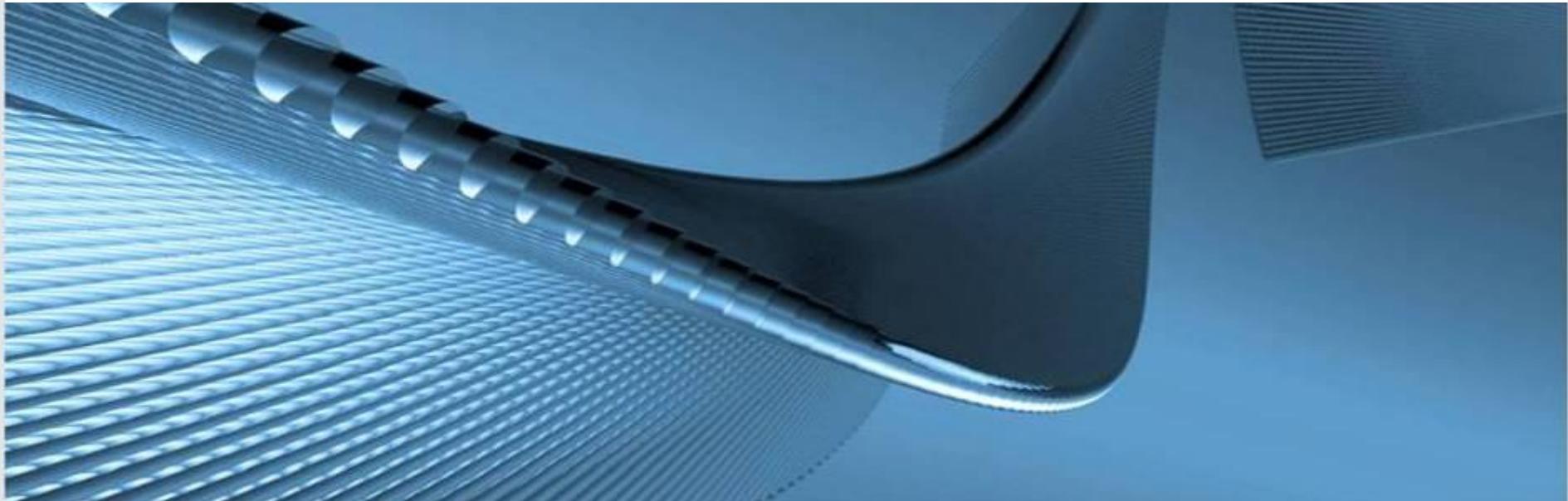# Steinbuch Centre for Computing (SCC) A large Multi-Functional HPC Centre

Rudolf Lohner, Frank Schmitz

KIT / SCC

- **Karlsruhe Institute of Technology - two strong partners united**
  - Universität Karlsruhe (TH)
    - One of the most research oriented universities in Germany
    - Nominated to one of three top universities in October 2006
    - Capitalized with over 100 million € over 5 years
  - Forschungzentrum Karlsruhe
    - Member of the Helmholtz Association
    - Internationally acknowledged non-university institution

- **Under the roof of KIT – Steinbuch Centre for Computing**
  - Computing Center of the Universität Karlsruhe (TH)
  - Institute of Scientific Computing of the Forschungszentrum Karlsruhe

