



A glimpse into the Arctic future: equipping a unique natural experiment for next-generation ecosystem research

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PhD student - Early Stage Researcher (ESR3) The functional adaptation of roots and rhizobiome in warming grasslands

About FutureArctic

The EU-funded Innovative Training Network [FutureArctic](#) aims to quantify how much carbon will escape from the Arctic in future climate. How do the multitude of ecosystem processes, driven by plant growth, microbial activities and soil characteristics, interact to determine soil carbon storage capacity? A group of fifteen PhD-students will study the [Forhot](#) ecosystem in Iceland, where a natural coincidence has provided us with the exceptional opportunity to actually look into the future.

Given the strong urgency of tackling and managing the climate challenge and the particularly important role herein of (sub)Arctic ecosystems, a rapid assessment of the ecosystem and ambient processes in this natural laboratory is essential. FutureArctic will achieve this challenge by adopting the fast advances made in the field of **machine learning and artificial intelligence (AI)**, **unmanned aerial vehicles (UAV)** and (remote) **sensor technology** into **environmental research at the ecosystem scale**, into a new concept of an '**ecosystem-of-things**'.

FutureArctic thus aims to channel an important evolution to automated machine-assisted fundamental environmental research. This is achieved through dedicated training of researchers with profiles at the inter-sectoral edge of computer science, artificial intelligence, environmental and agricultural science, sensor engineering and communication and social sciences. FutureArctic training ensures the **development of unique enviro-technological job profiles**, all with their own specialty, embedded in holistic knowledge on connected high-data throughput ecosystem research, ready for machine-assisted environmental ecosystem science and modelling.

About the host organization

The University of Tartu (UT) belongs to the top 2% of world's best universities (QS World University Rankings 2016-17). According to the Essential Science Indicators (ESI), UT has reached the top 1% of the most-cited universities and scientific institutions in 10 fields, including biological sciences. Root-rhizosphere research group led by Dr [Ivika Ostonen](#) is working at the Institute of Ecology and Earth Sciences, University of Tartu (UTARTU). The group also belongs to Centre of Excellence in Ecology of Global Change: Natural and Managed Ecosystems ([EcolChange](#)) and has a close cooperation with soil microbiologists led by prof. Jaak Truu working in the Institute of Molecular and Cell Biology (UTARTU). This group focuses on the relationships between soil microbial community structure and biogeochemical processes (N and C cycling) in soil.

Dr. Ivika Ostonen is Senior Research Fellow of Landscape Ecology since 2006. Her main research focus is on belowground carbon and nutrient cycling of terrestrial ecosystems, with the emphasis on root foraging strategies driven by multidimensional relationships between roots and their associated bacteria, archaea and mycorrhizae in ecosystem adaptation to environmental change. She has been involved in ForHot activities since 2013. Within FutureArctic she will supervise ESR3 (co-supervisors Dr [Marika Truu](#) (UT) and Assoc Prof [Boris Rewald](#) (VSI, BOKU, Austria) and co-supervise ESR12.

Task description

Your PhD project

You will investigate herbaceous plant roots, as well as soil and plant microbial communities in order to study interactions (adaptation mechanisms) of the root-rhizobiome complex along the soil warming gradient in the Forhot.

You will focus on the changes in root traits, including plant species-specific changes in root biomass, production and turnover rates as well as on the role of associated partners within root-rhizobiome (e.g. mycorrhizae, bacteria and archaea) and in the plant roots (endophytic microbes) in the resource uptake. This is studied together with root phenology (onset, peak and cessation of root growth and synchronization between shoot and root growth), root system morphology and root physiology. Rhizo-deposition flux is assessed in relation to qualitative shifts in the root associated food-web. The main aim is to work out a trait-based multidimensional framework integrating changes in root traits, rhizodeposition (root C exudation, root litter) and structural shifts in root associated rhizobiome including description of the variety of alternatives in root-rhizobiome consortia enabling adaptation in a warming (sub)arctic.

The microbiological studies will involve DNA extraction from plant rhizosphere and root tissue, DNA based analyses of fungal, bacterial and archaeal communities using metagenomics and quantification of genes applying quantitative PCR.

Secondments

You will embark on secondments to other FutureArctic partners (UNIVIE, UAntwerpen and VSI), to integrate soil microbiome and rhizobiome functionality insights in a microbial soil organic matter turnover model and to parameterize root imaging for market-ready solutions for non-destructive rhizobiome assessments (with ESR12).

Benefits of working in an ITN

- ✎ You will be working within our international group of > 25 researchers
- ✎ You will get in contact with the other members of this international consortium and will benefit from the joint training platform to develop skills necessary for developing an “ecosystem-of-things”.

Profile and requirements

- ✎ Applicants must hold a MSc or equivalent in the field of biology, microbiology, plant ecology, soil science, environmental sciences or a related discipline
- ✎ Applicants must have a solid knowledge of plant and microbial ecology.
- ✎ Applicants can be of any nationality.
- ✎ Applicants must have an ability to understand and express themselves in both written and spoken English to a level that is sufficiently high for them to derive the full benefit from the network training.
- ✎ Applicants must be eligible to enrol on a PhD programme at the host institution (or at a designated university in case the host institution is a non-academic organisation).

In addition:

H2020 MSCA Mobility Rule: researchers must not have resided or carried out their main activity (work, studies, etc.) in the country of the host organisation (Belgium) for more than 12 months in the 3 years immediately before the recruitment date. Compulsory national service, short stays such as holidays, and time spent as part of a procedure for obtaining refugee status are not taken into account.

H2020 MSCA eligibility criteria: Early Stage Researchers (ESRs) must, at the date of recruitment by the host organisation, be in the first four years (full-time equivalent research experience) of their research careers and have not been awarded a doctoral degree. Full-Time Equivalent Research Experience is measured from the date when the researcher obtained the degree entitling him/her to embark on a doctorate (either in the country in which the degree was obtained or in the country in which the researcher is recruited, even if a doctorate was never started or envisaged).

Benefits

- ☛ You will be employed by the host organisation for 36 months.
- ☛ A competitive salary plus allowances. Moreover, funding is available for technical and personal skills training and participation in international research events.
- ☛ You will benefit from the designed training programme offered by the host organisation and the consortium.
- ☛ You will participate in international secondments to other organisations within the FutureArctic network and in outreach activities targeted at a wide audience.

Please, find additional information in the [Information package for Marie Curie fellows](#)

Application

Interested candidates are invited to apply for this position through the link below.

<https://reaalteadused.ut.ee/en/admissions/phd-projects>: under Phd projects 2019 second period - Institute of Ecology and Earth Sciences, Geography. To apply click in the menu on the left.

Expected start date: September 2019

More information and other vacant positions can be found on www.futurearctic.eu

Additional information

For additional information about the research project and this individual position, please contact:

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