

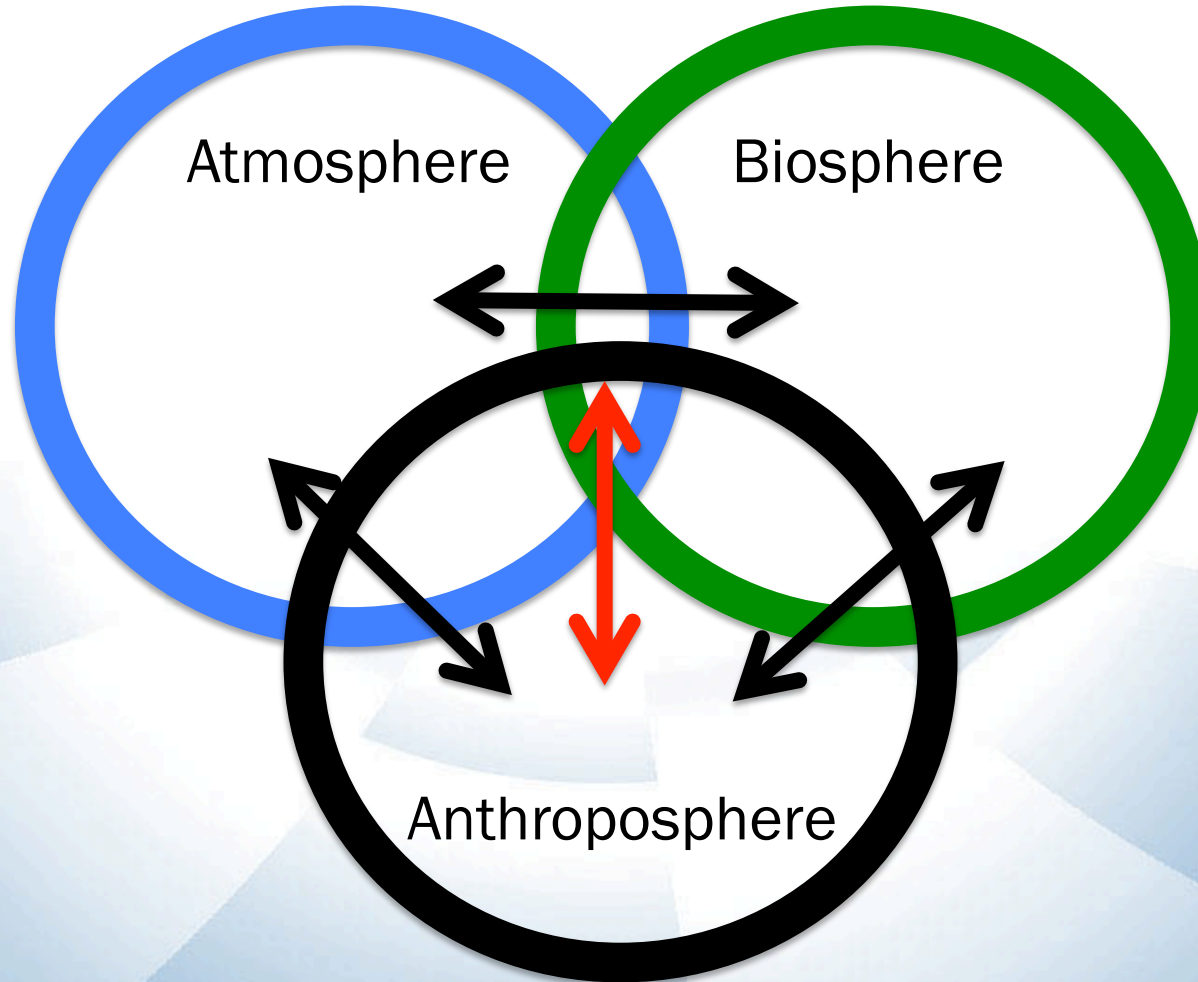
# iLEAPS, Integrated Land Ecosystem Atmosphere Process Study

