

THE INSTITUTE OF AGROPHYSICS  
OF THE POLISH ACADEMY OF SCIENCES IN LUBLIN  
IS SEARCHING FOR:

**PhD FELLOWSHIP (f/m)**

**in the Department of Metrology and Modelling of Agrophysical Processes on the research project „Physico-empirical description of the unsaturated soil hydraulic conductivity coefficient with the hysteresis effect taken into account” (2021/43/B/ST10/03143), funded by the National Science Centre within the program OPUS 22**

**1. Requirements:**

- a) Master's degree in chemistry, physics, mathematics, life sciences or engineering sciences;
- b) basic knowledge of soil physics or microbiology;
- c) good command of the English language – necessary for scientific communication and report/articles writing;
- d) ability to use Microsoft Office;
- e) good communication skills and ability to work as a part of a team, self-motivation;
- f) availability to field trip and/or measurements;
- g) programming skills in any programming language.

**2. Job description:**

The Institute of Agrophysics, Polish Academy of Sciences, [Department of Metrology and Modelling of Agrophysical Processes](#) is looking for PhD student in the [Doctoral School of Quantitative and Natural Sciences](#).

**PhD thesis proposal:**

**Physico-empirical description of the unsaturated soil hydraulic conductivity coefficient with the hysteresis effect taken into account.**

- The PhD studies will take place for 48 months (from 01.10.2023) at the Department of Natural Environment Biogeochemistry, Institute of Agrophysics, Polish Academy of Sciences, Lublin, Poland under scientific supervision of dr hab. Krzysztof Lamorski ([k.lamorski@ipan.lublin.pl](mailto:k.lamorski@ipan.lublin.pl)) the supervision of the Project Principal Investigator – prof. dr hab. Cezary Sławiński ([c.slawinski@ipan.lublin.pl](mailto:c.slawinski@ipan.lublin.pl)).
- The doctoral scholarship is financed by the National Science Centre, Poland – OPUS-23 and its payment will be in accordance with Annex to NCN Council Resolution No 79/2021 9 September 2021 amending the Regulations on awarding funding for research tasks funded by the National Science Centre as regards research projects. The scholarship is guaranteed for a period of 48 months.
- Language of PhD course and thesis: English or Polish.
- The condition for the Candidate's involvement and payment of the scholarship in the OPUS-22 project under the conditions set out in the Act on Higher Education and Science of 20 July 2018 (Journal of Laws 2022 item 574 as amended) is his/her admission to the Doctoral School of Quantitative and Natural Sciences. Details (documents, procedures, deadlines) are available on [the website](#).



Hysteresis phenomenon can be observed for two essential hydrophysical soil characteristics: soil water content-soil water pressure head dependence (retention curve) and soil hydraulic conductivity coefficient in the unsaturated zone-soil water pressure head dependency. These characteristics significantly impact the whole processes in the soil, especially the wetting and drying processes, thus determining the conditions for plant growth.

Unfortunately, the hydraulic conductivity coefficient in the unsaturated zone is a challenging soil characteristic to measure. The measurement of this coefficient is highly time-consuming and limited by the measuring range of used methods. Because of those difficulties, laboratory measurements of unsaturated soil hydraulic conductivity coefficient-soil water pressure head dependency are usually limited to the main drying branch. Thus, hysteresis phenomena of this coefficient are poorly investigated and ignored in the models. This is an essential gap in the actual state of knowledge. Elaboration of a physical-empirical model that takes into account the hysteresis effect of hydraulic conductivity coefficient in the unsaturated zone would make up this gap, affecting at the same time a better understanding of the topic of the macroscopic description of mass transport in the unsaturated zone of the soil. It would also allow taking into account the hysteresis effect of hydraulic conductivity coefficient in the simulation-forecasting models currently used, making them more accurate.

Therefore, the PhD aims to develop a physical-empirical model of the soil hydraulic conductivity coefficient in the unsaturated zone taking into account the hysteresis effect of selected soil types. The aim will be realized based on the soil hydraulic conductivity coefficient measurements in the saturated and unsaturated zone and measurements of the chosen soil physical properties. The measurements of the hysteresis of hydraulic conductivity coefficient, performed for an extensive range of soil types and collected in the form of a database, will be used for the model development utilizing machine learning/artificial intelligence methodology.