Forschungszentrum Karlsruhe
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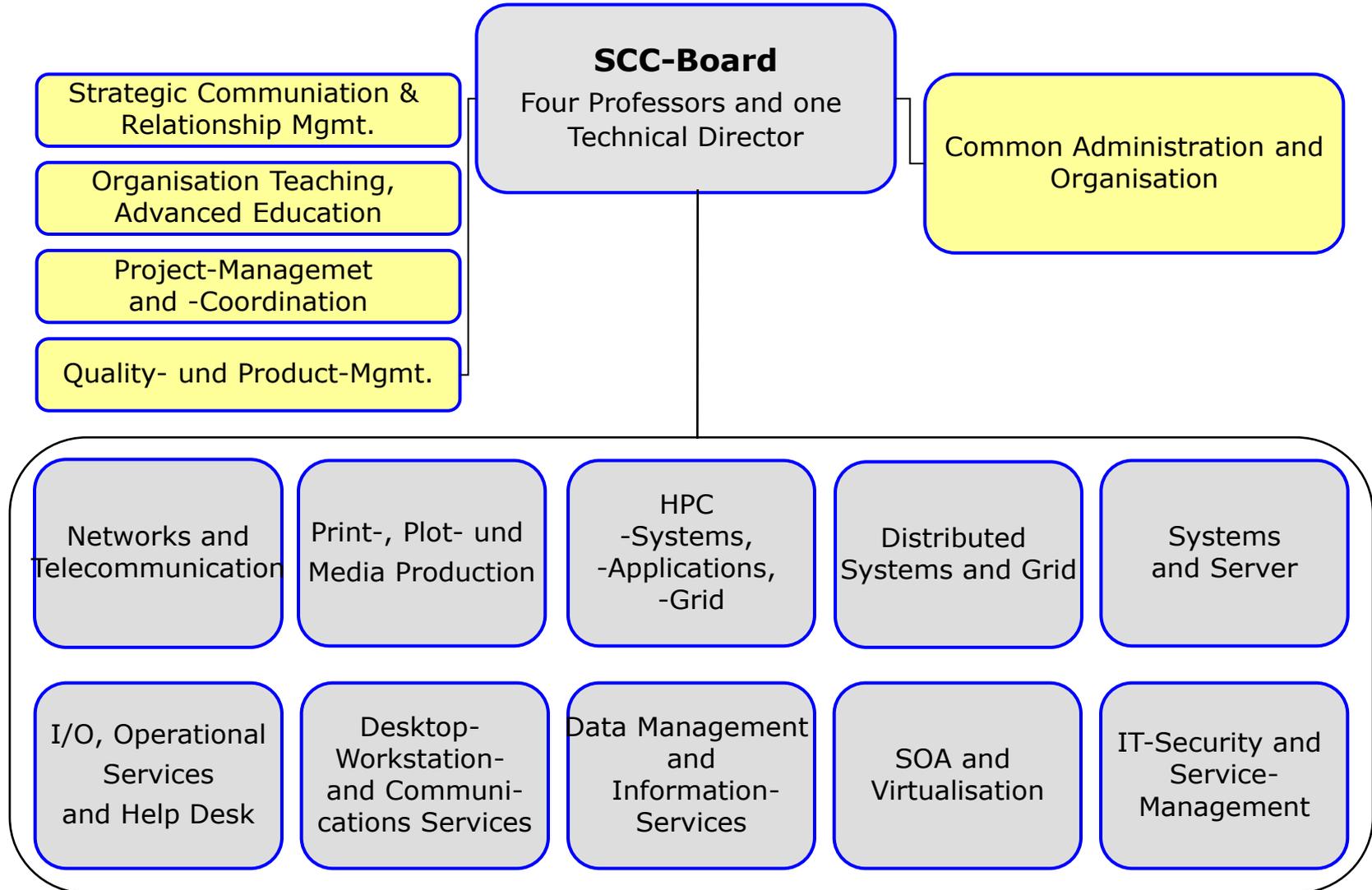# Virtual Computing Centre Karlsruhe since 1996

RZ Uni KA

IWR / FZK

Virtual Computing Centre since 1996

- IT-Services for UKA
- High Performance Computing
- Numerical Methods on HPC
- Integrated Information Mgmt.

- IT-Services for FZK
- Scientific Computing
- GridKa, CampusGrid, D-Grid
- Nat. & Intl. Grid Projects

10 SCC Departments

SCC-Board
Four Professors and one Technical Director

Strategic Communiation & Relationship Mgmt.

Organisation Teaching, Advanced Education

Project-Managemet and -Coordination

Quality- und Product-Mgmt.

Common Administration and Organisation

Networks and Telecommunication

Print-, Plot- und Media Production

HPC -Systems, -Applications, -Grid

Distributed Systems and Grid

Systems and Server

I/O, Operational Services and Help Desk

Desktop- Workstation- and Communi- cations Services

Data Management and Information- Services

SOA and Virtualisation

IT-Security and Service- Management

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KIT / SCC Roadmap

- **Karlsruhe Institute of Technology (KIT)**
  - ☐ Foundation Contract to be signed in 2007
  - ☐ Official start of KIT:

    January 1st, 2008

- **Steinbuch Centre for Computing (SCC)**
  - ☐ Founded simultaneously with KIT
  - ☐ Official start of SCC:

