Biogeosciences Discuss., 5, S2170–S2172, 2008
www.biogeosciences-discuss.net/5/S2170/2008/

Biogeosciences Discussions

Interactive comment on "Modeling the dynamic chemical interactions of atmospheric ammonia and other trace gases with measured leaf surface wetness in a managed grassland canopy" *by* J. Burkhardt et al.

J. Burkhardt et al.

Received and published: 3 November 2008

We thank reviewer # 4 for the valuable comments. We made a thorough revision of the paper to improve the manuscript in terms of general focus and clarity. We introduced table 2 in order to quantify and compare model performance.

In the following we address the different general and specific points .

General comments: We considerably shortened the methods section.

Specific comments: p 2511. l 12 - 15: We introduced the following phrase with respect to measurement uncertainties: A detailed record of the flux uncertainties is reported

by Milford et al. (2008) and summarized by Sutton et al. (2008b). The analysis showed that the scatter between four replicate gradient systems varied throughout the experiment, though typically fluxes were estimated with +/- 20% to +/-60% relative standard deviation between instruments. Further comparison with relaxed eddy accumulation measurements and with a near surface inverse dispersion model showed consistent to the gradient method. There is also an extensive section on this in Sutton et al., 2008, and a paper mainly dealing with this issue (Milford et al., 2008). (Milford, C et al.: Ammonia fluxes in relation to cutting and fertilization of an intensively managed grassland derived from an inter-comparison of gradient measurements, Biogeosciences Discuss., accepted, 2008.) (Sutton M.A., et al. (2008b) Dynamics of ammonia exchange with cut grassland: Synthesis and conclusions paper. Biogeosciences Discuss., submitted, 2008).

p 2513, l 23 - 24: Fig. 1a has been changed to a simpler one in agreement with the text, and description of parameters is now complete. The calculation is identical to Sutton et al. 1998.

p 2515 l 23 - 24: Yes 1 m above ground, but this part has been removed. Wetness sensors are in three stages, within the limits given (usually in the center point of this , i.e. 37.5 cm for 30 to 45, but sometimes this was not possible). Consistent now throughout the paper.

p 2515, l 20: A completely new calculation method has been introduced, which is explicitly explained in section 2.1. of the new manuscript. All calculations were redone on this basis. The original reasoning had been to include an anchor value at an RH of 0.7 (Deliquescence point of several important aerosol salts).

p 2516, l4: BET included in the introduction: The process of physical adsorption (or physisorption) is physically well described by a BET isotherm with RH-dependent exponential increase (Brunauer, Emmett, and Teller, 1938; the name results from the authors initials).

BGD

5, S2170–S2172, 2008

Interactive Comment

p 2519, l 10 - 15: Rephrased: It is noticeable that leaf wetness depends more strongly on air humidity for the upper leaves than within the canopy, as leaf wetness persisted on the lower leaf levels even when relative humidity had already decreased.

p 2520, l 21 - 22: Quantitativeness: we included table 2 into the new version, describing degree of flux direction, correlation, and absolute differences between values of measured and modeled fluxes.

p 2520, l 25 - 26: We removed this part completely as a reaction to the criticism of another reviewer.

Section 3.2 Chemical analysis of dew was done as a test to see if the conditions of microscopic thin water films are related to the macroscopic water layers which can bee chemically analysed. The reasoning has been made clearer throughout the paper. We discuss the discrepancies between the two now in more detail.

Technical corrections: Fig. 1 a has been changed and it is clearer now to see the move from one to the other model, as well as the direction the paper takes. The figures are citations from earlier papers, which should be used to get the full explanation. The size of the figure has not been decided by us. However, by zooming in with a computer it is possible to see the letters in comfortable size.

Figs. 2, 4, 5, 6, 7, 8: We changed the figures to different signs per parameter, but still in colours.

Interactive comment on Biogeosciences Discuss., 5, 2505, 2008.