

## Investigation of the Terrestrial Hydrological Cycle Acceleration (ITHACA)

### Background

Funded by the Czech Science Foundation, “the [Junior STAR grants](#) aim to support excellent basic research and provide early career researchers with an opportunity to achieve scientific independence and build their own research group.” Starting in January 2022, ITHACA is an aspiring project that will bring together young researchers from various disciplines under the guidance of Dr. [Yannis Markonis](#). The project team consists of experts in hydroclimatology (Martin Hanel, Czech University of Life Sciences Prague), hydrology (Oldrich Rakovec, Helmholtz-Centre for Environmental Research), and stochastic hydrology (Simon M. Papalexiou, University of Calgary), and will study **how the acceleration of the hydrological cycle (THC) will influence water availability over land**.

This will be achieved by analyzing the THC variability in a combination of multi-scale data-driven methods with climate and hydrological modeling. Conceptually, the methodological approach has three discrete steps. Starting in the past, paleoclimatic data will be scrutinized to assess the range of THC variability and the transition times between dry and wet regimes. Then, moving to the present, datasets from the observational period will be used to quantify the ongoing acceleration and its statistical significance. Finally, hydrological modeling will be used to understand the impact on water availability. External collaborations will further support the above lines of research with research groups in Imperial College London, Florida Tech, and Beijing Normal University.

### Home Institution

[Czech University of Life Sciences Prague](#) (CZU) is the leading Czech university in water research. Currently, the university has more than 18 000 students (10% are international students), six Faculties and one Institute. CZU offers over 170 accredited study programs at B.Sc., M.Sc., and Ph.D. levels with a quarter of them offered in English. Since 2007 the Czech University of Life Sciences has been a member of the Euroleague for Life Sciences and was recently ranked as the most sustainable university in the Czech Republic (Green Metric World University Rankings: 53rd in sustainability out of 912 evaluated universities). The [Faculty of Environmental Sciences](#) (FES) is one of the top Faculties nationwide with extensive experience in teaching and broad research interests. It follows an integrative, multi-disciplinary approach in the doctoral and master’s degree programs, and the faculty is committed to providing graduate students with skills to be successful in a range of careers. The project will be carried out in the [Department of Water Resources and Environmental Modeling](#), a fast-growing and dynamic department with high research activity and increasing international exposure. Our scientific studies cover [a broad range of subjects](#) ranging from hydroclimatic variability to planetary hydrology. CZU is located in Prague, one of the top-ranked European cities to live in, with a rich history in arts and science.

### The Positions

The successful applicants will participate in creating a research group that focuses on innovative research with societal impact. One of our top principles will be to maintain an inclusive, thriving environment that encourages personal growth and respects work-life balance. Diversity, not only in terms of gender or nationality, but most importantly as it comes to opinions and beliefs, will also be a necessary component of group functioning.

### *Post-doctoral researchers*

- **Hydroclimatology** (5 years): they will ideally have a background in atmospheric sciences or hydrology and their main task will be to work on the statistical analyses involved in the THC acceleration and their attribution to the physical mechanisms involved.
- **Hydrological modeling** (4 years): they will use global hydrologic models to quantify the changes in water availability due to changes in THC, as well as perform idealized experiments to improve our understanding of the cross-scale properties of THC.
- **Stochastic hydrology** (3 years): they should have a strong expertise in statistics and will work in the implementation of the stochastic framework needed to model the hydroclimatic processes of THC and the quantification of natural variability.

Prospecting candidates with a solid background in basic science and experience in big data analyses will be considered with particular attention. For all the positions a good knowledge of R or Python is essential. If interested, there are available teaching opportunities and engagement to other projects over various topics. The three post-doctoral research positions will start in **March/April 2022** with some flexibility for later appointments. We offer a competitive salary package with full social and health benefits and remote work options, commensurate with work experience.

### *Ph.D. students (4 years)*

The following topics are offered under the supervision of Dr. Y. Markonis:

- Cross-scale investigation of long-term hydroclimatic variability over land.
- Process-based analysis of hydrological memory over multiple spatio-temporal scales.
- Stochastic assessment of the terrestrial hydrological cycle acceleration in the 21<sup>st</sup> century.

Prospective students must have a degree in geoscience or engineering discipline related to water or atmospheric sciences. Good knowledge of programming will be considered an asset, as well as previous research experience in paleoclimatology, hydrological modelling, and/or statistics. The Ph.D. positions will be co-supervised by Dr. M. Hanel, Dr. O. Rakovec, and Dr. S. M. Papalexiou and start at the beginning of **October 2022**.

### *M.Sc. Scholarships (2 years)*

The Master's students will be enrolled in the M.Sc. program of [Environmental Modelling](#) and contribute to various project activities, such as data curation, visualization for exploratory data analysis, technical support in database management and the development of interactive applications for public outreach. The Master's program also starts at the beginning of **October 2022**.

More information about the project and the position details will be provided to the shortlisted candidates. Interested candidates should send a CV with three references to [ithaca@fzp.czu.cz](mailto:ithaca@fzp.czu.cz) by the **10<sup>th</sup> of December 2021**. Later applications will also be accepted if any of the positions remain open.