Abstract for InGOS annual meeting 2015.

EddyUH – an advanced software for processing eddy covariance flux data

O. Peltola[1], Mammarella, I., Nordbo, A., Järvi, L., Rannik, Ü. and Vesala, T.

[1] Department of Physics, University of Helsinki, P.O. Box 48, Helsinki 00014, Finland

olli.peltola@helsinki.fi

The eddy covariance (EC) method is the most direct way to measure the surface atmosphere exchange of momentum, heat and gases at ecosystem scale. The method relies on determination of vertical turbulent fluxes via measurement of vertical motions and concentration fluctuations. In order to capture all the turbulent motions, the measurements need to be made with high frequency, typically at 10 Hz. During the last decades, a global network of EC flux measurement sites has emerged (FLUXNET) covering wide range of ecosystem types. However, a common set of procedures to process the so-called raw data into meaningful ecosystem scale fluxes is still lacking, which is likely because many of the required data processing steps are site and instrument (gas analyser and sonic anemometer) specific. Furthermore, with the recent development in non-CO2 greenhous gas (GHG) instrumentation, the flux measurements of these gas constituents are becoming more common and data processing standards are even less developed. Evidently, the commonly used EC data processing softwares need to be cross-compared and validated against each other. In this study an EC data processing software EddyUH is introduced and compared against widely used software EddyPro.

Data from two sites were used: CO_2, H_2O and CH_4 flux data from a boreal fen site called Siikaneva, which is situated in central-Finland, and CO_2 and H_2O flux data from an urban site called Erottaja, which is located in densely built Helsinki city centre. The data used covers a wide range of gas analyser and sonic anemometer combinations, which allowed a detailed comparison of different modules of the softwares. Data processing was done with six different schemes and the calculated fluxes were compared between the softwares.

Regression statistics showed a good agreement between the softwares and the scatter between the processed fluxes was generally small. Best agreement was aqcuired with CO_2 and CH_4 fluxes measured with closed-path gas analysers LI-7000 (LI-COR Inc., USA) and G1301-f (Picarro, USA), respectively. The biggest differences between the software outputs resulted from the so-called spectral corrections. Finally, the cumulative fluxes over several months were commonly within ± 2 %, indicating no significant systematic bias between the software outputs. The presentation will introduce EddyUH software package and discuss the software intercomparison results and their implications on the accuracy of EC flux data.