

**Institute:** Institute of Nature Conservation, Polish Academy of Sciences

**Title:** Reconstruction of the Late Glacial palaeoenvironmental changes of the Polish Western Carpathians, on the base of lithological and macrofossils analyses of the selected landslide fen deposits.

**Name of potential first supervisor:** dr hab. inż. Włodzimierz Margielewski, prof. IOP PAN

**Name of potential second supervisor:** dr hab. Renata Stachowicz-Rybka, prof. IB PAN

**Background information:**

The subject of the research is the reconstruction of palaeoenvironmental changes during the Late Glacial (ca 15-11.7 thousand years) within the Western Carpathians. The research will be conducted within the Kotoń and Klakłowo landslide fens in the Beskid Makowski Mts., where the accumulation of organic and mineral sediments began at ca 15-13.5 thousand years ago, and the Late Glacial sequences of sediments constitute 70% of the profiles. Based on plant macrofossil analysis (seeds, fruits, needles, megaspores) and lithological analysis of sediments (loss on ignition, grain size) done for two profiles of each fen, and many radiocarbon (<sup>14</sup>C) datings, the changes of natural environment occurring within the top parts of the mountains (Kotoń) and in the valley zones (Klakłowo) during the Late Glacial will be reconstructed. The research will allow to recognize the variations in local plant communities of the fens and their vicinity during a short (190 years) climate cooling of the Older Dryas Stadial (13540-13350 years), recorded as 0.5 m thick horizons. Based on plant macrofossil analysis, the hypothesis on presence of refugium of thermophilous trees like linden, oak and hazel during the Late Glacial in the Kotoń landslide (confirmed in both sites by pollen analysis) will be verified.

**The main question to be addressed in the project:**

The main scientific question is: how the common and regional climatic changes during the Late Glacial are reflected in the local record of the sedimentary environment of the landslide fen located in various hypsometric locations?

Important issue concerns also an analysis of mineral sediment supply to the fen, resulting in formation of mineral horizons within peat sequences and being related to the warming phases in the Late Glacial (Bølling and Allerød).

Plant macrofossil analysis will highlight an impact of the climate changes occurring commonly in the Late Glacial on the natural environment in the fen sedimentary basin and its vicinity. It will also allow to verify the hypothesis indicated by previous pollen analysis about thermophilous plant refugia probably present at Kotoń landslide area during the Late Glacial (Bølling).

Comparing plant macrofossils compositions between two profiles from two different parts of the same fen will clarify whether a single profile is representative for a given fen, especially in context of relatively low biodiversity of the Late Glacial.

Analysis of the pollen grains in deposits (palynological analysis) performed by specialized laboratories will allow to determine how local changes in the natural environment reflect climatic (and environmental) changes regional or common in character.

**Information on the methods/description of work:**

The basic method of work comprises plant macrofossil and lithological analysis of mineral sediments derived from two selected landslide fens of Beskid Makowski Mts: the Kotoń and Klakłowo. A PhD student's tasks will be:

1. Lithological analysis of fen deposits, including granulometric analysis of mineral sediment (aerometric and diffractometric methods) and determination of the sedimentary environment dynamics (Passega diagram).
2. Creating curves of loss-on-ignition (LOI), by burning sediment samples in a muffle furnace at temperature of 550°C for each logs' interval of 2.5 cm thick.

3. Plant macrofossil analysis of sediments (seeds, fruits, needles, megaspores, etc.), allowing to determine the variability of plant associations over time in the sedimentation basin and its vicinity.
4. Radiocarbon datings of variability levels of plant associations and sediments, especially mineral horizons in the fen related to water circulation caused by permafrost melting.
5. Determining the modeled age for sediment profile, based on age-depth curve construction, using P-sequence procedure of the OxCal programme.
6. Macrofossils-based verification of the occurrence of thermophilous plant refugia in the Late Glacial sediments in the Kotoń fen.
7. An attempt will be made to find in the sediment profile a microtephra horizons related to volcanic eruptions during the Late Glacial.

**Additional information (e.g., special requirements from the candidate):**

A successful candidate should have a master's degree in discipline: biology or geology. He/she should be familiar with techniques of drilling in peatlands, aerometric method, loss-on-ignition analysis of sediments (along with creating a loss-on-ignition curve), basics of macrofossil analysis (including samples preparation), preparing samples for radiocarbon datings. Working with a petrographic microscope for tephra analysis will be also a desirable skill.

**Place/name of potential collaborator:**

The research crucial for the realization of the doctoral dissertation, is fully funded from the Preludium-Bis grant, awarded to dissertation supervisor from National Science Centre (NCN) for period 2021-2025 (Preludium-Bis 2020/39/O/ST10/03504). Research funds (525 942 zł) will provide a PhD student with a scholarship, opportunities for foreign internships and participation in national as well as international conferences, and will secure financing for the external laboratory analyses, e.g. radiocarbon datings, OSL (Optically Stimulated Luminescence), detailed pollen analysis and non pollen palynomorphs of the fen sediments (including more detailed research in pollen analysis performed so far), done in cooperation with dr Katarzyna Korzeń (Cracow) and Prof. Valentina Zernitska (Minsk, Belarus). Plant macrofossil analysis will be conducted under supervision of Prof. Renata Stachowicz-Rybka from the Institute of Botany of the Polish Academy of Sciences, who is also proposed for a role of a second supervisor. MSc Krzysztof Buczek from the Institute of Nature Conservation of the Polish Academy of Sciences will provide essential support in applying statistical methods to age-depth model construction (OxCal programme), preparing diagrams or data compilation in a time scale using Tilia programme.

**References:**

- Margielewski, W., 2018. Landslide fens as a sensitive indicator of the palaeoenvironmental changes since the Late Glacial; Polish Western Carpathians case study. *Radiocarbon* 60(4), 1199-1213.
- Bronk Ramsey, C., 2017. Methods for Summarizing Radiocarbon Datasets. *Radiocarbon* 59(2), 1809-1833.
- Starkel L., Michczyńska D.J., Krąpiec M., Margielewski W., Nalepka D., Pazdur A., 2013. Holocene Chrono-climatostratigraphy of Polish territory. *Geochronometria* 40(1), 1-21.