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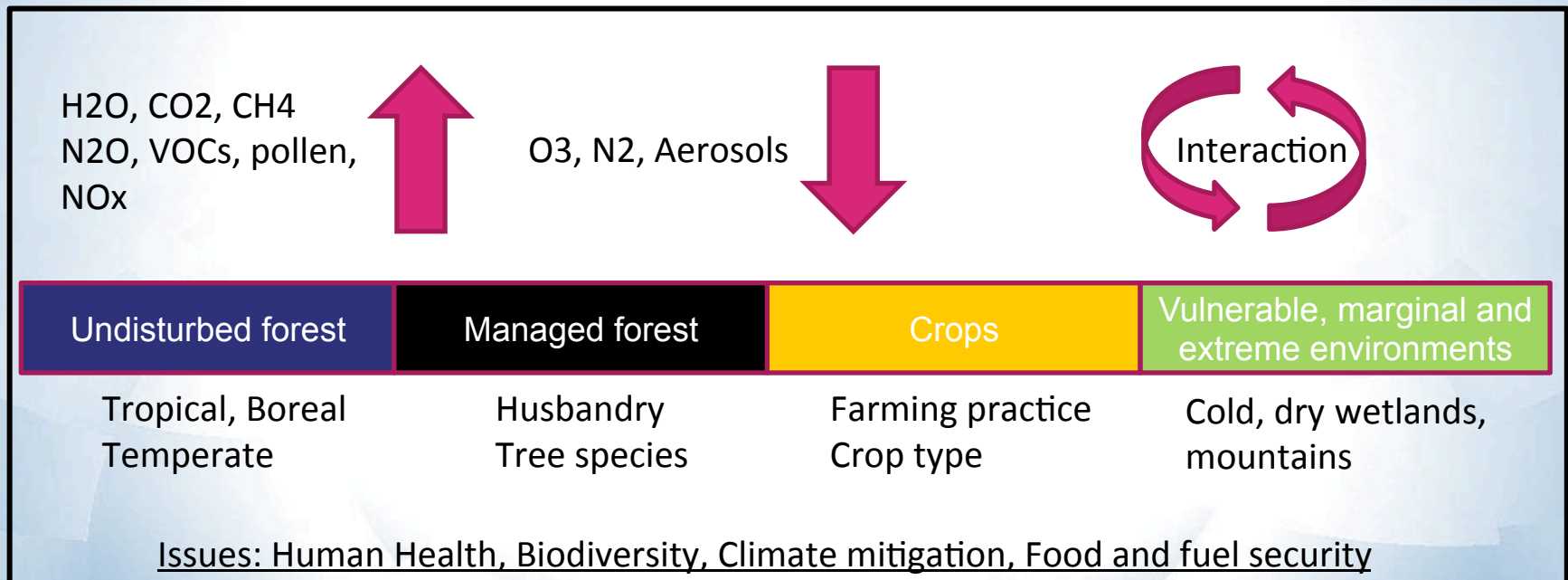
Co-Chairs of iLEAPS

