

A boundary integral equation method for Stokes flow past a smooth obstacle in a two-dimensional channel

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Abstract

In this paper we obtain a compound double-layer representation for Stokes flow past or due to the motion of a solid particle in an ambient flow located in a two-dimensional channel. The indirect method used in this paper can be considered as an extension of the well known Completed Double Layer Boundary Integral Equation Method of Power and Miranda (1987) from the case of Stokes flow due to the motion of a solid particle in a viscous incompressible fluid of infinite expanse to the case of Stokes flow in a two-dimensional channel. The problem is reduced to the study of a system of Fredholm integral equations of the second kind. We prove that this system has a unique continuous solution. The numerical results are presented for Stokes flow past or due to the motion of a circular obstacle in a two-dimensional channel between two parallel solid walls. Some conclusions which refer to the effect of the walls on the considered Stokes flow are also included.