The limit problem of the Patlak-Keller-Segel-Stokes system in scaling critical space

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Abstract

In this paper, we consider a singular limit problem of Cauchy problem for Patlak-Keller-Segel equation coupled with Stokes equation in scaling critical space. Precisely, by taking advantage of a coupling structure of equations and using a scale decomposition technique, it is shown that when the relaxation time parameter $\epsilon \rightarrow 0$, a solution of Patlak-Keller-Segel system coupled with nonstationary Stokes equation converges to that of Patlak-Keller-Segel system coupled with stationary Stokes equation in the critical Fourier-Besov space under certain conditions.

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