# ILEAPS past and future



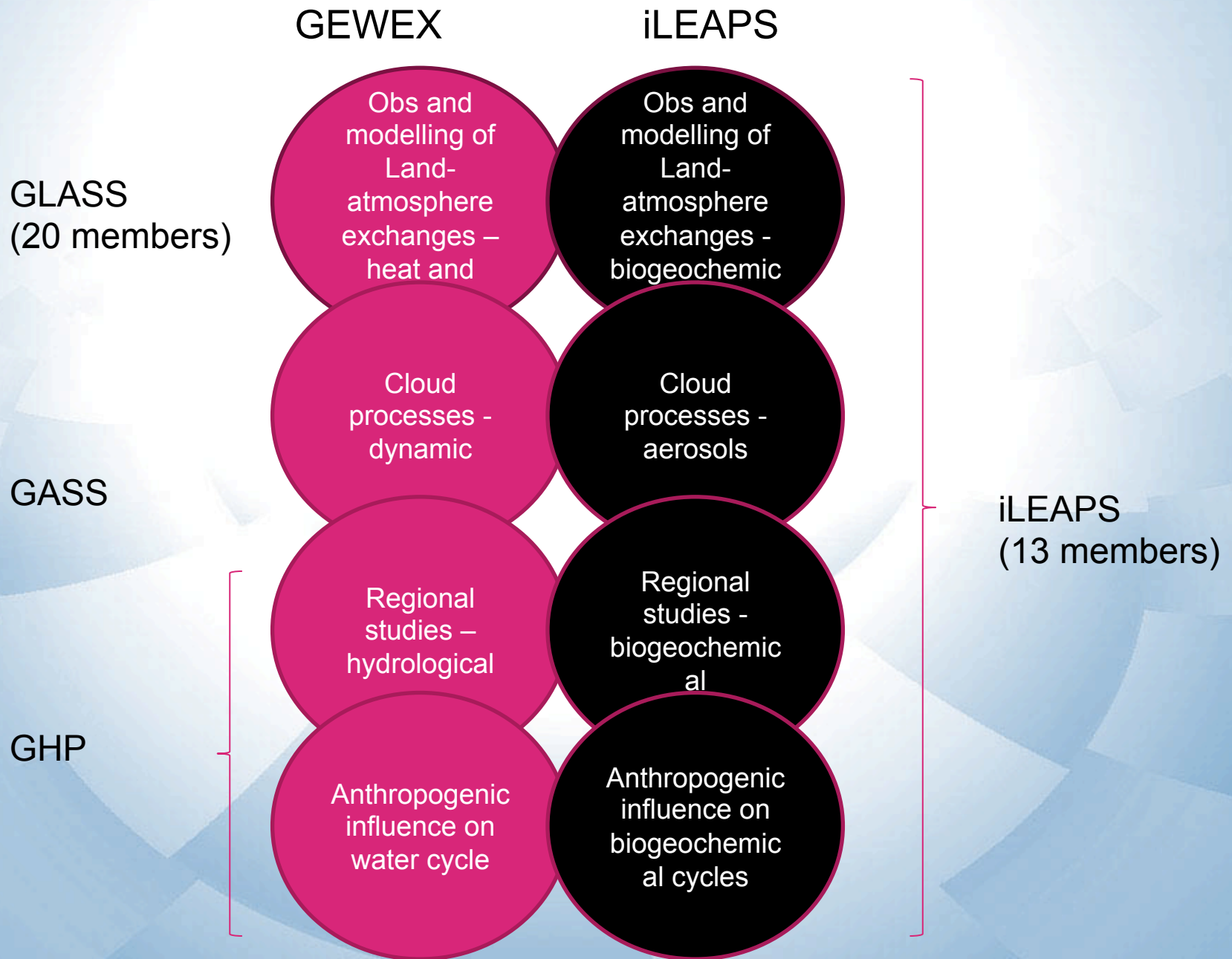
Science led foci: nurture and stimulation

# iLEAPS – integrated Land Ecosystem Atmosphere Processes Study



1. How **changing land-use and farming and forestry practice** (irrigation, tillage, fire, draining, fertilisers, grazing, forest husbandry, pest and weed control, choice of crops or trees) affects the **atmospheric chemistry, air quality and climate** (N<sub>2</sub>O, CO<sub>2</sub>, H<sub>2</sub>O, CH<sub>4</sub>, VOCs, pollen etc)
2. How anthropogenic changes in **atmospheric chemistry** (CO<sub>2</sub>, O<sub>3</sub>) affects **plant productivity** (ozone damage, CO<sub>2</sub> fertilisation)
3. How **vulnerable and marginal ecosystems** (very cold, very dry) will be affected by **changes in climate** (T, H<sub>2</sub>O, CO<sub>2</sub>)
4. How **ecosystems** (including fire, wetlands and vegetation) emit **short lived carbon**: e.g. isoprenes and methane as well as carbon dioxide and its impact on the **atmospheric chemistry**

# iLEAPS links closely to WCRP and GEWEX



# Science Areas

## Science areas for GLASS

- Water and energy fluxes
- PBL feedbacks
- Data Assimilation

GEWEX: Obs and modelling of Land-atmosphere exchanges – heat and water

iLEAPS: Obs and modelling of Land-atmosphere exchanges - biogeochemical

## Joint science areas:

- Impact of land use change
- Use of EO data
- Extremes
- Permafrost and soil freezing
- Model evaluation

## Science areas for iLEAPS

- CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, VOC, O<sub>3</sub>, Aerosol fluxes
- Nitrogen and carbon cycle
- Wetlands – impact on CH<sub>4</sub>
- Fire
- Dynamic vegetation processes
- Crops – phenology and physiology
- Impacts of land management on the human system (food/fuel production)

# Current Activities

## Current Activities

- Benchmarking: PLUMBER
- Global MIPS: GSWP3, LS3MIP, LUMIP
- Regional studies: ALMIP2, HyMEX
- Atmosphere feedbacks: LoCo, DICE

