Research Networking Programmes

Short Visit Grant ☒ or Exchange Visit Grant ☐

(please tick the relevant box)

Scientific Report

The scientific report (WORD or PDF file – maximum of eight A4 pages) should be submitted online within one month of the event. It will be published on the ESF website.

***Proposal Title**:* Laboratory training on gas chromatograph based non-CO2 greenhouse gas measurements

Application Reference N°: 6616

1) Purpose of the visit

There is a tall tower monitoring site at Hegyhátsál, Hungary, where atmospheric non-CO2 greenhouse gases (CH4, N2O, SF6) have been measured by Agilent 6890N gas chromatograph (GC) since 2006. In this autumn, a new N2O analyzer (Los Gatos Research Inc. [LRG], U.S.A.) will be installed at Hegyhátsál for the continuous monitoring of the N2O emission of the region.

I started to work with the GC in January 2014. My job is to start the N2O emissions measurements and supervise the long-term continuous GC measurements of atmospheric non-CO2 greenhouse gases performed at the site. As a beginner, I had little experience in this type of measurements and we had several problems recently with the GC because they had been run without professional supervision for a while.

The main purpose of my visit was to expand my knowledge in this measurement technique and to learn how to upgrade and optimize the existing system for high quality operation within the shortest possible time. Over and above to build new professional partnerships. As Armin Jordan, head of the GasLab, helped to install our GC at Hegyhátsál in 2006, and they operate a tall tower monitoring site similar to ours. Max Plank Institute for Biogeochemistry seemed the best place to get a training on the instrumentation. At one of their monitoring site (in Namibia) they also operate a LRG N2O analyzer, so they could share their experience about it with me.

2) Description of the work carried out during the visit

Day 1 (1th June): Arrival to Jena

Day 2 (2nd June)
GasLab, Max Planck Institute for Biogeochemistry (MPI-BGC), Jena
The main tasks at the GasLab are to assure the high accuracy analysis of trace gas mixing ratios (CO2, CH4, N2O, H2, CO, SF6) in flask air samples, to produce and calibrate reference standards, to develop new analytical methods and verify the procedures. I spent the first day of my visit in the GasLab with Armin Jordan, head of the GasLab. He introduced the lab, their work and the instruments, especially the gas chromatographs (GC) used. In the afternoon we reviewed some of their measurements data, checked the settings of the GC. One of the GC was broken so we dismantled, repaired and assembled it providing me with training in simple maintenance work.

Day 3 (3rd June)
*GasLab, MPI-BGC, Jena
We continued the work started on the previous day. We determined the potential problems that could happen with GC and discussed the possible solutions.
*Stable Isotope Laboratory (IsoLab), MPI-BGC, Jena
Willi Brand, head of the Stable Isotope Laboratory, showed me round the IsoLab. He explained their work at the lab and the equipment used.
*Tall Tower Atmospheric Gas Measurements group (TAG), MPI-BCG, Jena
In the afternoon I had meeting with Jost V. Lavric, the leader of the TAG. The TAG workgroup supervises nine tall tower monitoring site all around the world and their main focus is dedicated to the development of atmospheric measurement techniques. Jost Lavric introduced the group and the monitoring sites (the measurement programs and the instruments used). We compared the measurement program and the available equipment at Hegyhátsál with those operated by the TAG at their monitoring sites.

Day 4 (4th June)
Ochsenkopf Atmospheric Station (OXK), Ochsenkopf
Visit of the Ochsenkopf Atmospheric Station, one of the tall tower monitoring sites of TAG. We use similar measurement techniques at our monitoring site at Hegyhátsál. I had the opportunity to compare our gas chromatograph with the GC in OXK.

Day 5 (5th June)
ICOS Flask and Calibration Laboratory (FCL), Jena
Visit of ICOS lab, a central laboratory of the Integrated Carbon Observation System. Daniel Rzesanke, leader of FLC, guide me through the lab, introduced their work and the instruments. In the afternoon we jointly evaluated our data measured at Hegyhátsál with Bert Steinberg, expert of FLC. We tested the data by GCWerks software.

Day 6 (6th June)
GasLab, MPI-BGC, Jena
I continued the evaluation of our data with Armin Jordan at GasLab. He suggested methods to improve the performance of our monitoring system.
Departure to Hungary in the evening.

3) Description of the main results obtained

The aim of my visit was to get training on GC based non-CO2 greenhouse gas measurements and to learn how to develop our existing measurement system.
During the week I compared the GC measurement methods applied in Hungary and at the MPI-BGC laboratories (carrier gases, make-up gases, the setting of the GC, etc.). We identified the potential problems in our system. We identified that we should increase the temperature the ECD, change the flush-back - flush timing and the calibration method.
I studied the new developments: In the ICOS lab the make up gas of ECD is a CO2/N2 mixture, while in our case it is Ar/CH4. I tested the new GCWerks software developed for the control of gas chromatographs and evaluation of their output.
My next task is to apply the techniques I have learnt on our measuring system.

4) Future collaboration with host institution (if applicable)

Hegyhátsál tall tower GHG monitoring site is a potential ICOS monitoring site so we need close cooperation with ICOS central facilities, including laboratories at MPI-BCG. Our plan is to keep touch with the calibration lab, consult about the measurement techniques, and share the experiments. A new N2O analyzer will be install at Hegyhátsál this autumn, and we appreciate the experience Armin Jordan and Jost Lavric with this instrument. We will use standard gases from GasLab at Hegyhátsál.

5) Projected publications / articles resulting or to result from the grant *(ESF must be acknowledged in publications resulting from the grantee's work in relation with the grant)*

Essentially, this short visit was capacity building. I have learned the basics of certain measurement techniques applied at a greenhouse gas monitoring station and I could build contacts with scientists expert in this field. In the future we plan common projects and research.

6) Other comments (if any)

Every college at MPI-BGI was friendly and helpful. They showed me everything in details and thoroughly explained a number of times.
They helped me to book my accommodation at the guest room of the institute.
The visit was successful. I learned a lot and I met great people.