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Space research in the service of climate protection – conference invites members of the public to participate free of charge

From digital twins of the Earth to the Copernicus Earth Observation Programme, space research is at the forefront of efforts to combat climate change and playing a key role in disaster management. The Big Data from Space conference – held at the Austria Center Vienna from 6-9 November – will be focusing on the tools available to humankind to achieve the green energy transition, while spotlighting ongoing research programmes. And in keeping with the spirit of open science, participation is free of charge for everyone who has registered.

“There is much more to space research than looking from the Earth into space. Space exploration also allows us to look down on our own planet from space and gather global data that is pivotal to its health. Using today’s analytical methods, we are now in a position to observe the kind of large-scale trends that would be impossible to monitor from the ground alone. By combining satellite and ground observations, we are providing data, tools and methods that can be used to make important decisions to combat the climate crisis,” explained Stefanie Lumnitz, Big Data from Space conference Chair and Destination Earth EO Application Scientist at the European Space Agency.

Destination Earth – digital twins for the Earth

One flagship initiative is the European Commission’s Destination Earth (DestinE) project, which is a collaboration between the European Space Agency (ESA), the European Organisation for the Exploitation of Meteorological Satellites (EUMETSAT) and the European Centre for Medium-Range Weather Forecasts (ECMWF). DestinE involves developing a highly accurate digital model of the Earth – a digital twin – to model, monitor and simulate natural phenomena as well as hazards and the human activities associated with them. “It’s not just important to identify the Earth’s current health status, we also need to make predictions about what it will be like 50 or 100 years from now, and – and this is what’s special – to be able to make simulations of how that health status would be affected if one or multiple components change,” Lumnitz said.

Weather and climate change twin ready for action

“At present, we are still working on the development of the main components, but are planning to make the first two twins available to the public next year,” Lumnitz announced. These are digital twins that model weather-related extremes as well as various adaptations to factor in climate change. “More digital twins are set for release by 2027. The ultimate goal is to have a complete digital replica of the Earth comprising the different digital twins by 2030,”

she continued. This is intended to create greater worldwide understanding of topics such as climate change, extreme weather situations, and resource management as well as decision-making support in these areas and even better tools for disaster preparedness. The aim is also to gain new insights into the interaction between humans and nature to highlight the extent to which human action is required and what can be done to protect natural environments.

Space research in the service of climate protection

While what much of the Destination Earth project hopes to achieve is still some way off, space research has already provided a number of important tools that are helping to gauge the health of the planet. Accessible to the public free of charge, Copernicus – the Earth observation component of the European Union's Space programme – is at the heart of measures to monitor the planet from space. It now makes land, marine, atmospheric and climate change monitoring as well as disaster and crisis management possible, and therefore has an instrumental role to play in adapting to climate change.

Even more layers to green transition

“Through our Space for a Green Future Accelerator initiative, space exploration is helping to expedite the green transition with a focus on areas such as carbon-neutral cities, mobility and renewable energies,” Lumnitz commented. This revolves around decarbonising society and identifying solutions to limit the average global temperature increase to an acceptable level.

Space research provides data for solar and wind energy sites

Lumnitz also gives a very specific example of how space research can already help Europe to fulfil its energy transition ambitions: “Working in partnership with Austria, we have developed the Green Transition Information Factory which is an initial demonstrator that allows us to show where green energy infrastructure solutions would make most sense. It uses information on weather and sun conditions to pinpoint optimal locations for solar and wind power.” The data analyses it provides link existing wind turbine locations with the wind conditions in a given region to help identify which sites are particularly favourable for new wind farms. The information on sun conditions that it makes available can also be used to assess the solar generation potential of specific locations such as rooftops. “The range of possible applications is very broad. And the key to it all is that all the data is available to everyone – science, politics, industry and every other stakeholder – free of charge, so that decisions can be reached on the basis of sound data,” Lumnitz concluded.

Space satellite acts as warning system for forest fires

Satellite systems are also playing a crucial role in disaster management and the monitoring of civil emergencies such as prolonged dry spells, drought and forest fires. They are being used to measure thermal radiation in order to identify or predict fire sources, for instance. The advantages of satellite observation are clear: a global perspective and real-time monitoring as well as large amounts of historical data for comparison.

Progress lies in the detail

For space research to make an even more effective contribution to climate protection many more small advances are required, such as in the area of machine learning. Going forward, the idea is not just for AI to learn from the data, but also to learn how to adhere to the laws of physics in the process. How to approach large-scale big data formats is another focus, as is how to bring users closer to the data with few barriers.

About the Big Data from Space (BiDS) conference

BiDS will take place at the Austria Center Vienna from 6-9 November. The conference brings together key players from industry, academia, EU institutions and governments to identify user needs, exchange ideas and showcase the latest technological solutions and applications affecting space and big data technologies. And in keeping with the spirit of open science, participation is free of charge for everyone who registers by 30 October. [BiDS | Big Data from Space 2023](#)

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