic system, *Math. Methods Appl. Sci.*, 30, 961-976, (2007) · [Zbl 1115.76082](#)
- [24] Planchon, F., Global strong solutions in Sobolev or Lebesgue spaces to the incompressible Navier-Stokes equations in \mathbb{R}^3 , *Ann. Inst. Henri Poincaré*, 13, 319-336, (1996) · [Zbl 0865.35101](#)
- [25] Sermange, M.; Temam, R., Some mathematical questions related to the MHD equations, *Commun. Pure Appl. Math.*, 36, 635-664, (1983) · [Zbl 0524.76099](#)
- [26] Wang, Y., Asymptotic decay of solutions to 3D MHD equations, *Nonlinear Anal.*, 132, 115-125, (2016) · [Zbl 1328.35186](#)
- [27] Wang, Y.; Li, F., Global existence of three dimensional incompressible MHD flows, *Math. Methods Appl. Sci.*, 39, 4246-4256, (2016) · [Zbl 1346.76214](#)
- [28] Wang, Y.; Wang, K., Global well-posedness of the three dimensional magnetohydrodynamics equations, *Nonlinear Anal. RWA*, 17, 245-251, (2014) · [Zbl 1297.35191](#)
- [29] Wu, G., Regularity criteria for the 3D generalized MHD equations in terms of vorticity, *Nonlinear Anal.*, 71, 4251-4258, (2009) · [Zbl 1166.76059](#)
- [30] Wu, J., Generalized MHD equations, *J. Differ. Equ.*, 195, 284-312, (2003) · [Zbl 1057.35040](#)
- [31] Wu, J., Regularity criteria for the generalized MHD equations, *Commun. Partial Differ. Equ.*, 33, 285-306, (2008) · [Zbl 1134.76068](#)
- [32] Ye, Z., Global well-posedness and decay results to 3D generalized viscous magnetohydrodynamic equations, *Ann. Mat. Pura Appl.*, 195, 1111-1121, (2016) · [Zbl 1379.35257](#)
- [33] Yuan, J., Existence theorem and regularity criteria for the generalized MHD equations, *Nonlinear Anal. Real World Appl.*, 11, 1640-1649, (2010) · [Zbl 1191.35011](#)
- [34] Zhang, Z.; Liu, X., On the blow-up criterion of smooth solutions to the 3D ideal MHD equations, *Acta Math. Appl. Sin. Engl. Ser.*, 20, 695-700, (2004) · [Zbl 1138.35382](#)
- [35] Zhou, Y., Remarks on regularities for the 3D MHD equations, *Discrete Contin. Dyn. Syst.*, 12, 881-886, (2005) · [Zbl 1068.35117](#)
- [36] Zhou, Y., Regularity criteria for the generalized viscous MHD equations, *Ann. Inst. H. Poincaré Anal. Non Linéaire*, 24, 491-505, (2007) · [Zbl 1130.35110](#)

This reference list is based on information provided by the publisher or from digital mathematics libraries. Its items are heuristically matched to zbMATH identifiers and may contain data conversion errors. It attempts to reflect the references listed in the original paper as accurately as possible without claiming the completeness or perfect precision of the matching.