While performing the doctoral thesis as part of the implementation of project no. 2021/43/B/ST10/03143, the doctoral student will be among others, responsible for:

- participation in the analysis and choosing of representative soil profiles;
- samples preparation;
- soil properties analyses;
- unsaturated, saturated soil water conductivity measurements;
- running data analysis and screening, taking care of experiments;
- participation in the elaboration of the physical description of the soil hydraulic conductivity coefficient in the unsaturated zone taking into account the hysteresis effect;
- participation in the simulation of the yield in relation to hysteresis;
- participation in report writing;
- participation in publication preparation.

Do not hesitate to contact dr hab. Krzysztof Lamorski ([k.lamorski@ipan.lublin.pl](mailto:k.lamorski@ipan.lublin.pl)) with any question related to the PhD project.



3. **Funding scheme:** OPUS-22
4. **NSC panel name (Research field):** ST10
5. **Deadline for submitting applications:** till 27.09.2023, 2.00 p.m. UTC+2
6. **How to apply:** in electronic form via our Recruitment System:  
<https://career.ipan.lublin.pl/en/announcements/> and additionally in person or by traditional mail or by e-mail in accordance with the rules presented on [the website](#).
7. **Interview:** 29.09.2023, with the stipulation the deadline can be changed.
8. **Results will be announced by:** 30.09.2023, with the stipulation the deadline can be changed.
9. **Terms of employment:**

The successful candidate will receive scholarship for 48 months, under the rules of Act on Higher Education and Science of 20 July 2018 (Journal of Laws of 2022 item 574 as amended) in the amount of PLN 5,000.00 per month, reduced by ZUS due contributions on the side of the scholarship holder and the Institute up to the month of a mid-term evaluation and in the amount of PLN 5,000.00 monthly, reduced by ZUS due contributions on the side of the scholarship holder and the Institute after a positive mid-term evaluation result. **Please be informed the amount stated above also include contributions and benefits payable by the Institute (total scholarship cost), therefore the gross and net amounts of scholarship will be calculated as the above values being reduced accordingly.**
10. **Additional information:**
  - a) The recruitment process is organized as an open competition pursuant to the terms and conditions stated in The Act on Higher Education and Science of 20 July 2018 (Journal of Laws of 2022 item 574 as amended).
  - b) After the deadline for submitting applications will expire, the Committee may conduct interviews with candidates. In this case, each candidate will be informed individually about the first stage results, as well as the date of the interview.
  - c) The Institute reserves the right to award the fellowship to the candidate ranked 2nd, only if the chosen candidate resigns before signing the fellowship agreement.
11. **Required documents:**
  - 1) letter of application addressed to the Chairperson of the Committee – prof. dr hab. Cezary Sławiński;
  - 2) Curriculum Vitae with an information on meeting requirements regarding competences and abilities, a summary of scientific accomplishments and awards (including in particular: published scientific papers, conference speeches, participation in research projects, internships, training courses as well as other research achievements and scientific distinctions);
  - 3) copy of MSc diploma;
  - 4) recommendation letter issued by the research supervisor (additional document appreciated);
  - 5) declaration of availability to work in the Project with the indication of the starting date: 1st October 2023;
  - 6) declaration of consent to the processing of personal data contained in the fellowship offer for the needs of the recruitment process in accordance with the example below:

*„I allow my personal data stated in the abovementioned applications to be processed for the purpose of the recruitment by the Institute of Agrophysics of the Polish Academy of Sciences (20-290 Lublin, ul. Doświadczalna 4), in accordance with the General Data Protection Regulation (EU) 2016/679.”\**

\*) Information clause on personal data is available on the following website:



<http://www.ipan.lublin.pl/wp-content/uploads/2019/02/information-clause-IA-PAS.pdf>

**If you are interested in this position please send your application via our Recruitment System by 27.09.2023, 2.00 p.m. UTC+2: <https://career.ipan.lublin.pl/en/announcements/>**

**In addition, the Candidate should submit an application to Doctoral School of Quantitative and Natural Sciences according to information on [the website](#).**

We kindly inform that we contact only chosen candidates and also applications that are incomplete, submitted after the deadline or in the different form than required will not be processed.