

On the asymptotic analysis of parabolic equations with stiff transport terms

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Abstract

We perform the asymptotic analysis of parabolic equations with stiff transport terms. This kind of problem occurs, for example, in collisional gyrokinetic theory for tokamak plasmas, where the velocity diffusion of the collision mechanism is dominated by the velocity advection along the Laplace force corresponding to a strong magnetic field. This work appeal to the filtering techniques. Removing the fast oscillations associated to the singular transport operator, leads to a stable family of profiles. The limit profile comes by averaging with respect to the fast time variable, and still satisfies a parabolic model, whose diffusion matrix is completely characterized in terms of the original diffusion matrix and the stiff transport operator. Introducing first order correctors allows us to obtain strong convergence results, for general initial conditions (not necessarily well prepared).