

Final Report:

Travel costs for the workshop “Advancing the science of gas exchange between fresh waters and the atmosphere”

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I was funded by ESF Research Network Programmes (TTORCH-Short Visit Grant) for a workshop on greenhouse gas (GHG) emission in Hyytiälä Forestry Field Station, Finland (15-19th September 2014). All costs that will not be covered by the TTORCH-Grant will be covered by my DFG project (AN 777/2-1). This workshop had the purpose to bring an international community of scientists who study GHG emission from lotic and lentic waters together, to build a community, discuss research advances, address key knowledge gaps, and propose experiments, manuscripts, or funding options.

The workshop was organized in following three main working groups (Tuesday to Wednesday): i) Flux measurement, ii) Modeling, iii) In-Lake observation, and at least three synthesis groups (Thursday to Friday): i) Eddy flux synthesis, ii) Whole lake experiment and iii) Network science synthesis. All outcomes were summarized on Friday in the whole workshop synthesis group. Four key-speakers were selected to give a talk about their work on GHG emission in addition to the talks and discussions that had taken place within the working groups: Gesa Weyhenmeyer (University Uppsala), Hilmar Hofmann (University Konstanz), Werner Eugster (ETH Zürich), and Victor Stepaneko (University Moscow). These talks mainly addressed actual research on uncertainties regarding Eddy flux measurements and on uncertainties regarding global or regional upscaling. Upscaling is for example error prone, since different techniques are used. Furthermore, there is no clear consensus about gap filling techniques. In addition following scientists gave a short research talk about their work: Simona Castaldi (University Naples), Audrey Campeau (University Uppsala), Stuart Jones (University Notre Dame), and Mathilde Jammet (University Copenhagen). Several other researchers presented their actual work on posters at the poster sessions on Tuesday and Wednesday morning. The workshop was mainly organized by Miittaa Rantakari (University of Helsinki) and Timo Vesala (University Helsinki). It was accompanied by a well-organized social program, including welcome and final (boreal) dinner, one movie, sauna and one excursion to SMEAR II, an interdisciplinary forest research area.

Beside the workshop synthesis group on Friday, all working groups were organized in parallel sessions. I participated to the following working groups: ‘Flux measurements’ (Tuesday to Wednesday), ‘Network science synthesis’ (Thursday to Friday), and ‘whole workshop synthesis’ (Friday). In the group ‘Flux measurements’ we discussed different techniques to investigate gas exchange from inland waters. Following researchers were invited to give a talk there: David Bastviken (University Linköping), Gil Bohrer

(University Ohio), Anna Rutgersson (University Uppsala), and Eva Podgrajsek (University Uppsala). Especially Eddy flux systems, but also chamber measurements were in the focus of their talks and in the focus of our discussions. We stated the aims to implement standards for GHG measurements and to indicate critical variables necessary for comparisons across different systems. There was a discussion about a joint experiments where Eddy flux measurements will be compared with chamber measurements. I have suggested that they should use also trace gas in this experiment, since both Eddy flux measurements and chamber measurements are indirect techniques to estimate gas exchange. Trace gas would be a direct technique. The working group 'Network science synthesis' was organized by David Bastviken and had the goal to implement a platform as a kind of webpage to support and coordinate inland water GHG flux studies. This platform will include a Metadata-base, an overview about pros and cons of different methods (including uncertainties), addresses of research groups and research areas or efforts on GHG emission studies. It will support a better comparability of future inland water GHG flux studies and thus support upscaling. The platform has the aim to facilitate communication between researchers, to support method sharing, and to answer sampling design questions. Several participants stated their willingness to support the development of this webpage. I take the task to summarize different techniques, including their uncertainties, to study the reaeration coefficient (k). Own sensitivity analysis indicated that k is responsible for circa 42% variance in GHG flux estimations. The different techniques itself complicates the comparability between different studies and thus upscaling. This summary will be included in the GHG network platform. The outcomes of all working group sessions were presented in the joint session 'whole workshop synthesis' on Friday.

Around 60 participants from international research groups (USA, Brazil, Canada, and different European countries) visited this workshop. I used this opportunity to extend my network and to meet scientists that work on similar research areas as I do. There was for example a discussion with Marcus Wallin (University Uppsala) who is working on GHG flux from streams in boreal catchments. His group leader Gesa Weyhenmeyer invited me to give a talk in their seminar at Uppsala University, next year. There were also interesting discussions with Paula Kankaala and Pirkko Kortelainen. Both work on carbon turnover in lentic systems. I meet also different researchers from Germany (IGB-Berlin, GFZ-Potsdam) and thus extended my regional network.