Master studies available

in the group of **Plant-Atmosphere Interactions**
at the IMK-IFU in **Garmisch-Partenkirchen**

Impacts of coupled heat-drought events on photosynthetic activity and water relations in two contrasting tree species

Summer heat waves are expected to become more abundant in the future. However, the impact of heat events on forest ecosystems has only recently arouse interest in biogeochemistry research. This study focuses on the impacts of photosynthesis and tree water relations during extreme heat and investigates the degree of recovery. Gas-exchange and water potential measurements will be conducted in a state-of-the-art greenhouse experiment on coupled heat-drought stress in black locust and Douglas-fir trees.

Effects of heat and drought on photosynthesis and growth in Swiss pine seedlings under controlled conditions: Does timing matter?

Extreme weather events are predicted to increase in frequency and intensity. This study investigates the effects of the timing of combined heat-drought stress on tree physiology. The question is asked if early season stress will have a larger impact on photosynthesis and growth than stress experienced during late summer? The study includes measurements of gas exchange and biomass on young Swiss pine (*Pinus cembra*) growing under controlled conditions in a modern greenhouse facility.

Start: from April 2014

We are looking for motivated students, who are expected to work independently after comprehensive introduction to measurement techniques and data analysis.

The thesis can be written either in German or English.

We offer an **excellent research environment** within a young and motivated research team. Compensation to cover expenses in form of a **small salary** can be negotiated.

If you are interested please contact: nadine.ruehr@kit.edu or almut.arneth@kit.edu

Master studies available

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Modelling: land-use change effects on atmospheric CO2?

Conversion of natural vegetation to croplands/pasture typically involves a strong flux of CO2 to the atmosphere as the natural vegetation is harvested or burnt. However, the total effects of land-use change also include the difference between the CO2 that *would* have been captured by the natural vegetation, and the CO2 that *is* captured by the cropland. This project will use the LPJ-GUESS dynamic vegetation model to assess differences in carbon fluxes for relevant combinations of natural vegetation and crops/pasture, and thus provide information which can aid in the management of regional carbon budgets. *The student will learn to perform simulation experiments with a global vegetation and carbon cycle model, and to apply a variety of techniques to analyse and plot output from global vegetation models in context of climate change studies.*

Modelling: Effect of ecosystem nitrogen-limitation on lags in vegetation response to climate

Ecosystems do not react instantaneously to changes in climate. Rather processes such as ecosystem dynamics and CO2 fertilisation of photosynthesis lead to lags in the vegetation response which may be on the order of many decades. These lags mean the provision of ecosystem functions and services such as carbon storage and evapotranspiration are dependent upon the previous as well as the current climate. However, we now know that ecosystem behaviour under climate change is fundamentally affected by nitrogen availability. This project will use the new nitrogen-enabled version of the LPJ-GUESS Global Dynamic Vegetation Model to assess the influence of nitrogen limitation on the nature and magnitude of these lags, thus contributing to our understanding of the role of vegetation in the earth system.

Modelling: Effects of lengthening growing season on European ecosystem carbon balance and emissions of biogenic Volatile Organic Compounds

Increases in global surface temperatures with further increases projected during the 21st Century has in turn caused an observable increase in the length of the growing season, with budburst stimulated earlier in the year and senescence occurring later. This project will use the LPJ-GUESS Global Dynamic Vegetation Model to assess the impact of an extended growing season on the carbon cycle and the capacity of vegetation to act as a sink of atmospheric carbon dioxide; and the temporal and spatial distribution of emissions of a group of highly reactive hydrocarbons (commonly referred to as volatile organic compounds). *The student will learn to perform simulation experiments with a global vegetation and carbon cycle model, and to apply a variety of techniques to analyse and plot output from global vegetation models in context of climate change studies.*

We are looking for motivated students, who are expected to work independently after comprehensive introduction to measurement techniques and data analysis.
The thesis can be written either in German or English; communication in English at IMK-IFU will be a requirement.
We offer an **excellent research environment** within a young and motivated research team. Compensation to cover expenses in form of a **small salary** can be negotiated.

Start: from ca April 2014

If you are interested please contact: almut.arneth@kit.edu or thomas.pugh@kit.edu

! Internship available !

in the group of **Plant-Atmosphere Interactions**
at the IMK-IFU in **Garmisch-Partenkirchen**

We offer internships to support our research in the Plant-Atmosphere Interactions group at the Institute of Meteorology and Climate Research – Atmospheric Environmental Research (www.imk-ifu.fzk.de) in Garmisch-Partenkirchen. The intern will work together with our research team in the greenhouse facility to study the effects of extreme heat and drought on carbon and water dynamics in trees. The intern will learn state-of-the-art measurement techniques to measure CO_2, H_2O exchange and emissions of volatile organic compounds from plants. A small salary to pay for expenses can be offered**. Start from April 2014**.

If you are interested please contact nadine.ruehr@kit.edu or almut.arneth@kit.edu