

Press Release

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Urbanization, Agriculture and Melting Glaciers Collaboration “Terra_Byte”: Highest Computing Capabilities for Global Change Research Byte

One of Europe's most powerful supercomputing centres – the Leibniz Supercomputing Centre (LRZ) of the Bavarian Academy of Sciences and Humanities – and Europe's largest space research institution – the German Aerospace Center (DLR) – will cooperate in the evaluation of the enormous amounts of data daily collected by Earth observation satellites on the state of our planet in conjunction with other global data sources such as social networks.

"This is a milestone for the Munich metropolitan region and for Bavaria as a research hub," said Bavaria's Science Minister Bernd Sibler at the signing of a cooperation agreement between the partner institutions on 27 May 2019 in Garching near Munich. "This cooperation shows the full potential of our research institutions in Garching and Oberpfaffenhofen! The work of both institutions is outstanding and internationally acknowledged. Their joint project now opens completely new possibilities to investigate Global Change and its effects on our region comprehensively. This is an important basis for politics and society to create suitable framework conditions for a future on our earth worth living. Aviation and astronautics, supercomputing and artificial intelligence engage with each other. The technology of tomorrow is being developed here!"

"If we want to understand the processes of global change and its development, we must be able to evaluate the data from our satellites in space in the best possible way," emphasised Prof. Hansjörg Dittus, DLR Executive Director for Space Research and Technology. "The cooperation between DLR and LRZ will enable us in the future to analyse huge amounts of data using the latest methods in a highly efficient and independent way. We will contribute our developments and technologies in space research as well as our own sensor data. For example, we can carry out novel analyses to better understand the consequences of global trends and environmental changes such as global urbanisation, the expansion of agricultural use to the detriment of unspoilt ecosystems or the rapid changes in the polar regions of the earth and the atmosphere, which without any question are not without consequences for humans."

"The cooperation of these two leading research institutions brings together two partners who complement each other ideally in their competencies and contribute their expertise, resources and research areas. The Leibniz Supercomputing Centre has proven experience as an innovative IT service provider and high-performance and data analytics centre, and is a reliable and efficient partner for the Bavarian universities and, in future, for DLR and its institutes in Oberpfaffenhofen," says Prof. Dieter Kranz Müller, Head of the LRZ.

Huge amounts of Earth observation data

Every day, Earth observation satellites deliver huge amounts of data in such high resolution that conventional evaluation methods have long since reached their limits. "Only a combination of a wide variety of historical and current data available online in conjunction with state-of-the-art high-performance computing systems will enable our researchers to derive global information at the highest resolution allowing us to make statements about the development of planet Earth. Artificial intelligence methods are playing an increasingly important role in fully automated analysis. This enables us to identify phenomena and developments that would be difficult to detect using conventional methods," says Prof. Stefan Dech, Director of the German Remote Sensing Data Centre at DLR. "For the four DLR institutes in Ober-

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pfaffenhofen researching satellite-based Earth observation, this cooperation is of crucial importance. We can now carry out a variety of methodological and geoscientific global analyses which was previously impossible due to the volume of data and limited computing power. Of particular importance is the technological data concept jointly developed between DLR and LRZ which will link the LRZ with DLR's German Satellite Data Archive in Oberpfaffenhofen and, in addition to current global data stocks available online, will also link historical data from our archive and DLR's own data," continued Dech.

Challenges for data analysis including social media

Data from the European Earth observation programme Copernicus have already exceeded the threshold of 10 petabytes. One petabyte corresponds to the content of about 223,000 DVDs – a quantity that would weigh about 3.5 tons. By 2024, the Sentinel satellites of the Copernicus programme will have generated more than 40 petabytes of data. These will be supplemented by further petabytes from national Earth observation missions such as the DLR radar satellites TerraSAR-X and TanDEM-X or the American Landsat data. However, it is not only the large amounts of data from the satellite missions that are currently posing challenges to scientists; data on global change published on social networks are also valuable sources. These data, however, are very heterogeneous, their veracity is inconclusive and they are not available indefinitely.

DLR researchers are therefore increasingly using artificial intelligence (AI) and machine learning methods to identify trends in global change and analyses of natural disasters and ecological contexts in global and regional time series spanning decades.

These methods, however, require that the necessary data be made available online on high-performance data analysis platforms (HPDA = High Performance Data Analytics). The technical objective of the cooperation is therefore to set up such a platform which will have access to all Earth observation data required for research via the German Satellite Data Archive (D-SDA) of DLR in Oberpfaffenhofen and data distribution points of the freely available satellite data from various providers.

DLR's German Remote Sensing Data Center (DFD) coordinates the cooperation activities for the participating DLR institutes: In addition to DFD, the institutes involved are the Institute for Remote Sensing Methodology, the Institute for Atmospheric Physics and the Institute for High Frequency Technology and Radar Systems in Oberpfaffenhofen. The Institute of Data Sciences in Jena and the Simulation and Software Technology facility in Cologne are also involved in the implementation of the technology.

Cooperation for Global Change

In this cooperation, DLR deals with research questions related to environmental change and global change, methodological and algorithmic process developments in the field of physical modelling and artificial intelligence (AI), the management of long-term archives and the processing of large data sets.

The LRZ focuses on the research and implementation of operational, scalable, secure and reliable IT services and technologies, the optimization of processes and procedures, supercomputing and cloud computing as well as the use of artificial intelligence (AI) and Big Data procedures. The existing IT systems of the LRZ (including its newest supercomputer, SuperMUC-NG) will be used as well and the experiences in energy-efficient supercomputing are used.

It is planned to implement online availability of around 40 petabytes for thousands of computing cores. Through joint investments by DLR and LRZ, it is planned to implement the first stage of the expansion by the end of 2020. The new HPDA platform will be integrated into the existing infrastructure of the LRZ in Garching. The platform's largely free and open data will also be accessible to scientists at Bavarian universities and colleges.

Images can be found on the web page

https://www.lrz.de/presse/ereignisse/2019-05-27_dlr-lrz-kooperationsvertrag/

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