Asymptotic Properties of Linearized Equations of Low Compressible Fluid Motion

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Abstract

We consider initial–boundary value problem for linearized equations of viscous barotropic fluid motion in a bounded domain. We briefly discuss results on existence, uniqueness and estimates of weak solutions to this problem. Then we focus on the asymptotic behaviour of the solutions as the compressibility tends to zero, i.e. on the passage to so-called *incompressible limit*. Briefly, we show that

- in general case the velocity field converges *weakly* in $L^2(0,T;H^1_0)$;
- if the initial condition for the velocity is divergence-free then the velocity converges *strongly* and the pressure converges $*$-*weakly* in $L^\infty(0,T;L^2)$;
- if, in addition, the *initial condition* for the pressure is compatible with the *initial value* of the pressure in the incompressible problem then the convergence of the pressure is *strong*.

We also demonstrate the necessity of these sufficient conditions using explicit solutions which are available for simplified data.

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