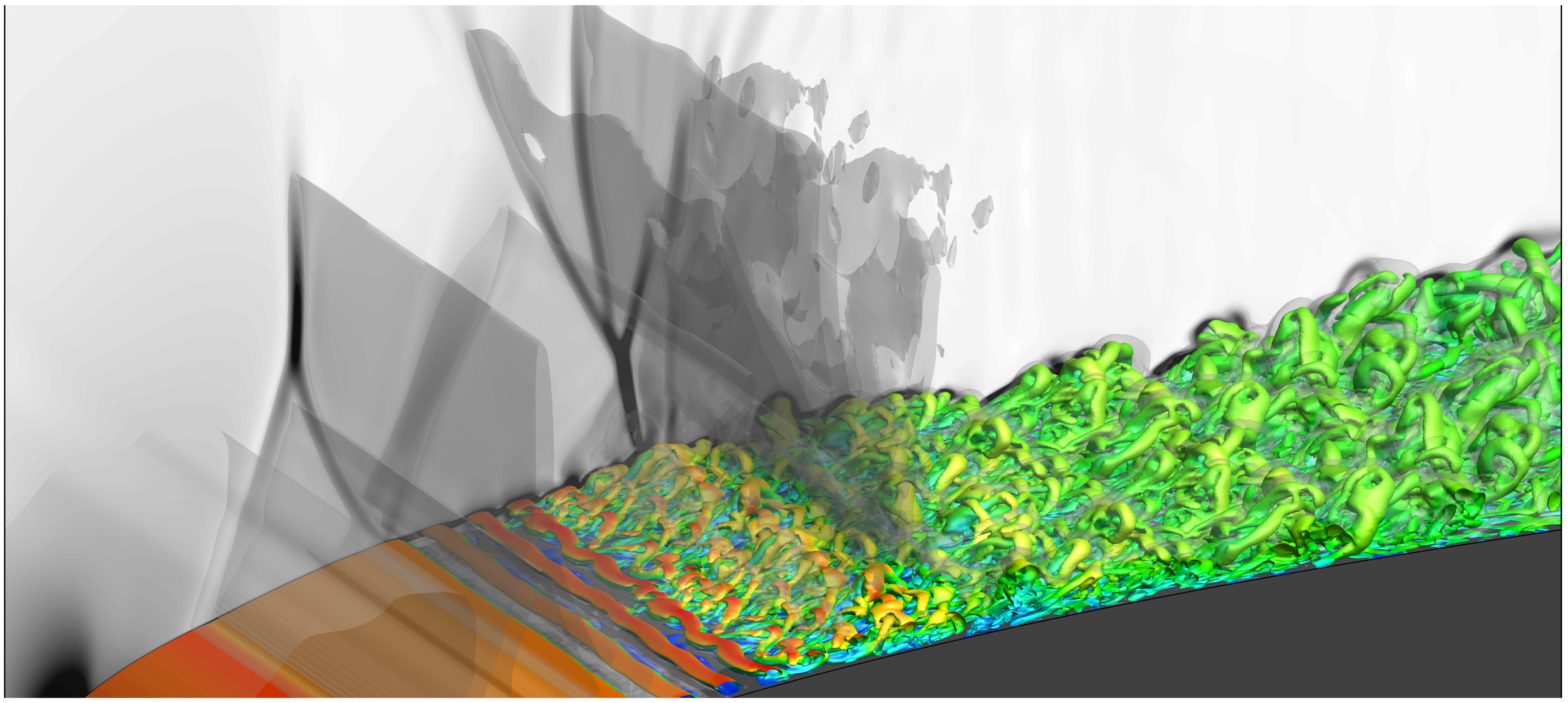
Shock Wave Laboratory
High-Temperature Gas Dynamics
RWTH AACHEN UNIVERSITY
Prof. Dr.-Ing Herbert Olivier