GEWEX: Obs and modelling of Land-atmosphere exchanges – heat and water

iLEAPS: Obs and modelling of Land-atmosphere exchanges - biogeochemical

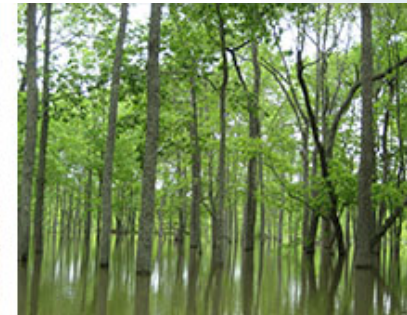
## Current Activities

- Regional studies (Asia) – new flux data
- IMECS: with GLP and AIMES
- ESA-iLEAPS Biosphere-atmosphere-society index

## Joint current activities:

- LUCID/LUMIP
- Extreme environments and extreme events: EEE
- GSWP3 – jointly defined model experiments
- ACPC

The iLEAPS led project **Extreme Events and Environments from climate to Society (E3S)** is one of the eight newly launched Future Earth initiatives to support global sustainable development. The E3S project is scientifically coordinated and managed in the MPI-BGC (Markus Reichstein).



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(bottom left): Bsam (<http://picsload.com>); (bottom middle left): Jay Janner, The Statesman; (bottom middle right): NATO; (bottom right): Dr. Bernd Gross

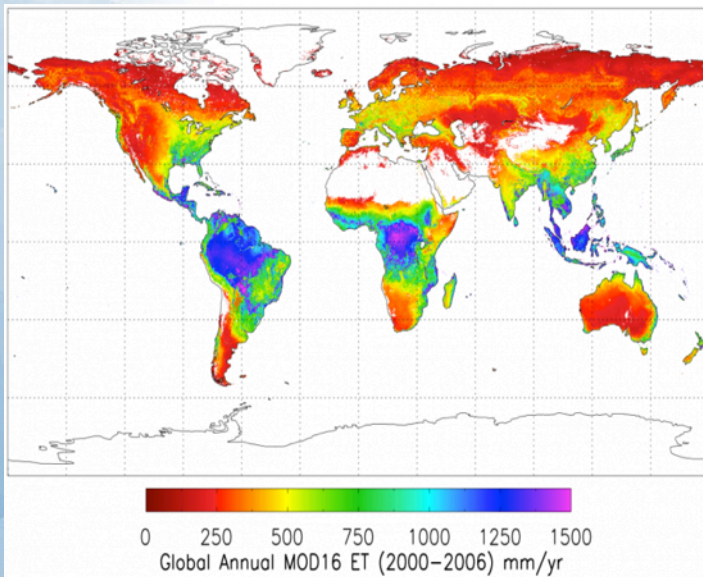
Which are the most relevant metrics for climate extreme impacts on ecosystems and societies?

How do social and natural systems interact at different time-scales?

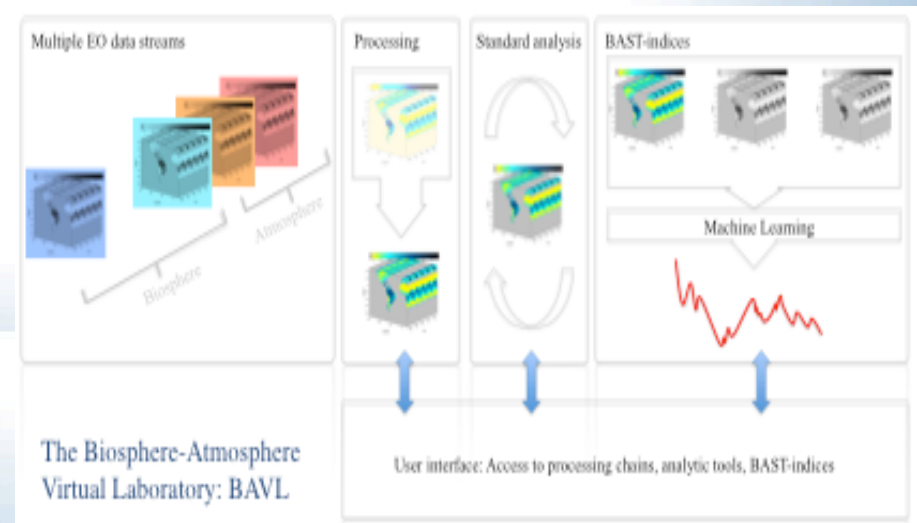
Which system properties yield resistance and resilience to extreme conditions?

