

PhD Project in Physical Sciences (YAFD)

Supervisor: Professor Siim Veski

Co-supervisor: Senior Researcher Anneli Poska

Name of the department or research group: TALTECH, Department of Geology, PRG323

Proposed PhD topic: **Postglacial climate change in northern Europe: focus on chironomid-based reconstruction of summer temperatures**

Description: The subject of the PhD project „Postglacial climate change in northern Europe: focus on chironomid-based reconstruction of summer temperatures” is closely connected with the personal research funding team grant (PRG323) led by Siim Veski „Tracking the time-lags of species response to environmental change using palaeo-proxy data and modelling (TrackLag)”. The PhD project is planned to start in 2019.

Sedimentary records of different organism groups are widely used to reconstruct changes in past climatic conditions. Palaeoecological proxies (pollen, macrofossils, aquatic biota, geochemical and isotope data) provide empirical archives of past climate change. The sub-fossil organism remains deposited in lakes and bogs provide a record of past terrestrial and aquatic environment, many of which can today be used to quantitatively reconstruct the environmental conditions. Several regional- to continental scale palaeo-climate reconstructions have been published based on pollen-climate calibration datasets. A considerable amount of palaeo-climate (temperature and precipitation) reconstructions based on different proxies, such as chironomids, diatoms, tree-rings, stable isotope records (in particular ^{18}O) from speleothems, and from lake sediments have been published during last decades. However, above mentioned studies rarely utilize more than one paleoclimate proxy source and are therefore susceptible to the shortcomings associated with the specific organism group. New, multiproxy records produced from the low data coverage areas and development of multiproxy dataset would provide basis for more solid and trustable results. The current PhD project will focus on chironomid-based reconstructions, one of the most useful paleoclimate indicators as a part of a multi-proxy study. The new paleoclimate reconstructions can then be used as an independent variable to validate the vegetation reconstructions of past conditions and to calibrate models in order to more realistically represent spatial and temporal patterns of future changes tracking the time-lags of species response to environmental change using palaeo-proxy data and modelling.

This PhD project will:

1. Compile a dataset and evaluate the availability and potential of chironomid remains preserved in sedimentary basins as climate proxies using published materials;
2. Collect and perform multiproxy palaeoecological analysis of sedimentary records with a focus on Chironomid-based reconstruction of summer temperatures from low data coverage areas in northern Europe over the entire post-glacial period (ca 14700 years);
3. Collect a chironomid training set of low data coverage areas in northern Europe;
4. Use gained information to reconstruct the post-glacial climate and incorporate the results in multi-proxy studies of past environmental change.

Job description

The position is available for a 4-year period and your key tasks as a PhD student at TalTech are:

- To manage and carry through your research project
- Attend PhD courses
- Write 3 scientific articles and your PhD thesis
- Teach and disseminate your research
- To stay at an external research institution for a few months, preferably abroad
- Work for the department

The study will be conducted using existing sediment cores with a variety of multi-proxy data from European and Baltic locations, new material will be collected from low data coverage areas in northern Europe. The PhD candidate will participate in fieldwork for collecting sediment samples and training sets. The palaeoecological analysis will be conducted at TalTech Department of Geology. The PhD candidate is expected to have experience in working with paleo datasets, and a basic knowledge of palaeo-climate reconstruction techniques, and GIS-based spatial modelling.

Qualifications:

The applicants should fulfil the following requirements:

General admissions criteria

- a good BSc and MSc degree from an internationally recognised university in an Earth Science discipline (Geology, Quaternary geology, Palaeoecology) or relevant subject area (Limnology, Palaeolimnology, Ecology).
- English language proficiency at a minimum of IELTS band 6.5 with no component score below 6.0, or equivalent level.

Specific candidate requirements

- highly motivated earth science graduate, keen to work on a multi-disciplined project, good communicative skills, proactive and independent work, affinity with working in the field
- emphasis will also be laid on previous publications (if any) and relevant work experience
- previous experience or proven interest in the research field of earth sciences
- drivers' licence (optional)