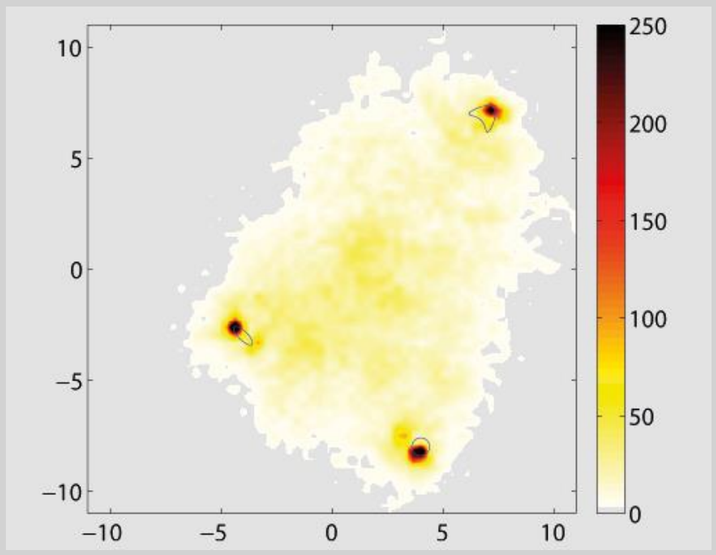
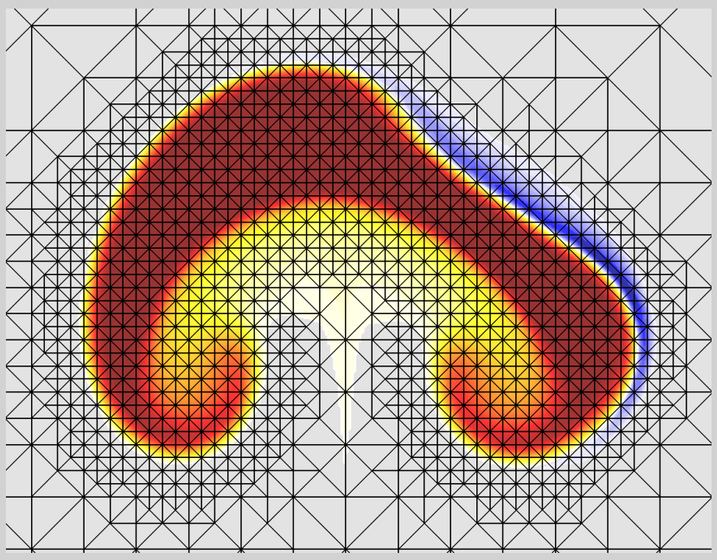
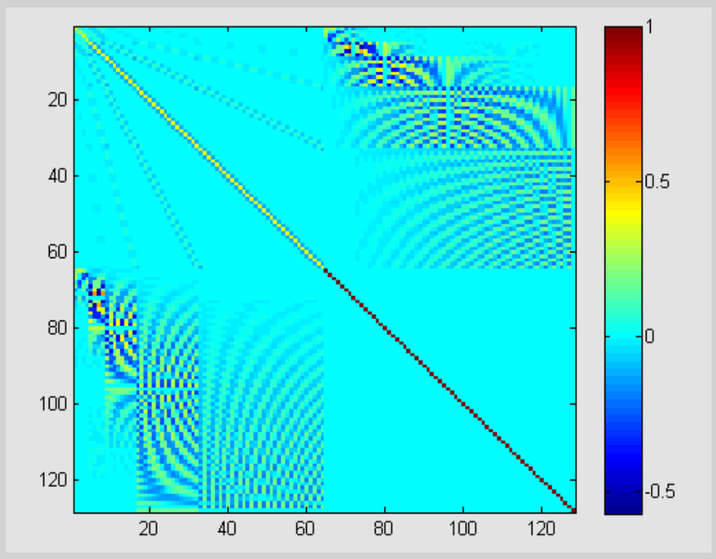


Oberseminar Numerik





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„Asymptotic preserving scheme for kinetic theory based turbulence model“

Abstract:

Many of the existing approaches for turbulent flows utilize analogy from the kinetic theory. In particular, modeling of the turbulent eddy viscosity is analogous to the calculation of microscopic thermal effects in the kinetic theory of gases. In [1] a modified k-ϵ turbulence model is derived as moments from the kinetic theory. We discuss this model and devise a numerical method for the turbulent incompressible flow. The Boltzmann equation used in the construction of the model has an isotropic relaxation collision operator. However, the relaxation time in the collision operator depends on the microscopic turbulent energy. This makes the model implicit in nature, hence making it difficult to construct an efficient numerical scheme. In order to achieve an efficient numerical scheme, we introduce a change of frame. This incorporates a stiff relaxation type source term in the equations. The concept of asymptotic preserving schemes is then used to tackle the stiffness. Some simple numerical tests are introduced to validate the result.

References

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2. Crouseilles, N., Lemou, M., Rao, S.R., Ruhi, A. and Sekhar, M., *Asymptotic Preserving scheme for a kinetic model describing incompressible fluids*. Kinetic and Related Models, **9** (2016), pp. 51-74

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