    January 1st, 2008

SCC Portfolio

- **Infrastructure**

- **Services**

- **Projects**

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GridKa, the Tier-1 computer center for LHC

LHC=large hadron collider (CERN)

Grid based structure in a worldwide environment for high energy physics

- gLite

- storage resource manager (SRM) based on dCache

- Resource broker for world wide usage of LHC resources

- PBSpro for resource management

- Certification Authority (CA)

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GridKa, usage in Germany

Aachen (4)●
Bielefeld (2)●
Bochum (2)●
Bonn (3)●
Darmstadt (1)▲
Dortmund (1)●
Dresden (2)●
Erlangen (1)●
Frankfurt (1)●
Freiburg (2)●
Hamburg (1)▲
Heidelberg
(1)▲(6)●
Karlsruhe (2)●
Mainz (3)●
Mannheim (1)●
München (1)●(5)▲
Münster (1)●
Rostock (1)●
Siegen (1)●
Wuppertal (2)●
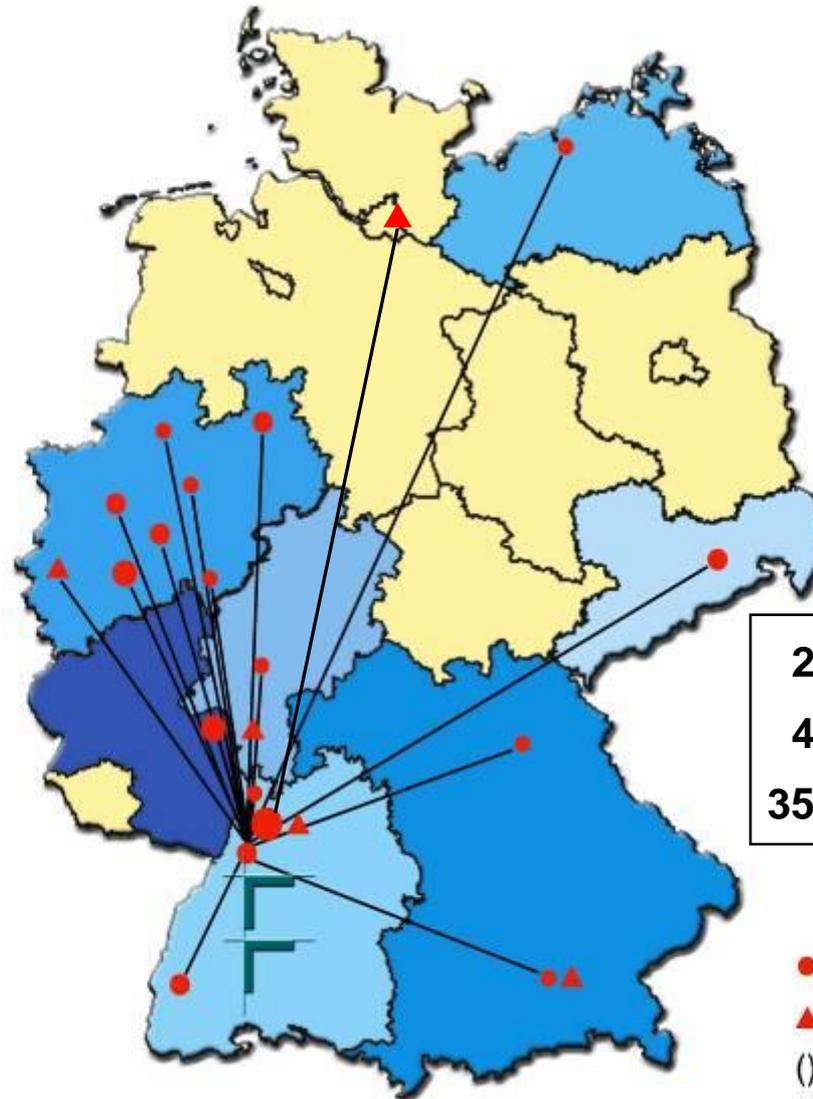
22 Research Centers

