CAB coupled atmosphere biosphere virtual laboratory

esa European Space Agency

EXPLORING THE EARTH SYSTEM DATA CUBE

A Workshop exploring trajectories, outliers, extreme events, and causal relations in the emerging multidimensional Earth system data cube

DATE AND LOCATION:

Max-Planck-Institute for Biogeochemistry, Jena, Germany
Date: Nov. 26-27, 2015

BACKGROUND:

Across Europe (and elsewhere), many projects and scientists are working in parallel on the question of how to tap into **the potential of a simultaneous exploration of multiple Earth Observations (EOs)**. New missions and reprocessing of existing data archives confront scientists with an unprecedented amount of data simultaneously monitoring the land surface from multiple perspectives. The CAB-LAB project aims to support the exploration of multiple ESA-EOs (together with other relevant data streams) to better characterize the trajectories of land ecosystem changes.

This endeavour requires developing and applying **novel, ideally robust and generally multivariate statistical methods and data mining tools** to **explore the emerging high dimensional Earth system data cube**. The focal topic for this workshop is co-interpreting EOs for their capacity to extract **longer-term transformations,** detect **impacts of extreme anomalies,** and ideally also **discover causal relations** affecting land ecosystems. This path into new approaches is a pressing scientific challenge, currently being tackled on many fronts.

Participants are invited from across this diverse community to explore the issues together. The ultimate goals is achieving a better understanding of the trajectory of land-surface processes and their relation to other components of the Earth system – in particular, the atmosphere and hydrological cycle, and the role of humans.

In this context, the CAB-LAB team will also introduce the **Earth System Data Cube** that it is developing**,** together with prototypes of mechanisms to empower the scientific community to explore EOs towards a better understanding of land-atmosphere interactions.

Max Planck Institute for Biogeochemistry

Stockholm Resilience Centre
Sustainability Science for Biosphere Stewardship

Stockholm University

Brockmann Consult GmbH

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AIMS:

- **Bringing together scientists of different disciplines i.e.**
  - **Remote sensing community** actively working on developing new data products.
  - **Environmental/Social scientists** actively working on the exploration of EOs for detecting, interpreting, and attributing extremes and anomalies in land-surface processes.
  - **Statistical and mathematical scientists** actively working on developing novel approaches to deal with high-dimensional data i.e. time series to map transient changes, detect multivariate extremes, novelty data constellations, or developing statistical attribution schemes or new ideas on causal inference.
  - **The interested community** that aims at exploring the emerging Earth system data cube for different purposes.
- **Exchanging experiences, initiating collaborations, and maximizing synergies** amongst scientists interested in the methodological devolvements or applications for exploring the suite of ESA data.
- **Gaining an overview of European research** activities exploring the suite of EOs in tandem, beyond univariate/disciplinary approaches.
- **Identifying common strategic scientific goals for the coming years,** where collaboration could lead to an added value for all participants.
- **Identifying where the ESA support to science element CAB-LAB can strength other research initiatives**, by tailoring its products and data analytic toolkit to the needs of the community.

ORGANIZING TEAM:

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LINK:

http://earthsystemdatacube.org/

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WORKSHOP STRUCTURE (PRELIMINARY[1])

Day 1: Scientific overview

09:00	Welcome
09:30-10:00	Keynote lecture 1
10:00-12:30	Short presentation by participants: Societal/Environmental perspectives on detecting and analysing transient changes, abrupt transformations and extremes by environmental scientists.
Lunch	
13:30-14:00	Keynote lecture 2
14:00-16:30	Statistical and mathematical perspectives on detecting and analysing transient changes, abrupt transformations and extremes by environmental scientists.
Break	
17:30-19:00	Interdisciplinary break out groups on methodological requirements and novel perspectives for • Multivariate extremes and interpretation • Transient and ecological trajectories • Multiple testing • Causality • … as emerging
Joint Dinner with excellent German food and beer	

[1] Will be updated asap based on registrations and confirmations

Day 2: Scientific interaction and outlook developments

9:30-10:00	Keynote lecture 3
10:00-10:30	Wrap-up from previous day
10:30-12:30	New constellations of people! Interdisciplinary break out groups on methodological requirements and novel perspectives for • Multivariate extremes and interpretation • Transient and ecological trajectories • Multiple testing • … as emerging
12:30-13:30	Wrap up and common discussion on • upcoming challenges and • requirements to the ESA (projects), • perspectives for interdisciplinary collaborations • requirements from environmental practitioners to methodological developments • Planning of common perspectives paper
Lunch	
14:30-open end	Bilateral exchange

Ideally, the results of the workshop will be summarized in a outlook paper that will be published together in two forms: A: scientific paper and B: letter to the scientific community