SHORT TERM SCIENTIFIC MISSION (STSM) SCIENTIFIC REPORT

This report is submitted for approval by the STSM applicant to the STSM coordinator

Action number: COST-STSM-ES1404-41976
STSM title: Eddy Covariance flux measurements over ice/snow covers and lakes
STSM start and end date: 08/10/2018 to 27/10/2018
Grantee name: Elena Shevnina

PURPOSE OF THE STSM:

The aim of the mission is to contribute to knowledges on the eddy covariance technique to estimate evaporation and carbon emission over ice/snow covered surfaces and lakes. The data on CO2 and H2O fluxes was measured during two field experiments in the Schirmacher oasis, East Antarctica (Shevnina, 2018a) and in the Alentejo region, South West Europe. In these experiments, the measurements were done using the open-path gas analyser incorporated in the Irgason system by Campbell Scientific (https://s.campbellsci.com/documents/us/manuals/irgason.pdf). Since the CO2 emission is usually small over ice/snow covered surfaces and lakes (Salgado et al., 2016), a spectroscopic correction is important for calculations of the CO2 fluxes (Helbig et al., 2016). The spectroscopic correction is implemented in the Iragson's unpromted output under the operational system (OS) EC100 08.01 version (the Alentejo experiment), however it does not accounted in raw data under OS EC100 07.01 (the Antarctic experiment). In this context, the post processing procedure need to be modified depending on the OS version. The Irgason of the Finnish Meteorological Institute (FMI) was temporary send for inter calibration with the instrument of the Institute of Earth Science (IES). This is important step for the FMI's instrument going to be used in MOSAiC field experiment (https://www.mosaic-expedition.org/).

DESCRIPTION OF WORK CARRIED OUT DURING THE STSMS

There were three main goals to achieve during the STSM: (i) to analyse CO2 and H2O fluxes for the Antarctic experiment; (ii) to code the post processing procedure of raw data outputs for the OS EC100 07.01 and OS EC100 08.01; (iii) to analyse results of the Alentejo experiment. The STSM was done in following schedule:

08.10–11.10.2018: the Irgasons of the FMI and IES were calibrated in the lab using the standard zero and span procedure (https://s.campbellsci.com/documents/us/manuals/irgason.pdf). The OS version was upgraded to EC100 08.01 for the Irgason of the FMI according to the recommendations by Ivan Bogoev (Campbell Scientific);

12.10.2018: both instruments were deployed on the floating platform in the Alqueva Lake for the inter calibration between two instruments;

13.10–25.10.2018: the collaborators were working on the manuscript "Water balance of Antarctic lakes: focus on Evaporation" for the HESS special issue "Modeling lakes in the climate system" (https://www.hydrol-earth-syst-sci.net/special_issue365_944.html).

25.10–26.10.2018: the collaborators were working on the coding of the post processing procedure for the Irgason data for the OS EC100 07.01 and OS EC100 08.01.

26.10.2018: the Irgason of the FMI was removed from the floating platform to be transported to Finland.
The Method and Data section the manuscript "Water balance of Antarctic lakes…" was appended by the description of the forcing for the FLake experiments (Elena Shevnina), the post processing procedure for the data for the Antarctic experiment (Miguel Potes). In the Result section of the manuscript some figurers were produced to analyse the results of the FLake experiments and synoptic situation during the Antarctic experiment (Elena Shevnina, Rui Salgado, Ekaterina Kourzeneva and Daniela Franz).
The Alentejo experiment was only carried out during 12 days, however the raw dataset gives general overview on a consistency (coherence) of the measured fluxes by the instruments of the FMI and IES. The raw dataset by the FMI's Irgason is used to test the code for the post processing procedure (OS EC100 08.01). To develop the code of the post processing procedure, a project was started at: https://github.com/russkiy78/elena1. The aim of the project is code the post processing procedure for the output from the Irgason (OS EC100 07.01 and OS EC100 08.01) and make it freely available for the scientific community. This project is supported in collaboration between scientists and professional programmer (Alexander Krasikov). The raw datasets for the Alentejo experiment from two instruments (FMI and IES) were processed with the code by Miguel Potes, to be further analysed for the consistency (coherence) in the measured variables.

DESCRIPTION OF THE MAIN RESULTS OBTAINED

The main results of the STSM include the improvement of the measurement technique for the Irgason of the FMI (the CO2 spectroscopic correction is included to unprompted output for the RS485); starting development of the open source development of the post processing procedure for the Irgason by Campbell Scientific (OS EC100.07.01 and EC100.08.01); and the results of inter comparison of two Irgasons on the Alqueva lake during the period of 12 days. The results was presented during the workshop "Towards a better harmonization of snow observations, modelling and data assimilation in Europe", 30-31 October, 2018, Budapest, Hungary (Shevnina et al., 2018). Also, Elena Shevnina presented the seminar in the University of Evora 24 October, 2018 (Shevnina, 2018b).

FUTURE COLLABORATIONS (if applicable)

The future collaboration includes mainly the preparation of the manuscript "Water balance of Antarctic lakes…" (section 1.3 by Rui Salgado, section 2.2.1, results and discussion by Miguel Potes). The deadline for the manuscript submission os 31 of December, 2018. It is possible to continue filed studies in the Arctic by involving both Irgasons (FMI and IES) to the MOSAiC experiment as well as in the Antarctic field campaigns. The results of the Alentejo experiment will be analysed and published in the database of the FLUX.net community.

Confirmation by the host Institution of the successful execution of the STSM

The host institution, represented by Rui Salgado and Miguel Potes, confirms that the main goal of the STSM was achieved.

References

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