Modeling and numerical approximation of general pipe flows

Bernd Rummler

Otto-von-Guericke Universitaet Magdeburg
Institut fuer Analysis und Numerik
PF 4120, 39016 Magdeburg, Germany

bernd.rummler@ovgu.de

We regard a general class of boundary-pressure-driven flows of incompressible Newtonian fluids in unbounded three-dimensional pipes.
After a brief presentation of strategies for modeling and scaling, we prescribe suitable periodical conditions in the unbounded direction to enable the use of Banach-space-methods.
We sketch results on existence and uniqueness for the initial-boundary-value problem of the Navier-Stokes equations(- to be considered as an initial-value problem in Banach spaces).
We calculate the numerical approximation of the velocity-field by the use of the Galerkin equations built on Stokes eigenfunctions.
Finally, the description of the numerical approximation is finished by the reconstruction of the kinematic pressure out of the velocity-field.