Max Planck Institute
for Biogeochemistry

Press Release
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More successful together: Computer scientists and ecologists investigate changes in ecosystems

Climate and land use changes have irreversible impacts on the biodiversity of terrestrial ecosystems. The consequences of these threats for our ecosystems are only partially understood. Today, researchers have a wealth of new data sources at their disposal to study the fundamental changes taking place on our planet. Over the past four years, scientists from different disciplines from seven European countries have worked together intensively on this topic in the European Union-funded project "BACI". Now they will meet from 27 to 28 March 2019 at the Max Planck Institute for Biogeochemistry in Jena for a final exchange of ideas. Their experiences and the results of their joint development work will be incorporated into future strategies for environmental monitoring at the European level.

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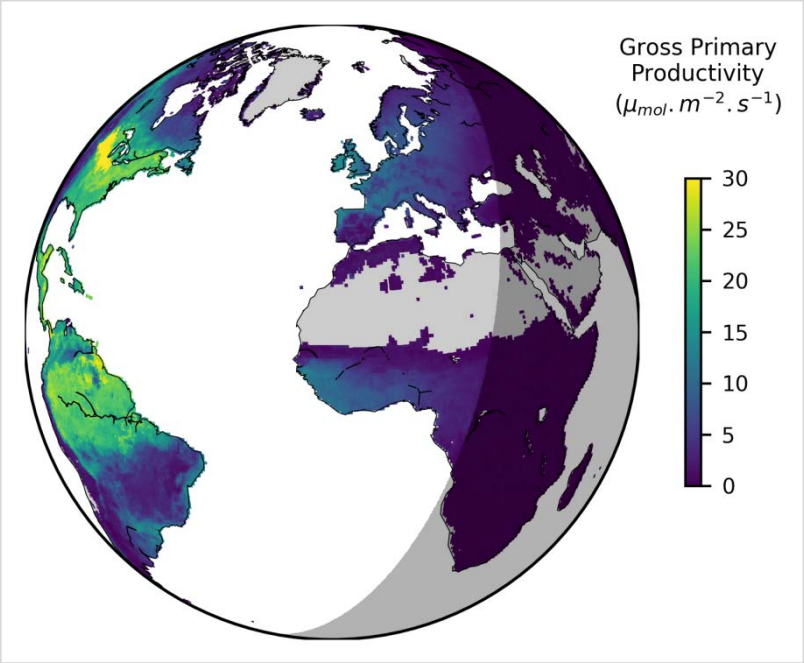
Climate change and the associated intensification of extreme meteorological events on the one hand, and rapid land-use changes on the other, confront us with new global challenges. However, any strategy for nature conservation and landscape protection requires a solid basis of data. A new generation of European satellite observations - the so-called Sentinels - enables us to monitor the ecosystems of our globe with an unprecedented resolution in space and time. However, the huge amounts of incoming satellite data must be evaluated efficiently in order to detect changes in ecosystems early on. This is a challenging task that individual researchers cannot accomplish alone. Progress in this case can only be made if environmental scientists team up with computer scientists and remote sensing experts.

"*The rapid development in computer science towards fully automated methods that detect anomalies in complex data is also a crucial step in environmental research*," explains Dr. Miguel Mahecha, coordinator of the BACI project (Detecting changes in essential ecosystem and biodiversity properties - towards a Biosphere Atmosphere Change Index). But the chosen approach also opened up new perspectives for the computer scientists involved in the project. "*We are pleased that our research makes a contribution to the environmental sciences,*" says Prof. Joachim Denzler. "*Here we face new challenges that exceeded the capacity of existing methods. With the development of new algorithms, we have also taken an important step forward in our field.*" adds the Chair of Digital Image Processing at Friedrich Schiller University Jena and member of the Michael-Stifel Center Jena (MSCJ).

The joint project BACI, which was financed from the research and innovation program of the European Commission Horizon 2020, can boast several success stories: The project succeeded in combining radar and optical data that contribute to, for instance, determining biodiversity patterns in European forest ecosystems. By combining satellite data and measurements of carbon dioxide exchange between ecosystems and the atmosphere using machine learning methods, it was, for the first time, possible to visualise the daily CO2 uptake of the entire Earth. Also, it has also been possible to predict the values of tree rings using artificial intelligence methods. Most of these breakthroughs were only possible due to unconventional ways of using artificial intelligence methods to answer ecological questions.

“The future of environmental research is data-driven and unthinkable without advances in computer science.” resumes Mahecha.



The graph shows the CO2 uptake of vegetation by photosynthesis on Earth for a period of half an hour. In the right part of the graphic, the shadow symbolizes the night when light-dependent photosynthesis comes to a standstill. (Graphics by Sujan Koirola, data processing by Paul Bodesheim, Image license: CC BY 4.0)

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For more information please visit BACI’s webpage (www.baci-h2020.eu/) and twitter (https://twitter.com/baci_h2020).