**44 Working Groups**

350 Scientists

● University
▲ other research institutions
() Number of working groups

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GridKa, future plans

FZK has signed the WLCG MoU and is able to deliver resources for the LHC experiment up to 2022 as the Tier-1 center
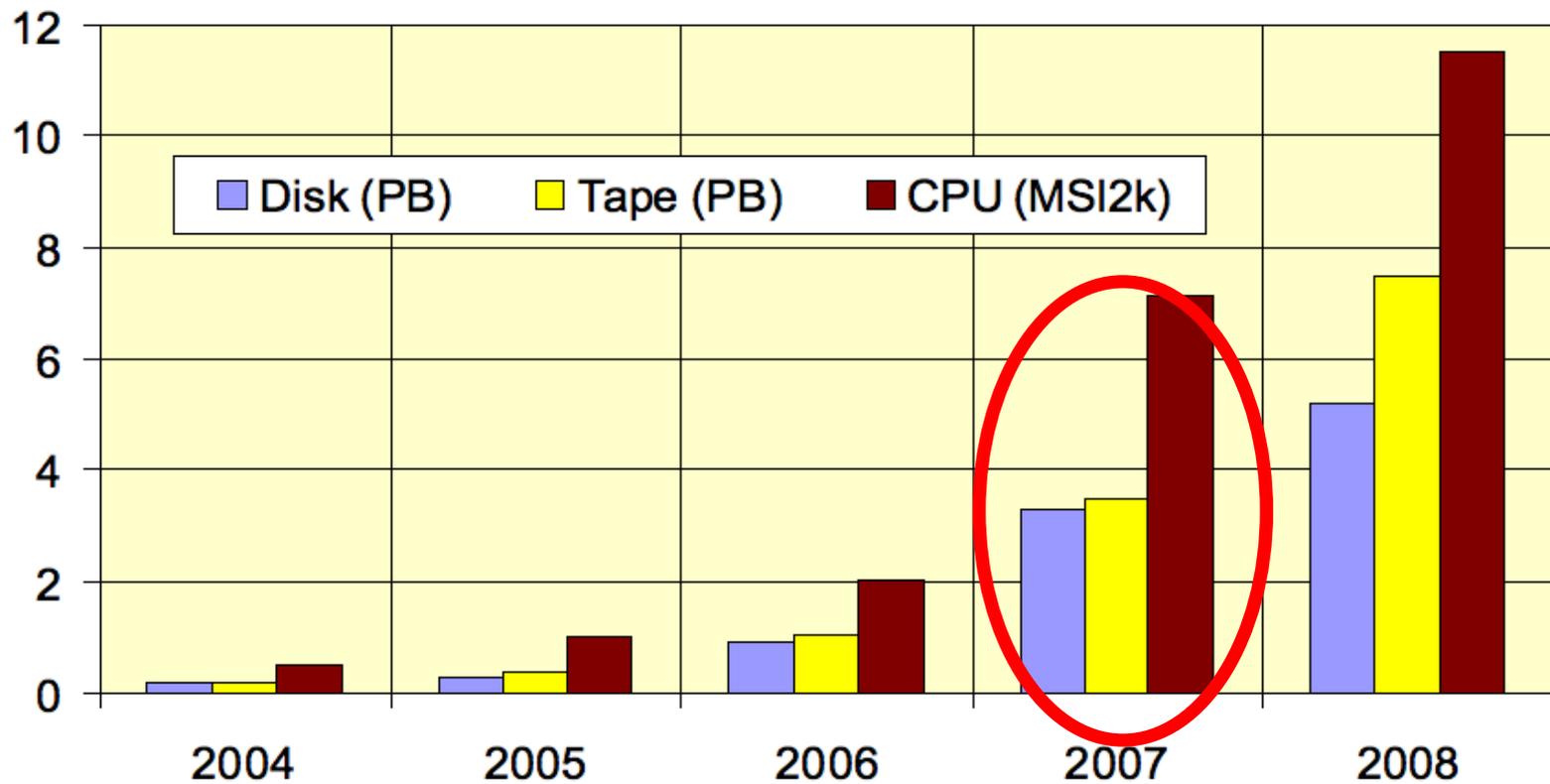
resources for WLCG (Worldwide LHC Computing Grid Projekt

Motivation for the project CampusGrid

- heterogeneous IT-environment: vector-, SMP-, cluster-, blade-systems, SAN, NAS, Unix, Linux, Windows, Solaris, SuperUX, ….

- global view by the user

- only one user management (ADS from Microsoft)

- one job management

- metacomputing (MPI, ..), "real-time" applications

- access data for visualization at the local workstation

- global accounting

- seamless integration into different projects and middleware concepts like gLite, LCG, D-Grid, Unicore, GT4, ….

