The Leibniz Supercomputing Centre

Institute of the Bavarian Academy of Sciences and Humanities

IT Service Provider for the Munich Universities

Regional Computing Centre for Research Institutions in Bavaria

German National Supercomputing Centre

European Supercomputing Centre

serves as university computing centre for

WWM

BAYW

ITZ
LRZ Compute Cloud

HPC Systems

SuperMUC-NG

Top500 (June 2020): #13

Lenovo Intel (2019)

311,040 cores Intel Xeon Skylake

719 Terabyte Main Memory

26.9 Petaflops Peak Performance

70 Petabyte Disk Space

311,040 cores Intel Xeon Skylake

Cluster

Storage (Cloud)

Network

Email

LRZ

HRX

LinuxCluster

Cloud Computing
Environmental sciences provide challenging use cases:

- Computational demand continuously increasing
- Big data problems (high-resolution simulation, monitoring data, data variety, ...)
- Highly interdisciplinary and collaborative
- Uncertainty in model simulations and observation data
- Societal impact

Scientific partnerships to foster collaboration between environmental science domain and computer science/IT-providers:

- Support for using IT infrastructure for environmental science
- Improve IT services with dedicated use cases

Environmental Computing @ LRZ
• Workflows for HPC simulations
• Computing on Demand
• Citizen Science
• VR visualization

• Uncertainty quantification
• Model order reduction/Al
• Management for HPC simulation data
• Geodata processing
• Real-time workflows

• Optimization of HPC codes
• Containers on HPC
• Community building

Environmental Computing @ LRZ

Solid Earth

Hydrology

Climate
Assessment of the effects of climate change on hydrological extreme events (floodings and droughts)

Single model large ensemble climate & hydrological simulations (50 members, 1950-2100)

- Code porting and optimization
- HPC workflows for ensemble simulations with hydro-climatological process chain
- Data management for simulation output (~ 400 TB)
- Support for ML analysis of model output
- VR-visualization
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Global high-resolution agro-hydrological ensemble simulations for different crops and management practices.

- High-throughput computing for cloud-based dissemination of simulation results using OpenDataCube.
- Analysis of different domain decomposition methods for load balancing.
- High-throughput computing for cloud-based dissemination.

Local to global scale monitoring system for water related SDGs.
- Data exchange and analytics platform for HPC simulation data (e.g. ClimEx)
- Uncertainty quantification workflows (Cloud & LinuxCluster)
- Cloud-based testbed for flood forecasting workflows
- Model benchmarking
Outlook

• Long-term integration into national research data management infrastructure
• Near real-time management of water resources with sensor networks

Upcoming topics:
• Establish (basic) geoscience services for users (not project-driven)
• Components from projects
• Creating synergies by consolidation of existing software environments