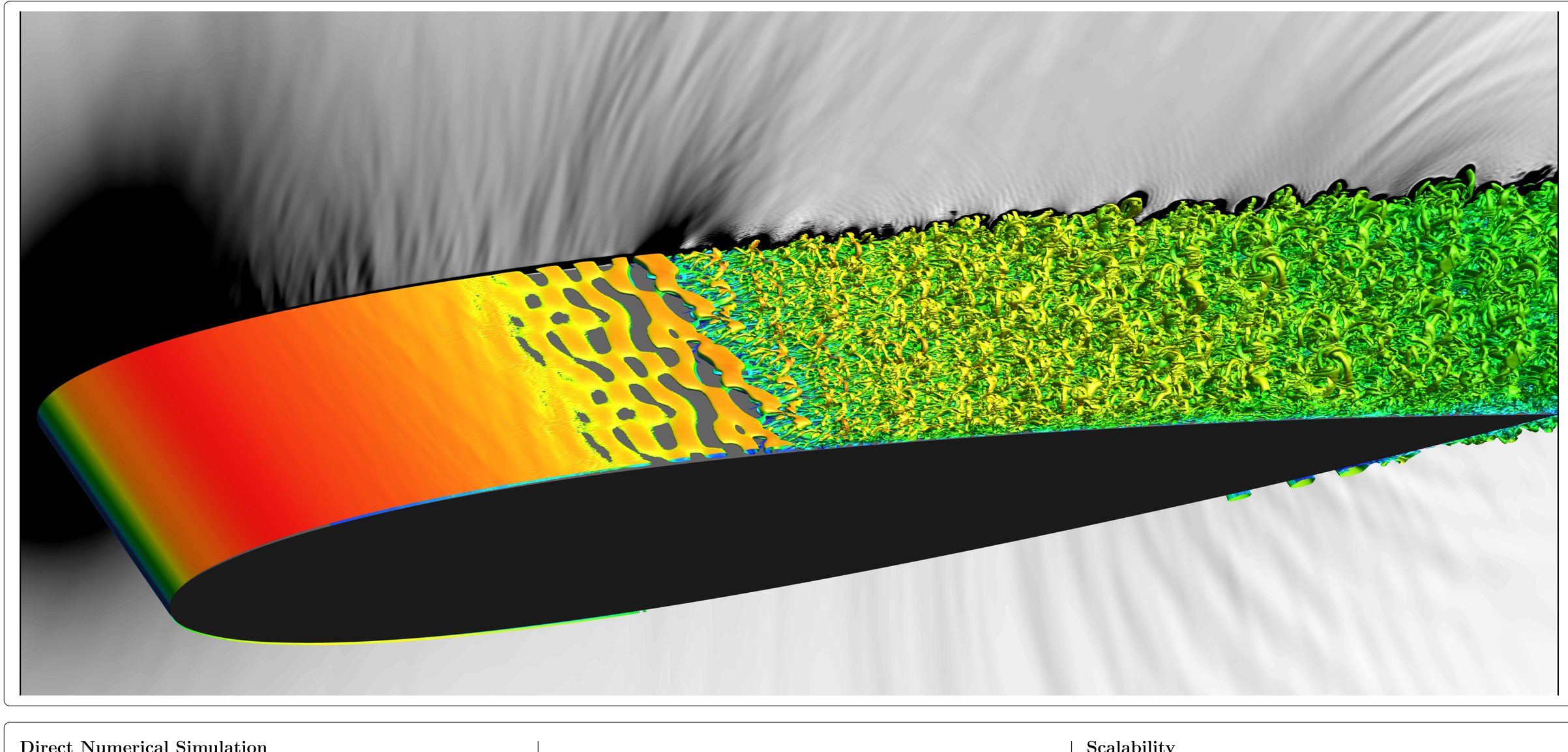
SHOCK

Section Numerical Simulation
Prof.Dr.habil.(RUS) I. Klioutchnikov
Dipl.-Ing. M. Gageik

Structured High-Order Computational Kernel

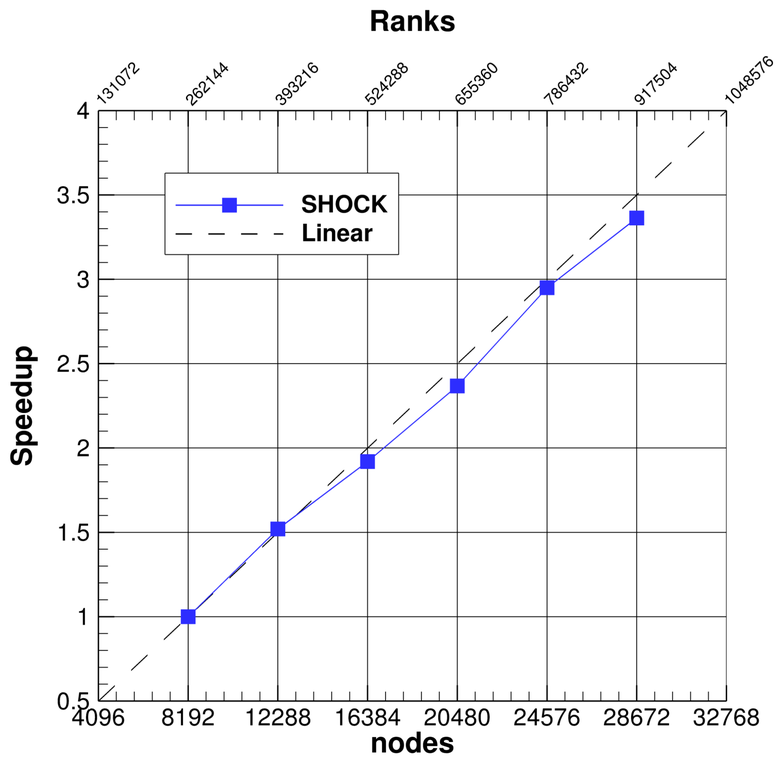
for Direct Numerical Simulation of compressible flows





Direct Numerical Simulation

- flow configurations:
  - compressible, unsteady
  - viscous (Navier-Stokes) or inviscid (Euler)
  - three-dimensional, two-dimensional rotational symmentric or two-dimensional
  - curvilinear coordinates (including subzones with rotated coordinate systems)
- high-order shock capturing schemes:
  - 5^{th} and 9^{th} order WENO scheme (inviscid)
  - Lax-Friedrichs flux-vector splitting
  - 6^{th} and 10^{th} order central scheme (viscous)
  - 3^{rd} and 4^{th} order Runge-Kutta (time)



Scalability

- SHOCK is member of the **High-Q Club**
  (Highest Scaling Codes on JUQUEEN [FZ Jülich])
- 458,752 cores (1,835,008 compute threads)
  on BlueGene/Q (JUQUEEN)

Programming language

- C
- pure MPI (asynchronous)
- I/O in parallel HDF5 (CGNS)

Tested on platform

- Bull-Cluster (RWTH Aachen)
- BlueGene/Q (FZ Jülich)

Application developers

- Gageik, Manuel, Dipl.-Ing.
  gageik@swl.rwth-aachen.de
- Klioutchnikov, Igor, Prof. Dr.rer.nat. habil. (RUS)
  klioutchnikov@swl.rwth-aachen.de