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D-Grid (the German Grid initiative)

- starting September 2005 to build a sustainable Grid infrastructure

- six Community Grid projects an the D-Grid Integration Project (DGI)

- funded by BMBF, the Federal Ministry of Education and Research

- astronomy, climate research, high energy physics, engineering research, medical research, humanities

- gLite, GT4, UNICORE

- SRM/dCache for the data access

- heterogeneous CPU access (AIX, Linux, Solaris, SuperUX)

Numerics in HPC at the SCC - Projects

- **Shosholoza Project**: America's Cup

  - ☐ Form optimization/Model reduction/Weather forecast

  - ☐ Head of the Scientific Advisory Board

- **Metras Project**: Weather Forecast

  - ☐ Cooperation with the University of Hamburg

  - ☐ Task force SCC (7 employees)
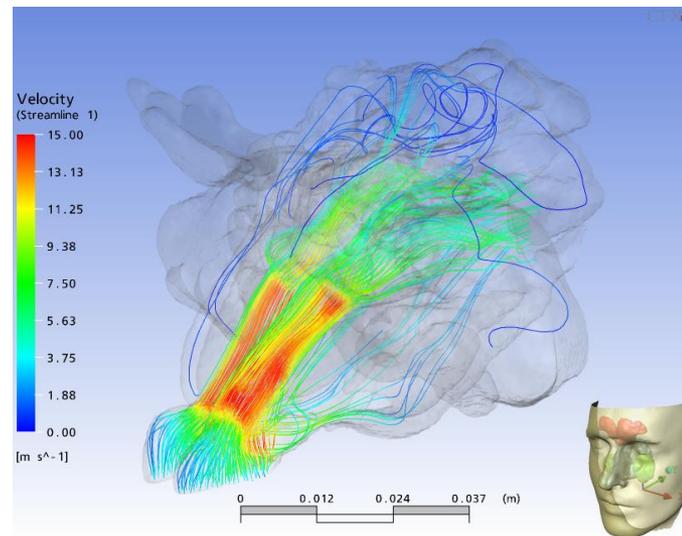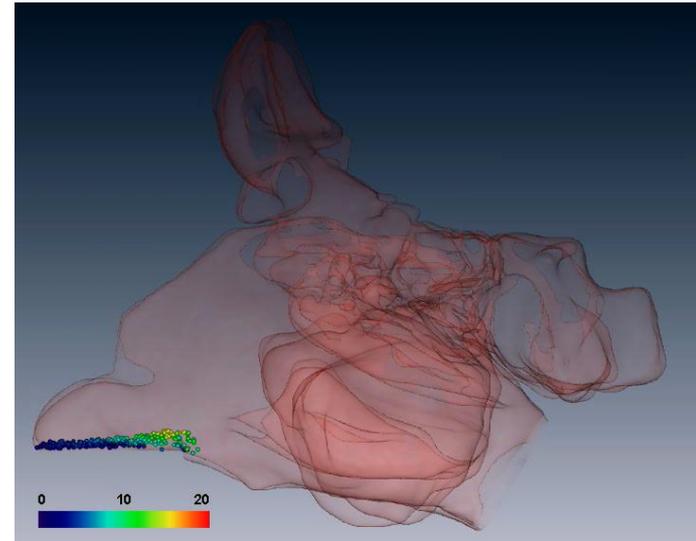
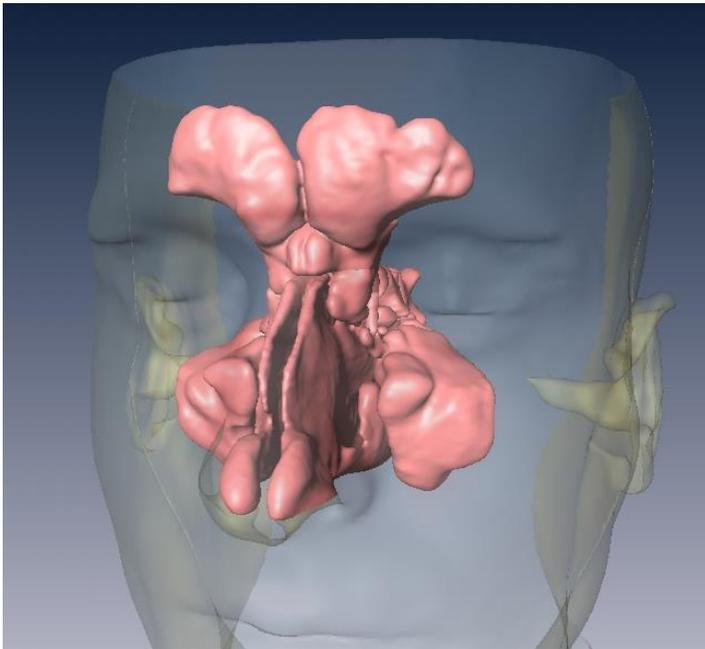- **Simulation of Solid Oxid Fuel Cells**

