High Performance Computing for Climate Research

The national HPC center DKRZ provides high performance computers, high capacity data storage and management, and superior service for German climate research. The earth cannot be experimented with. Therefore, DKRZ's computer systems are the laboratory for climate modelers. DKRZ operates an archive for the extremely large volumes of climate model data and has the scientific knowledge to manage it.



High performance computing for climate research

DKRZ's HPC and archive systems are chosen to provide optimal performance and efficiency for climate modelling. In addition to running these systems, DKRZ provides various services to enable efficient use of these resources.

The HPC system "Mistral" consists of computer components by Bull, a disk storage system by Xyratex/Seagate and high performance interconnect by Mellanox.

Mistral at a glance:

- 3,000 Bullx B700 DLC compute nodes
- 1,500 nodes with two 12-core Haswell processors per node
- 1,500 nodes with two 18-core Haswell processors per node
- total of 90,000 compute cores
- total peak performance of 3.1 PetaFLOPS
- 240 Terabytes main memory
- 54 Petabytes Lustre-based parallel filesystem

Climate analysis and visualization

Due to increasing amounts of data, the analysis of climate simulations has become a real challenge. "Mistral" also comprises 21 visualization nodes equipped with with NVidia Tesla K80, Quadro M6000 and M40 GPUs and 100 nodes for interactive access and pre- and post-processing of simulation data.







Climate data storage

Climate modellers generate extremely large amounts of data. DKRZ is one of very few computing centres worldwide which both have the technical facilities to store this data volume and the scientific knowledge to manage it.

DKRZ possesses one of the world's largest data archives – in 2016 about 50 Petabytes of simulation results from the past 30 years were already stored.

The DKRZ HSM system and tape library at a glance:

- 5 petabyte HPSS disk cache
- 8 automatic Sun StorageTek SL8500 tape libraries
- 77.000 tape cartridges
- 8 robots per library
- 75 tape drives





 total capacity of up to 500 petabytes • projected data growth of 75 petabytes per year • bidirectional bandwidth up to 18 gigabytes per second

For enabling sustainable use of the large amount of climate model data produced, DKRZ operates data lifecycle services that support the whole data life cycle: A seamless end-to-end workflow from data production over data storage, data processing, data dissemination to data storage is supported to optimize the data management in climate science. With the ICSU World Data Center Climate (WDCC), DKRZ runs a fully documented long-term data archive with a size of currently 4 petabytes.



