EMS Annual Meeting Abstracts
Vol. 11, EMS2014-430-2, 2014
14th EMS / 10th ECAC

The evapotranspiration determined by scintillometery, Bowen Ratio/Energy Balance and aerodynamic method over agricultural fields in Central Europe

Gabriela Pozníková (1,2), Milan Fischer (1,2), Matěj Orság (1,2), Zdeněk Žalud (1,2), Miroslav Trnka (1,2)

(1) Global Change Research Centre AS CR, v.v.i., Department of Climate Change Impacts on Agroecosystems, Brno, Czech Republic (g.poznikova@gmail.com), (2) Mendel University in Brno, Department of Agrosystems and Bioclimatology, Brno, Czech Republic

There are numerous approaches to measure evapotranspiration (ET). In this paper, three different methods will be used to determine ET. Firstly, one of the earliest methods well established in the ET community is the Bowen Ratio/Energy Balance method (BREB). It is based on measurements of air temperature and humidity gradients in combination with net radiation and soil heat flux. Secondly, the aerodynamic method based on measurement of air temperature, humidity and wind speed profiles in combination with Monin-Obukhov theory (MOST). Thirdly, scintillometery as a relatively new technique based on detecting and evaluating of scintillations, in other words intensity fluctuations of the signal – laser beam – sent from transmitter to receiver of scintillometer. It is an optical device which measures structure parameter (Cn2) of the fluctuations in refractive index of air. The CT2 (structure parameter of temperature) can be derived from Cn2 using basic meteorological data and after by applying MOST sensible heat flux can be determined. Afterwards, ET can be obtained as a residual of the energy balance equation using measured net radiation and soil heat flux.
At the beginning of the growing season 2014, three large aperture scintillometers (BLS 900, Scintec) and three BREB systems (EMS Brno) were installed at three localities across the Czech Republic and Austria. There are different homogenous covers at these sites, namely alfalfa field (Medicago sativa) in Rutzendorf near Vienna, mountain grassland in Gumpenstein (Austria) and rape field (Brassica napus) in Polkovice (Czech Republic). Path lengths at these sites vary from 356m in Gumpenstein to 550m and 617m in Rutzendorf and Polkovice, respectively. Apart from the equipment necessary for BREB method, the systems monitor soil temperature, surface temperature, air pressure, precipitation, and wind speed and direction profiles. The measurements of wind profiles allowed us also additional comparison using an aerodynamic method.
For the purpose of this presentation ET measured by scintillometer, the BREB and aerodynamic method will be compared for 3 localities. Proposed measurements are a part of the larger project which aims to monitor drought in Central Europe. For these purposes the remote sensing and ground based models will be calibrated using our scintillometer measurements in the future. They will serve as verification of the drought early warning system.

Acknowledgements
The reported research was supported by project of the Operational Programme of Education for Competitiveness of the Ministry of Education, Youth and Sports of the Czech Republic: contract no. CZ.1.07/2.3.00/20.0248, and of projects no. LD13030, and LD14121 supporting participation of the Czech Republic in the COST action ES1106.