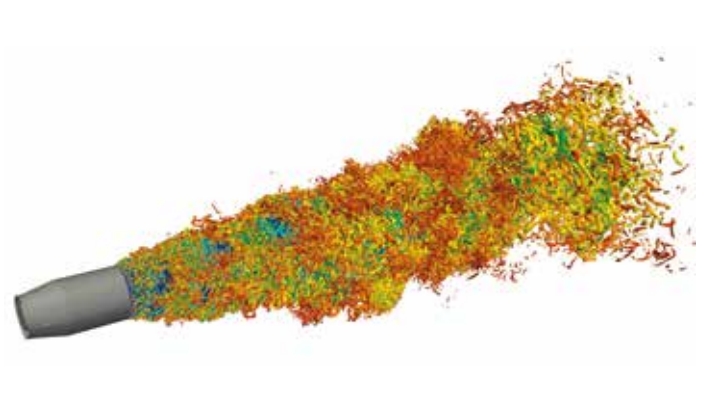
JARA Jülich Aachen Research Alliance

AN INITIATIVE OF

RWTH AACHEN UNIVERSITY | JÜLICH FORSCHUNGSZENTRUM

JARA Simulation Laboratory

Highly Scalable Fluids and Solids Engineering



- Large-scale CFD on massively parallel computers
- Finding ways towards peta- and exascale computing
- Porting and scaling of CFD applications and tools
- Design of parallel PDE solvers (FEM and FVM)
- Supporting researches with respect to HPC and CFD

Know-How

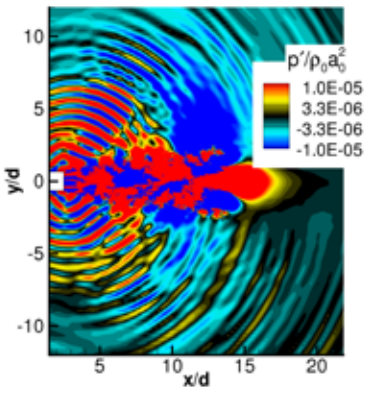
- Finite element methods
- Finite volume methods
- Cartesian grid-based methods
- Mesh partitioning
- Parallel preconditioners
- Shape optimization
- Fluid-structure interaction
- Multi-physics coupling

Current HPC Projects

- Large-scale mesh decomposition
- Tree-code-based finite volumes
- CFD code benchmarking (4 codes)
- Peta-scaling of XNS (RWTH, Behr)
- Peta-scaling of ZFS (RWTH, Schröder)

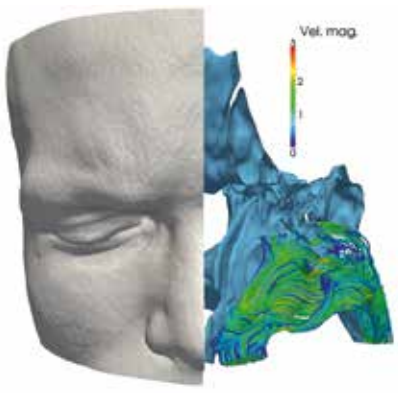
Current CFD Projects

- Spatially resolved simulation of packed bed chromatography (FZJ, Lieres; RWTH, Behr)
- Large-eddy simulations in support of accurate blood flow and blood damage (FH Aachen, Behbahani; STFC, Moulinec)
- Simulation of the flow in the nasal cavity for surgery optimization (RWTH, Schröder)
- Simulation of the particle deposition in respiratory airways (RWTH, Schröder)
- Computational aeroacoustics for turbulent jets (RWTH, Schröder)



Computational Aeroacoustics

- Collaboration project with the Institute of Aerodynamics, RWTH Aachen University
- Noise reduction goals require large-scale simulations of complete jet engines
- Development of a direct-hybrid CFD-CAA method
- Latest simulations with one billion degrees of freedom on 450,000 cores
- Code scales to the full JUQUEEN (member of the High-Q Club)



Respiratory Flow

- Collaboration project with the Institute of Aerodynamics, RWTH Aachen University
- Simulation of the flow in the human nose and lung to understand respiratory pathologies
- Shape optimization to increase the breathing capacity
- Evaluation of the functionality performance of nasal cavities

Contact: lintermann@jara.rwth-aachen.de | Web: www.jara.org/jara-hpc