Global regularity problem of two-dimensional magnetic B\'{e}nard fluid equations

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Abstract

In the paper, we devote to broadening the current global regularity results for the two-dimensional magnetic B\'{e}nard fluid equations. We study three cases: (i) fractional Laplacian dissipation $(-\Delta)^\alpha{u}$, partial magnetic diffusion $(\partial_{x_2x_2}b_1,\partial_{x_1x_1}b_2)$ and Laplacian thermal diffusivity $\Delta\theta$; (ii) partial fractional dissipation $(\Lambda^{2\alpha}_{x_2}u_1,\Lambda^{2\alpha}_{x_1}u_2)$, partial magnetic diffusion $(\partial_{x_2x_2}b_1,\partial_{x_1x_1}b_2)$ and Laplacian thermal diffusivity $\Delta\theta$; (iii) partial fractional magnetic diffusion $(\Lambda^{2\beta}_{x_2}b_1,\Lambda^{2\beta}_{x_1}b_2)$, Laplacian thermal diffusivity $\Delta\theta$ and without Laplacian dissipation Δ{u} (i.e., $\mu=0$)), and establish the global regularity for each cases.

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