Detecting changes in essential ecosystem and biodiversity properties- towards a Biosphere Atmosphere Change Index: BACI

Deliverable 9.2: Press release 2

Project title:	Detecting changes in essential ecosystem and biodiversity properties- towards a Biosphere Atmosphere Change Index
Project Acronym:	BACI
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Main pillar:	Industrial Leadership
Topic:	EO- 1- 2014: New ideas for Earth-relevant space applications
Start date of the project:	1st April 2015
Duration of the project:	48 months
Dissemination level:	Public
Responsible of the deliverable	Miguel Mahecha (MPG) Phone: +49 3641 576265 Email: mmahecha@bgc-jena.mpg.de
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1. Introduction

The BACI progress and review meeting took place in Jena from the 7th to the 9th of June 2016. The meeting, organized and hosted by the Max Plank Institute for Biogeochemistry, was an opportunity for the BACI scientists to meet and analyze the outstanding results and main difficulties of the first year of the project.

The 27th of June a press release titled "*Early warning system for critical changes in ecosystems"* (English version) and "*Frühwarnsystem für kritische Veränderungen von Ökosystemen"* (German version) was sent to the media and published on the following websites:

2. Publications

a. Max Plank Institute

- English: https://www.bgc-jena.mpg.de/pmwiki.php/PublicRelations/Single?userlang=en&id=1466968572
- German: https://www.bgc-jena.mpg.de/index.php/PublicRelations/Single?userlang=de&id=1466968572

b. BACI project website

- English and German: http://baci-h2020.eu/index.php/Outreach/PressReleases

3. Annex- Press releases

Press Release
Jena, 24th of June, 2016

Max-Planck-Institut
für Biogeochemie

Early warning system for critical changes in ecosystems

International experts met at the Max Planck Institute for Biogeochemistry in Jena, Germany, to discuss the state of terrestrial ecosystems. Their research project focusses on describing and understanding the state of ecosystems and how ecosystems have changed over the recent past. The scientists rely on a combination of novel satellite data, ground observations and innovative methods from informatics. The ultimate goal is to develop an early warning system for detecting critical environmental transitions.

Ongoing climate change and continuous land use changes are intimately related to societal, political and economic processes. Jointly, these processes lead to changes of ecosystem functioning at the local, regional and global scale. Such ecosystem transformations are a matter of concern since the 1980s and have led to integrated research programs often considering ecosystem research, climate sciences and social sciences. Today, however, new opportunities for research emerge in view of the dramatic progress in the quality of Earth Observations with respect to spatial, temporal and spectral resolution (in particular from ESA's sentinel satellites). Likewise, informatics increasingly develops means to deal with large amounts of data and effective processing tools. Thus, old questions regain relevance: Can we automatically detect critical changes of ecosystems by combining novel satellite data, ground observations and innovative methods of machine learning? How can we use scientific findings resulting from these innovations to better inform society?

Such questions were addressed in a meeting of 35 scientists of the EU-funded "BACI" project, which were coming from Germany, Great Britain, Spain, Italy, Denmark, Canada and Switzerland. The meeting took place at the Max Planck Institute for Biogeochemistry in Jena, Germany, from June 7th to 9th. The aims were to synchronize efforts to develop and implement an early warning system for changes and disturbances at the interface between terrestrial ecosystems and the atmosphere.

Initial results of the research project suggest that new satellite data, local ecosystem observations and machine learning can be combined as a promising methodology. "Compared to earlier times, we are now well prepared to achieve a more comprehensive detection and understanding of ecological extreme events, such as e.g. droughts or heat waves," says Dr. Miguel Mahecha, leader of the BACI project, "and we put a special focus on biosphere - atmosphere interactions and feedbacks in the Earth System."

Postfach 10 01 64
07701 Jena

Hans-Knöll-Straße 10
07745 Jena

Tel.: +49 (0)3641 57-60
Fax: +49 (0)3641 57-70
www.bgc-jena.mpg.de

Direktorium

Prof. Susan Trumbore, PhD
Tel.: +49 (0)3641 57-6110
susan.trumbore@bgc-jena.mpg.de

Prof. Dr. Martin Heimann
Tel.: +49 (0)3641 57-6350
martin.heimann@bgc-jena.mpg.de

Prof. Dr. Markus Reichstein (GfD)
Tel.: +49 (0)3641 57-6273
mreichstein@bgc-jena.mpg.de

Forschungskoordination & Presse

Dr. Eberhard Fritz
Tel.: +49 (0)3641 57-6800
efritz@bgc-jena.mpg.de

Presse- & Öffentlichkeitsarbeit

Susanne Héjja
Tel.: +49 (0)3641 57 6801
shejja@bgc-jena.mpg.de

The project's most ambitious goal is to develop an early warning index to detect sudden changes and unusual occurrences in the data streams. "We especially want to find those anomalies, which are of high relevance for the functioning of terrestrial ecosystems, such as changes in the CO_2 and water fluxes between the biosphere and the atmosphere", Dr. Mahecha explains. Such an early warning system for ecosystem changes should allow scientists and users to develop specific management and adaptation strategies at an early stage of changes.

