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Micro-Macro Simulation of Viscoelastic Fluids in Three Dimensions ALEXANDER RÜTTGERS, MICHAEL GRIEBEL, Institute for Numerical Simulation, University of Bonn — The development of the chemical industry resulted in various complex fluids that cannot be correctly described by classical fluid mechanics. For instance, this includes paint, engine oils with polymeric additives and toothpaste. We currently perform multiscale viscoelastic flow simulations for which we have coupled our three-dimensional Navier-Stokes solver NaSt3dGPF with the stochastic Brownian configuration field method on the micro-scale. In this method, we represent a viscoelastic fluid as a dumbbell system immersed in a three-dimensional Newtonian liquid which leads to a six-dimensional problem in space. The approach requires large computational resources and therefore depends on an efficient parallelisation strategy. Our flow solver is parallelised with a domain decomposition approach using MPI. It shows excellent scale-up results for up to 128 processors. In this talk, we present simulation results for viscoelastic fluids in square-square contractions due to their relevance for many engineering applications such as extrusion. Another aspect of the talk is the parallel implementation in NaSt3dGPF and the parallel scale-up and speed-up behaviour.

Alexander Rüttgers
Institute for Numerical Simulation, University of Bonn

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