  - ☐ Detailed chemistry and 3D

- **United Airways**: Simulation of the respiratory tract

  - ☐ Cooperation with the clinical Center (2 employees)

  - ☐ Numerical HPC

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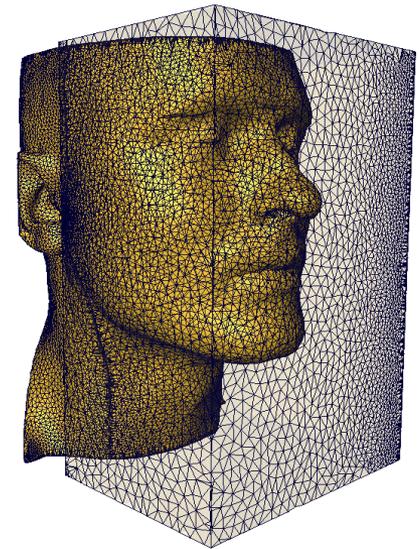
United Airways Project

Numerics in HPC at the SCC - Projects

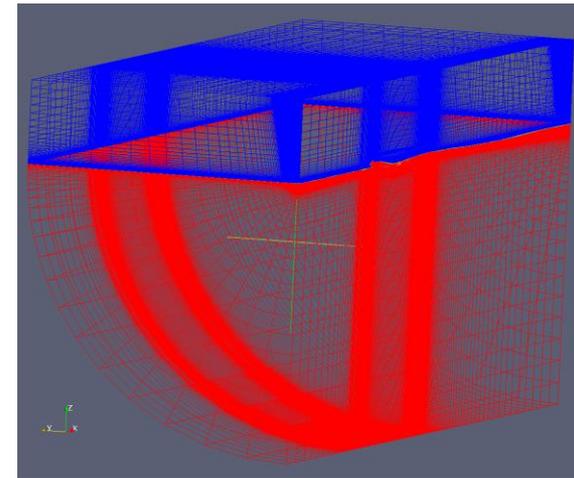■ **Multicore and coprocessor technology**