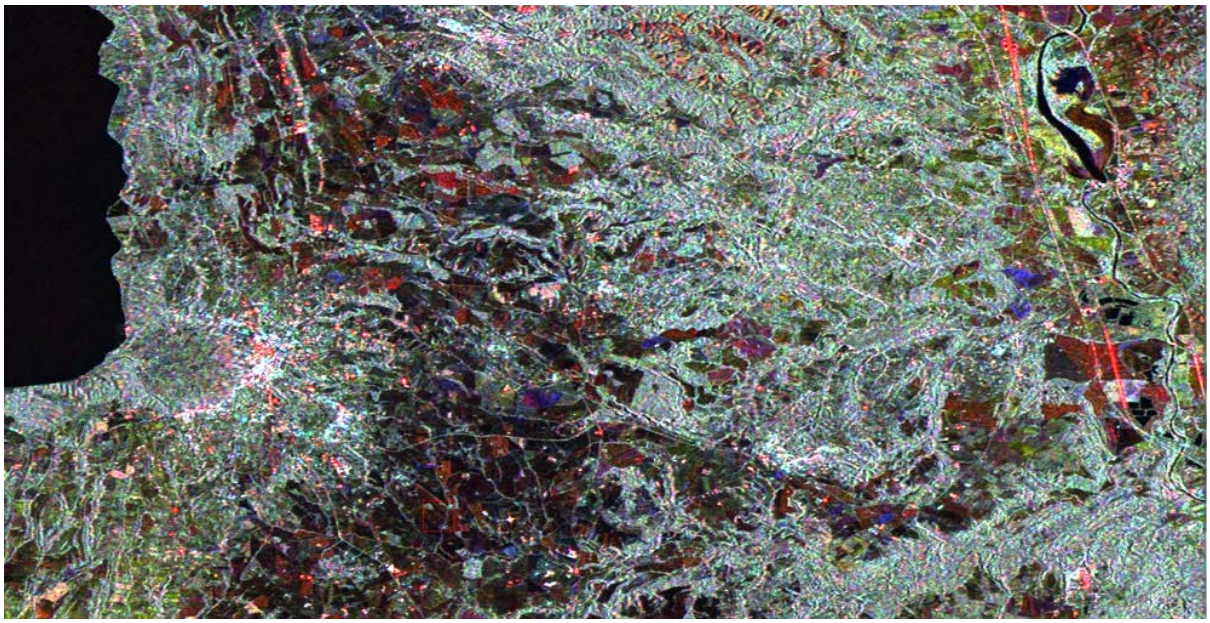
The BACI project "Detecting changes in essential ecosystem and biodiversity properties – towards a Biosphere Atmosphere Change Index" is financed by the European Commission´s Horizon 2020 research and innovation program. The project is coordinated by the Max Planck Institute for Biogeochemistry in Jena, Germany (www.bgc-jena.mpg.de). In concert with the 10 European project partners, the University of Jena (https://www.uni-jena.de) substantially contributes to the success of the project with their research on analysis of novel satellite data and on innovative methods of machine learning. The project exemplifies that today research in this area needs to embrace multiple branches of science across disciplinary boundaries. In Jena this has been conceptually realized with the foundation of the Michael Stifel Center for Data-driven and Simulation Sciences (http://www.mscj.uni-jena.de), where the University and the Max Planck institutes join their expertise. *[MM/EF/DF]*

Contact:
Dr. Miguel Mahecha
Abt. Biogeochemische Integration
MPI für Biogeochemie
07745 Jena
Phone: 03641-57 6265
Email: mmahecha@bgc-jena.mpg.de

Prof. Dr. Christiane Schmullius
Institut für Geographie, Abteilung Fernerkundung
Friedrich-Schiller-Universität Jena
07743 Jena
Tel: 03641-94 8880
Email: c.schmullius@uni-jena.de

Prof. Dr. Joachim Denzler
Lehrstuhl für Digitale Bildverarbeitung
Friedrich-Schiller-Universität Jena
07737 Jena
Tel: 03641-94 6301
Email: joachim.denzler@uni-jena.de

Further information:
http://www.baci-h2020.eu website of the BACI project



Copernicus Sentinel data (2015): The image shows the area east of Lago di Bolsena in Italy acquired by the European Radar Remote Sensing Satellite “Sentinel-1a”. Radar measures tell about the physical properties of the Earth surface by transmitting and receiving electromagnetic waves. With long wavelengths we are able to detect and analyze different surface properties, such as the moisture content, surface roughness, etc., without any restrictions due to cloud cover or daytime. The picture shows the amount of the received backscatter (echo reflected from the object) for different land cover types. As water and unmanaged agriculture areas (dark areas) has very low backscatter intensities, cities, settlements and forests (bright areas) are resulting in higher backscatter of the radar signal. (MU)
https://sentinel.esa.int/web/sentinel/faq