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Description and first tests of a tunnel-shaped flow-through chamber for minimum disturbance net ecosystem flux measurements

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The poster describes a tunnel-shaped, large (1.6 m^2 surface area) flow-through chamber for simultaneous CO_2 and H_2O flux measurements on cropped or bare agricultural soils. The chamber is based on an earlier, actively ventilated model for H_2O (evapotranspiration) of short grass only, introduced by Werner (2000). In order to extend the concept to CO_2 fluxes and different canopy heights, the shape of the new chamber is cubic and a differential, non-drying closed path gas analyser is used to accurately determine small concentration differences between in- and outlet. In order to further minimize any disturbance of the ecosystem of interest by the presence of the chamber, a thin film with superior transmission properties on a frame was chosen as chamber material, and the first tests presented here were mainly performed in passively ventilated mode, where the chamber in- and outlet are aligned with the wind direction. The system was tested on different agricultural surfaces (wheat, grass, maize) at two different European sites in western Germany and southern France. At three measurement plots, direct comparisons to Eddy Covariance systems were possible. Especially for H_2O fluxes, results were highly encouraging (R^2 = 0.84, bias >-5). A somewhat poorer performance for CO_2 fluxes (R^2 = 0.72, bias = -8) is hypothetically attributed to a larger spatial variability of CO_2 fluxes. Future research and improvement need are briefly discussed.

Werner, J., 2000. Die Erprobung einer neuen Messanordnung zur Verdunstungsbestimmung an Gruenland (Test of a new measuring configuration for the determination of evaporation on grassland; German with English abstract). Hydrol. Wasserbewirtsch. 44, 64-69.