

2 PhD fellowships | Hydrological and Climate Variability Research Group

The Hydrological and Climate Variability Research Group of the University of Life Sciences Prague is opening two funded positions for PhD studies.

High-profile international candidates from engineering, geosciences or computer science, wishing to achieve a further step in their career in the dynamic research environment of the University of Life Sciences Prague are welcome to apply. Candidates with previous experience in data analysis of big data sets and solid background in basic science will be considered with particular attention. Potential research topics include:

Multi-source quantification of global water cycle components

Our understanding of Earth's water cycle has improved dramatically due to the vast amount of different data sources. Remote sensing data and model simulations, complemented the traditional surface measurements and offered an unprecedented coverage in a global scale. However, this unique opportunity to obtain a robust quantification of global water cycle fluxes has been hindered by the uncertainty revealed in the first attempts of the unification of different data-products. Thus, it remains a challenge to constrain the variability stemming from observations by various sources, which will help us understand the effect of global warming to water resources in general.

Investigation of extreme states in Earth's global hydrological cycle

One of the major hypotheses related with global warming is the intensification of global hydrological cycle. During Earth's past there have been periods that global climate was dramatically different than the one we experience in Holocene. This extreme states propagated in different time scales with some times abrupt transitions, which still leaves unanswered questions about the links between temperature and water in our planet. The successful applicant will use paleoclimatic reconstructions in order to investigate and simulate the range of hydrological cycle natural variability using process-based and stochastic models.

Reconstruction of European hydroclimate during the last 2000 years

In the last decades there has been a growing number of reconstructions of past climates from proxy data. Over the same period, our efficiency in hydrological and climatic modeling increased geometrically. Therefore there is a need of high quality gridded reconstructions of temperature and precipitation that can be used as input for the hydrological models or for validation purposes of Earth System Models. This PhD aims to develop a complete high-resolution hydrological reconstruction for Europe during the last two millennia. Special focus will be given in the major periods of long-term (decadal or longer) drought, also cited as mega-droughts, and their links with

global atmospheric circulation and the hydrological cycle in general. The individual selected for this position should have a degree related to (paleo-) climatic studies or hydrology and will collaborate with researchers from Helmholtz Centre for Environmental Research (UFZ; Germany) and/or Global Institute of Water Security (GIWS; Canada).

Application of data-driven methods for catchment classification over Earth, Mars and Titan

What is common between Earth, Mars and Titan? All of these three planetary systems have or had active hydrological cycles and their geological fingerprints can be found in their catchments. The aim of this topic is to identify regions that share geomorphological characteristics between these three planets. To achieve this the successful applicant will explore different dimensionality reduction techniques (i.e., support vector machines, self-organizing maps) to effectively classify the catchments and then compare them to decipher the underlying processes.

The [Hydrological and Climate Variability Research Group](#) is an interdisciplinary team of young researchers focusing on the interactions between hydrological and climatic processes. It is affiliated to the Faculty of Environmental Sciences and the Department of Water Resources and Environmental Modelling, under the direction of Dr. Martin Hanel. Building upon national and international collaborations, we are trying to analyze how climatic variability affects the water cycle components and vice versa. To achieve this we explore existing multi-source data or produce new ones from field measurements and computer simulations, develop sophisticated statistical and numerical methods to process them and apply novel approaches to visualize and present them. A main research line of the group is the study of extreme hydroclimatic events, and droughts in particular, as we are motivated by its severe socioeconomic consequences to current and future generations.

The PhDs will be concluded in four years, starting in October 2019, with a net salary around 1000 €/month and will be supervised by Dr. [Y. Markonis](#). Interested candidates should send a CV and a motivation letter describing their research interests to markonis@fzp.czu.cz by 5th of February 2019.