# Improving a pulse chase labelling technique for wetlands

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The contact person at the host institute is Professor Janusz Olejnik ([janusz.olejnik@up.poznan.pl](mailto:janusz.olejnik@up.poznan.pl)). The visited site is POLWET, Rzecin (TNA2) operated by PULS. The visit will take place 22.9.-3.10.2014.

1. **Background and introduction**

The research visit has a dual goal 1) To enhance collaboration and knowledge exchange regarding ecosystem heating experiments and 2) to improve pulse chase labelling technique for wetlands. As such the visit is linked to a projects “Warming of Arctic Meadow under Pollution Stress: Effects and Potential Adaptation (MeadoWarm, 2013-2016, contact person Hanna Silvennoinen), “Integrated non-CO2 Greenhouse gas Observation System” FP7-INGOS (2011-2015, contact person Janusz Olejnik), Central European Wetland Ecosystem Feedbacks to Changing Climate – Field Scale Manipulation WETMAN (ID:203258, contact person Janusz Olejnik).

Increased temperature is one of the biggest climate change driven challenges different ecosystems are facing and information on ecosystem response regarding C and N cycles is needed to improve our understanding. One of the gaps in our knowledge on ecosystems under increased temperature is the fate of freshly photosynthesized carbon: how much of the fresh carbon will be stored in the peatland under increased temperature, how much of it is imminently respired and further how quickly and to what extent will the “fresh” carbon be utilized in fermentative processes creating CH4. Our goal is to measure imminent and long-term fate of the freshly photosynthesized carbon on a Central European wetland under increased temperature by using pulse chase labelling techniques. To our knowledge, there are no existing data on such a combination of experiments. The purpose of this visit is to develop a pulse chase labelling instrumentation and methodology suitable for a wetland and for measuring CH4.

There are long running ecosystem heating experiments around the world. Many of them are “passive” heating experiments, e.g. heating is created by manipulating the exit of the light from the plots. Active heating sites, where heating is created either directly to the ground by cables (neglecting direct impacts to vegetation) or above the canopy by infrared heaters exist in Europe, USA and in China. Hence, the methodology for heating experiments is well established.

Pulse chase labelling has been used to determine the rate of carbon uptake and the related respiration both ex situ and in situ in different ecosystems. The theory and principle methodology is therefore well established and published. Wetland as a target ecosystem creates further challenges for this technique: 1) high and variable water table may cause diffusion and transport of the labelled carbon and 2) CH4 as an important end-product of carbon turn over in wetlands cannot be neglected and methodology for measuring CH4 from pulse chase labelled site has to be improved.

Hanna Silvennoinen is coordinating the MeadoWarm (Warming of Arctic Meadow under Pollution Stress: Effects and Potential Adaptation) project, funded by the Research Council of Norway. In MeadoWarm an active heating experiment is currently running on an arctic meadow. The planned ecosystem heating at PULS offers common grounds for methodological considerations as well as to potential for co-publishing and sharing data.

1. **Objectives**

The overall hypothesis of the experiment to be conducted after the methodology has been improved is that *increased temperatures will affect both the incorporation of carbon from atmosphere to peat (e.g. photosynthesis) and decomposition rate of the “fresh” carbon both to CO2 and CH4.*

The detailed objectives of the research visit are to:

* enhance collaboration between PULS and Bioforsk on ecosystem heating methodology
* develop, build and test an instrumentation for pulse chase labelling on a wetland
* test the diffusion and leakage *in situ* and further to improve the methodology so that hydrology effect is negligible or develop a model that takes the impact into account

The objectives of this visit is well in line with the research objective of InGOS to promote innovative isotope measurements.

1. **Implemention**

The visiting scientist is Dr. Hanna Silvennoinen ([hanna.silvennoinen@bioforsk.no](mailto:hanna.silvennoinen@bioforsk.no)). The contact person at the host institute is Professor Janusz Olejnik ([janusz.olejnik@up.poznan.pl](mailto:janusz.olejnik@up.poznan.pl)). The visited site is POLWET, Rzecin (TNA2) operated by PULS. The visit will take place 22.9.-3.10.2014. For implementation, we need the infrastructure used at the Rzecin peatland site including a manual chamber system for measuring of gas exchange rates at Rzecin peatalnd and a PICARRO G2201-i gas analyser. Timetable and basis for budget are presented in table 1. The total applied cost for the project is 1100€, which consists of 600€ (according to table 1) and 500€ for travel costs

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| Dates | tasks | days | Costs (€) |
| 22.9.2014 | Travel | 1 |  |
| 23.-24.9. | Designing and building the test device | 2 | 100 |
| 25.-28.9. | Pulse chase labelling with the test device | 4 | 200 |
| 29.9-4.10 | Analysis from the labelled sites and adjusting the device and model for possible errors | 6 | 300 |
|  |  | total | 600 |