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Reduction of dimension via two-scale convergence

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ABSTRACT

The notion of two scale convergence was introduced for periodic homogenization by Nguetseng and fully developed by Allaire. It is a powerful tool that avoids formal two-scale expansions and generalising the idea of the energy method enables an easy proof of convergence of homogenization process.

Two-scale asymptotic expansions are also the most common tools for study of processes in thin domains and derivation of lower-dimensional models for their description.

In analogy with the homogenization theory we develop the notion of two-scale convergence as a tool for deriving lower - dimensional approximations for problems in thin domains. To illustrate the proposed method we derive the lower-dimensional approximation for non-Newtonian flow in thin domain. We write the problem in the form of variational inequality and then we use the two-scale compactness as well as the lower semicontinuity of the energy functional

Keywords: *two-scale convergence, thin domains, Navier-Stokes system, lubrication*

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