# BASI: Biosphere-Atmosphere Society Index

iLEAPS-ESA project: Multivariate analysis of Earth Observations to produce a Biosphere-Atmosphere Index including Fire, Soil water stress, Evapo-transpiration, Photosynthesis, Crop productivity, Land use change



Earth Observation Product



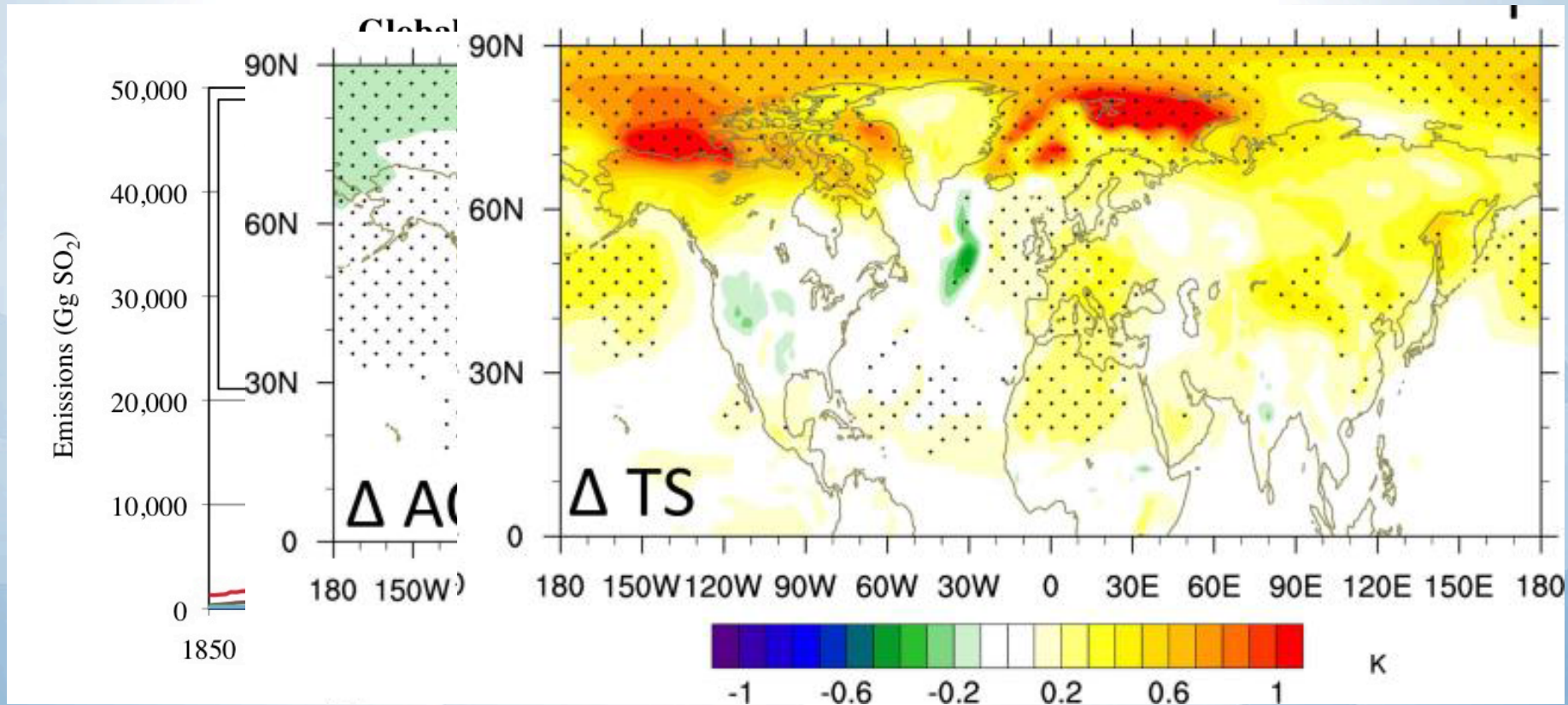
Multi-variate Analysis



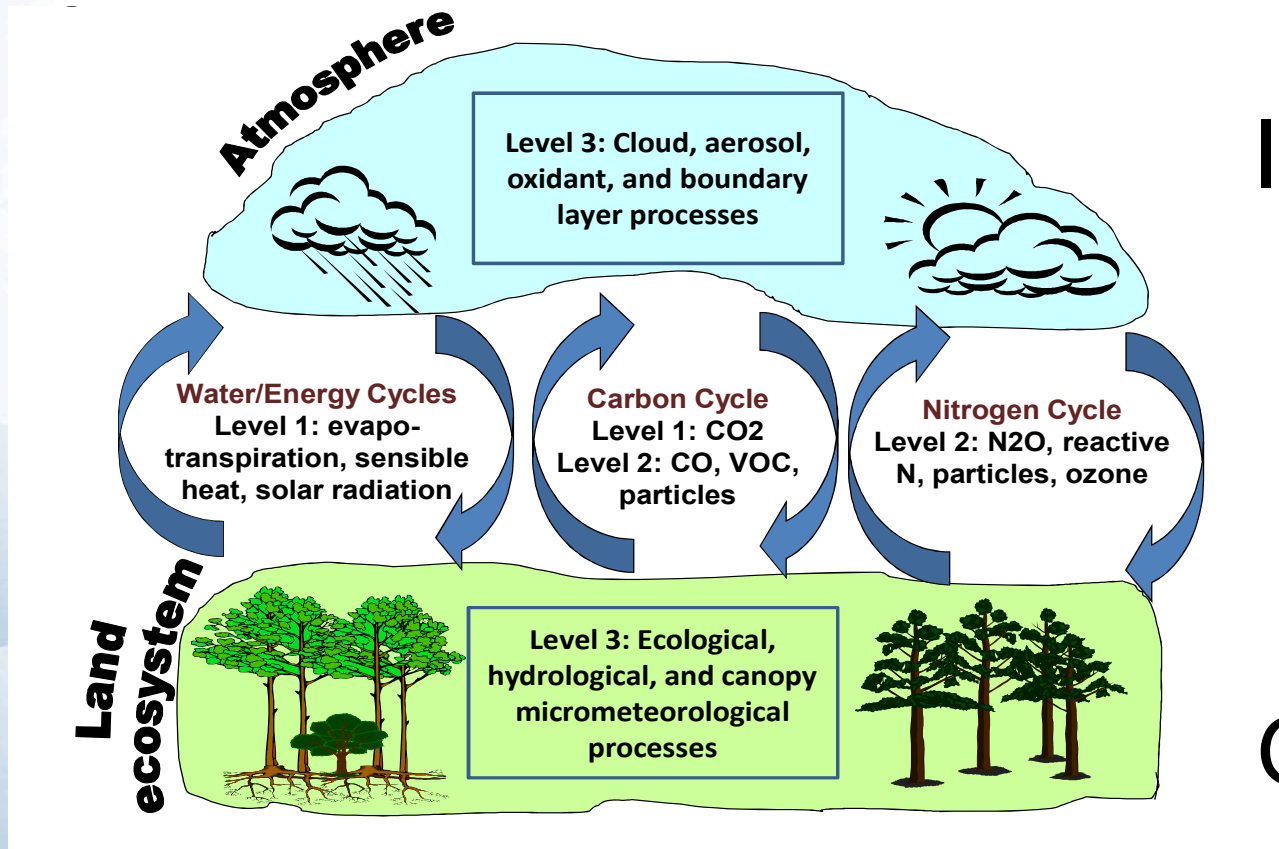
# Aerosols, Clouds, Precipitation and Climate (ACPC)

- The ACPC initiative has been established to facilitate and enable international and interdisciplinary research in this field. Jointly supported by GEWEX and ILEAPS.
- The goal of the ACPC research program is to obtain a quantitative understanding of the interactions between the aerosol, clouds and precipitation, and their role in the climate system.
- The main question ACPC tries to answer is: How do aerosol-precipitation interactions manifest themselves at the full range of temporal and spatial scales in the climate system?
- ACPC Workshop coming up in Oxford, 13-15 April, 2016.

