

# PHYSIKALISCHES KOLLOQUIUM

Mittwoch, den 19.10.2011, um 17:15 Uhr

Ort: Reichenhainer Str. 90; Neues Hörsaalgebäude, Raum: 2/N013



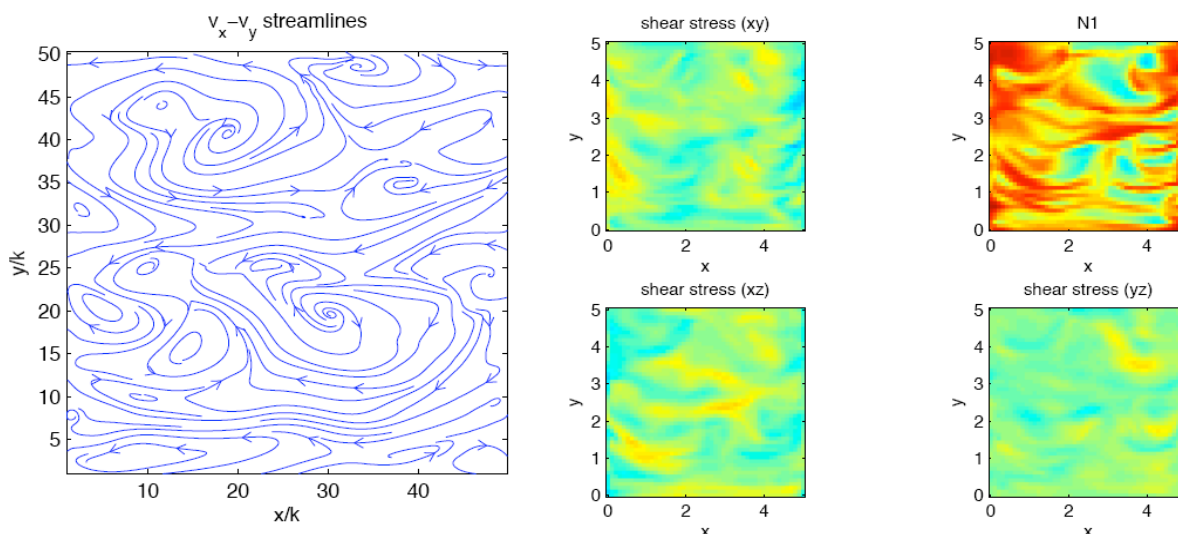
## Prof. Dr. Siegfried Hess

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### Regular and chaotic orientation behavior and flow properties of nano-rod fluids and liquid crystals

In fluids composed of non-spherical particles, as in nano-rod dispersions, liquid crystals or polymer liquids, the orientation of the particles is affected by a shear flow. The orientation, in turn, influences the viscous behavior. The average orientation is described by the second rank alignment tensor. The equation governing the orientation dynamics and the shear stress in the isotropic and the nematic phases are introduced. First a plane Couette flow with imposed shear rate is considered. Depending on the model parameters, regular steady and periodic solutions, as well as chaotic ones are found [1]. Relevant orbits are displayed for the various types of periodic orientation behavior referred to as tumbling, wagging and kayaking, and for chaotic states. The solutions are rather robust against time-dependent distortions of the shear rate [2]. Certain orbits can be stabilized by controlled shear stress [3]. The extension of the theory to fluids composed of particles with electric dipole moments [4] is indicated. For spatially inhomogeneous flows velocity spurts or jets [5] as well as low Reynolds number turbulence [6] are observed.

- [1] G. Rienäcker, M. Kröger and S. Hess, Phys. Rev. E 66 (2002) 040702; Physica A 315 (2002) 537-568.
- [2] S. Heidenreich, P. Ilg, and S. Hess, Phys. Rev. E 73, 06710 (2006), Phys. Rev. E 75, 066302 (2007).
- [3] S.H.L. Klapp and S. Hess, Phys. Rev. E 81, 051711 (2010).
- [4] S. Heidenreich, S. Hess and S. H. L. Klapp, Phys. Rev. Lett. 102,028301 (2009).
- [5] M. G. Forest, S. Heidenreich, S. Hess, X. Yang and R. Zhou, J. Non-Newtonian Fluid Mech. 155 (2008) 130-145.
- [6] C. Goddard, O. Hess and S. Hess, Phys. Rev. E 81, 036310 (2010).



Alle Zuhörer sind ab 17:00 Uhr zum Kaffee vor dem Hörsaal eingeladen.