☐ Cooperation with HP and ClearSpeed

■ Dedicated Research Group
Junior Professor

☐ Numerics on specific architectures

■ Multicore
■ Coprocessors
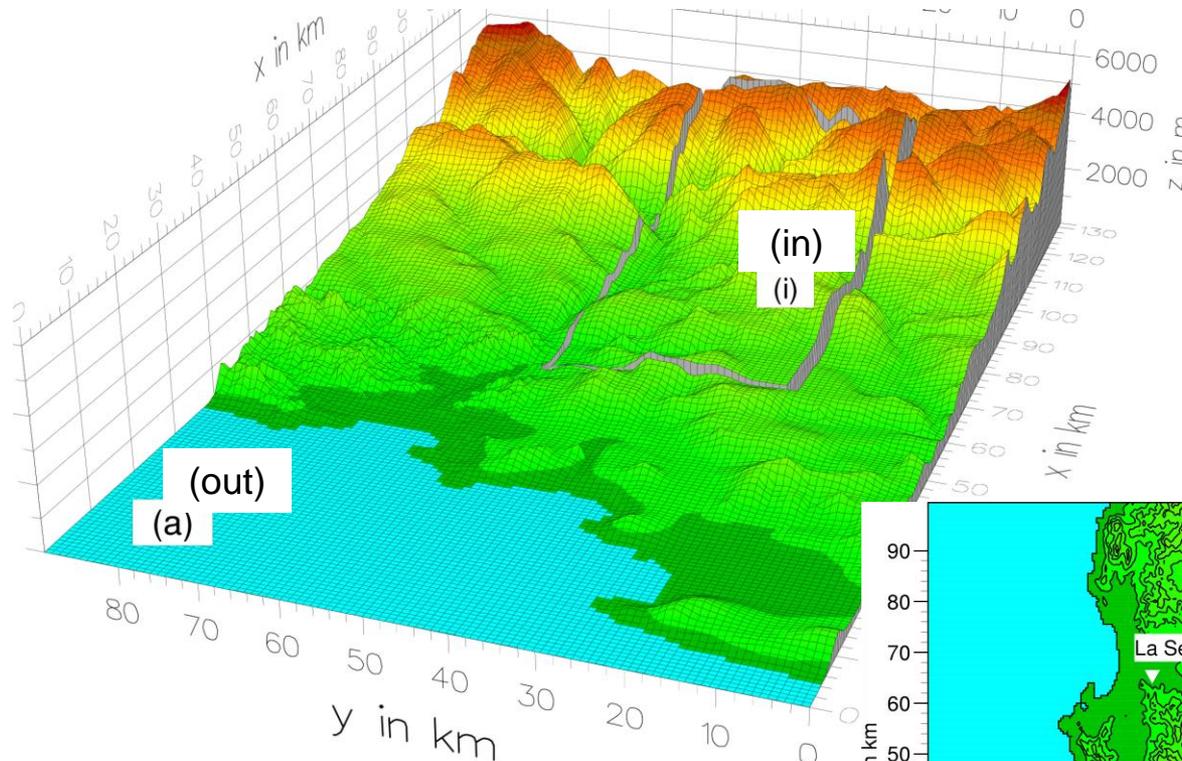
■ **Visualization Project**: on HP SVA

☐ Instationary 3D flow

■ **Software Development**

☐ HiFlow-Project: FEM, 3D, HPC (www.hiflow.de)

☐ HiVision-Project: Visualization

☐ OpenLB: Lattice-Boltzmann/HPC (www.openlb.org)

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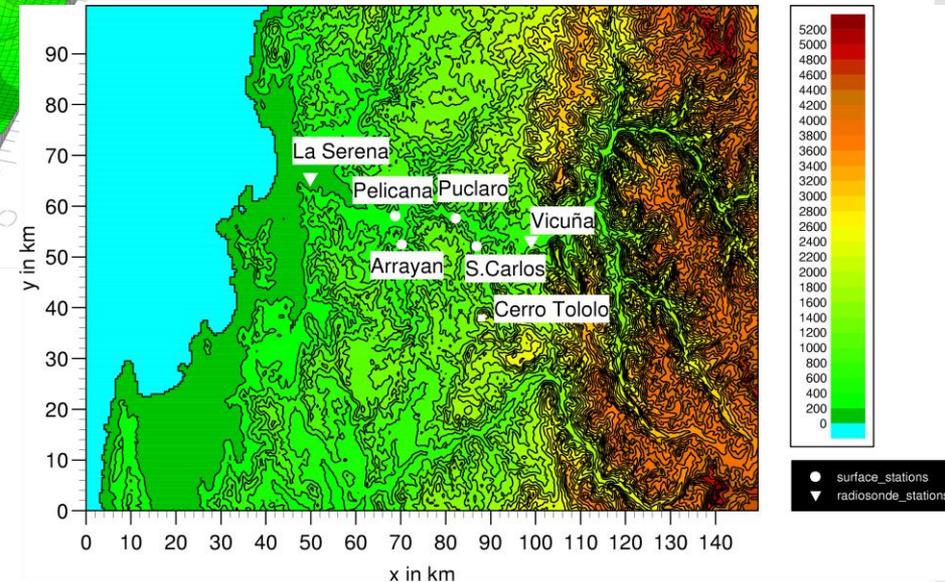Forschungsuniversität · gegründet 1825

The influence of a Storage Lake in the Arid Elqui Valley in Chile on the Local Climate

225 x 135 horizontal gridpoints
100   vertical levels

out: $\Delta x = 800$ m, $\Delta y = 800$ m

in(1): $\Delta x = $ 400 m, $\Delta y = 400$ m

in(2): $\Delta x = $ 200 m, $\Delta y = 200$ m

in(3): $\Delta x = $ 100 m, $\Delta y = 100$ m

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Thank you!

Questions?