On the well-posedness of the low Mach number limit system

Xian Liao
Mathematical Institute, Charles University, Czech Republic
xian@karlin.mff.cuni.cz

This talk is devoted to the study of the dynamics of the gases with small Mach number. The model comes from the complete Navier-Stokes equations when the Mach number goes to zero, and we will show that it is well-posed.

For the case with viscosity, we first establish classical results in [1], namely the strong solutions exist locally (resp. globally) in time for big (resp. small) initial data. We consider this Cauchy problem in the critical Besov spaces with the lowest regularity. Then, as shown in [3], under a special relationship between the physical coefficients, the system recasts in a simpler form and one may prove that there exist weak solutions with finite energy. In dimension two, by a weak-strong uniqueness argument, this implies that strong solutions with finite energy exist for all positive times.

In the inviscid case, for the finite-energy initial data in the borderline Besov spaces, we prove the local-in-time existence result in [2]. In particular in dimension two, we show that the lifespan goes to infinity when the density tends to a positive constant.

Finally, some a priori estimates for the parabolic equations with variable coefficients will be given.

References

[1] *R. Danchin, X. Liao*: On the well-posedness of the full low Mach number limit system in general critical Besov spaces. Commun. Contemp. Math. *14* (2012), 1250022, 47 p.

[2] *F. Fanelli, X. Liao*: The well-posedness issue in endpoint spaces for an inviscid low-Mach number limit system. Submitted.

[3] *X. Liao*: A global existence result for a zero Mach number system. Accepted in J. Math. Fluid Mech.