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*Analysis about a Two fluid mode and its comparison with MHD system*

We study a two fluid system which describes the motion of two charged particles in a strict neutral incompressible plasma. We study the well-posedness of the system in both space dimensions two and three. Regardless of the size of the initial data, we prove the global well-posedness of the Cauchy problem when the space dimension is two. In space dimension three, we construct global weak-solutions, and we prove the local well-posedness of Kato-type solutions. These solutions turn out to be global when the initial data are sufficiently small. We also study the stability of the solution around zero given that the initial data is small and has sufficient regularity. It turns out that our system is a system of regularity-loss and the  $L^2$  norm of lower derivatives of the solution decays. At last, this two fluid system can derive the classic MHD at least formally. Arsenio, Ibrahim and Masmoudi (2015) proved that the two fluid system converges to MHD under some constrain. We showed numerically that the two fluid system converges to MHD with no such constrain.