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Existence of strong solutions for a class of fluid-rigid coupling system. (Chinese. English summary) [Zbl 07366749]

Summary: In this paper, we discuss the existence of strong solutions for a class of fluid-structure interaction systems with multiple rigid bodies and incompressible fluid whose viscosity coefficients depend on density. We first use the variable substitution to establish a nonlinear differential equation corresponding to the research object in this article. Then, the smooth solution of the linearization problem is obtained by using the Galerkin approximation method, so that an approximate solution to the original problem can be constructed. By estimating the uniform boundedness of the approximated solution, the existence of strong solutions for a class of coupled systems describing the motion of multiple rigid bodies in incompressible fluid is proved finally. In particular, this conclusion allows a vacuum to appear inside the fluid when the initial density meets the compatibility conditions.

MSC:
35D35 Strong solutions to PDEs
35Q35 PDEs in connection with fluid mechanics

Keywords:
fluid-rigids coupling system; density-dependent viscosity coefficient; Galerkin’s approximation