# Regional radiation changes (Aerosols) – large scale dynamics - climate effects



# Flagship site



IGAC

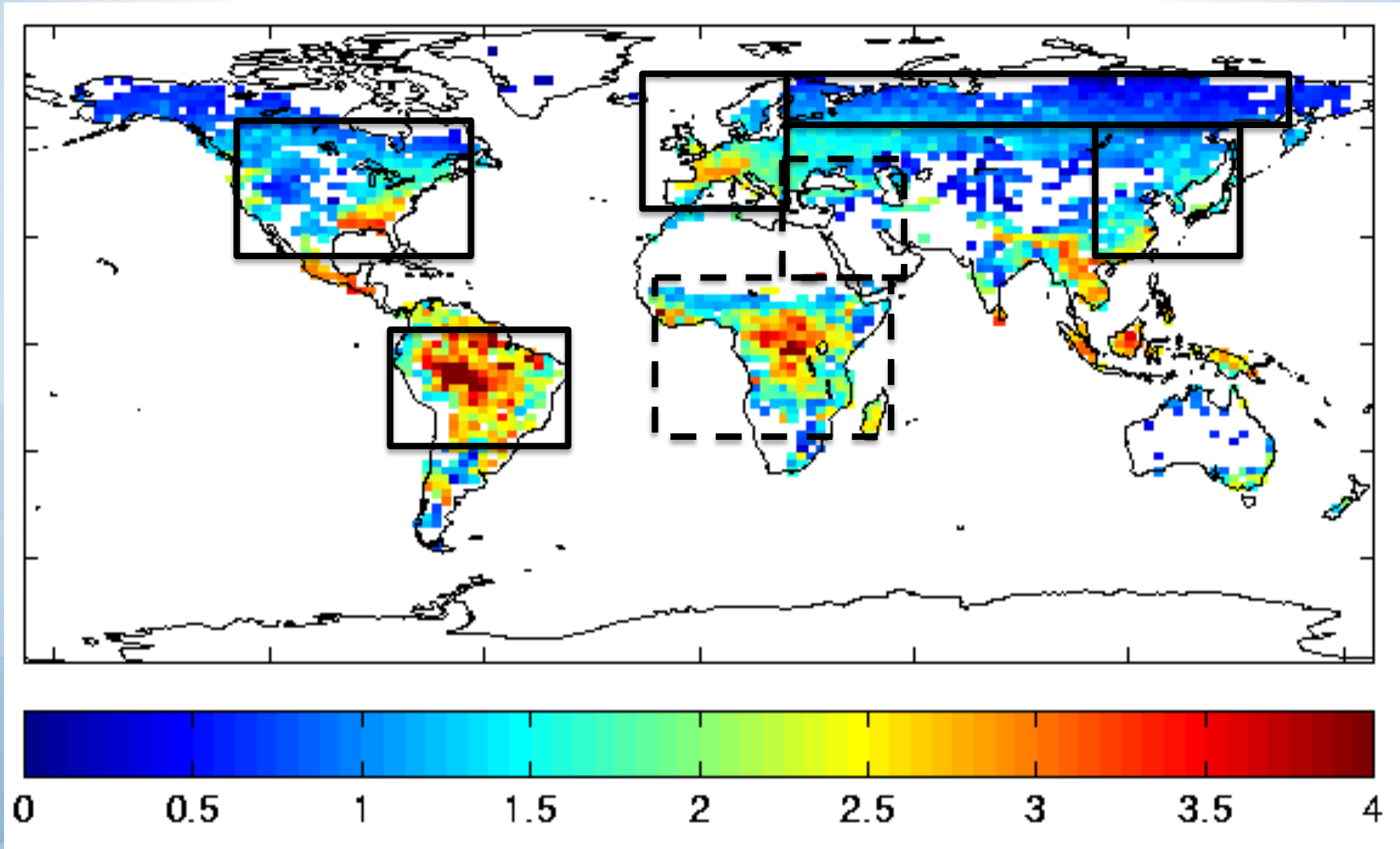
ILEAPS

GLP

WRCR  
XFWMG

*Schematic of land ecosystem – atmosphere interactions and hierarchical observational levels that include basic (1), advanced (2), and comprehensive measurements at flagship sites (3). Adopted from Guenther et al. (2011).*

# New regional nodes: strategic choices



# iLEAPS offices

- IPO in Nanjing, China
  - National committees in China, Korea and Japan
- Node for the MENA region at Cyprus Institute
- European office at Centre for Ecology and Hydrology, UK

# Future common activities

- Common initiatives
- Workshops
- Data collection /experimental activities
- Modeling cooperation
- Common regional nodes / offices

# Other

- Transition to Future Earth under ways
- MoU with WRCP but concrete short term plans with GEWEX

**Thank you for your attention**