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Micrometeorological and ammonia gradient measurements above agricultural fields in Turew (Poland)

T. Weidinger (1), A. Pogany (2), K. Janku (3), J. Wasilewsky (3), A. Mohacsi (2), Z. Bozoki (2), A.Z. Gyongyosi (1), Z. Istenes (4), A. Eredics (5), A. Bordas (1,6)

(1) Department of Meteorology, Eotvos Lorand University, P.O. Box 32, H-1518 Budapest, Hungary (weidi@ludens.elte.hu), (2) Photoacoustic Research Group, Department of Optics and Quantum Electronics, University of Szeged, Faculty of Natural Sciences, H-6720 Dom ter 9, Szeged, (3) Research Center for Agricultural and Forest Environment, Polish Academy of Sciences, Bukowska 19, 60-809, Poznan Poland , (4) Department of Informatics, Eotvos Lorand University, P.O. Box 32, H-1518 Budapest, Hungary, (5) Institute of Environmental and Earth Sciences, Faculty of Forestry, University of West Hungary, P.O.box: 132. H-9401 Sopron , (6) University Centre for Meteorology and Environmental Modelling, University of Novi Sad, Trg D. Obradovića 5, 21000 Novi Sad, Serbia

Two joint Polish-Hungarian field campaigns were performed close beside cattle farms, near Turew (Poland), with the idea to determine energy budget components above cropland and to estimate ammonia flux. The first campaign was performed above grassland with limited fetch (close shelter belt) in June 2008, the second above arable cropland in October 2008. Turbulent fluxes were calculated using micrometeorological measurement data (standard meteorological parameters, radiation and surface energy budget components) as well as three different methods: (i) the gradient, (ii) the Bowen ratio and (iii) the eddy covariance method. Results obtained using different methodologies for flux calculations and local effects on energy budget closure were compared. During the second campaign concentration of ammonia was measured employing three different instruments: (i) a passive sampler, (ii) the AMANDA system and (iii) a diode laser based photoacoustic instrument combined with preconcentration sampling (WaSul-Flux). These measurements provide data for ammonia flux calculation on landscape scale. Data obtained using the AMANDA system and the photoacoustic instrument was used to determine vertical and horizontal distribution of ammonia concentration. Ammonia fluxes were calculated using gradient and profile method. Sensitivity analysis of the ammonia flux calculation [(i) assessment of ammonia gradient, (ii) choice of universal function, (iii) application of gradient and profile techniques], daily variations of the energy budget components and the effects of ammonia emission from the cattle farm were also investigated.