Water Vapor and Carbon Dioxide Fluxes from a Bog Vegetation

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An A-g_s model couples the CO_2 assimilation, A, to the stomatal conductance, g_s and offers a physiological technique to simulate plant assimilation and transpiration. In this study we analyze observations of water vapor and carbon dioxide fluxes above a bog vegetation in the Netherlands. The observations are used to evaluate an assimilation photosynthesis (so-called A-g_s) model on canopy scale.

In agricultural practice, the growing condition for a plant will tend more and more to the potential growing condition, which means a growing condition as optimal as possible. Then, plants will have no lack of nutrients, pests, diseases will be oppressed and there will be hardly any competition with weeds. For example, to what extend pests and diseases will effect the growing condition of a plant is entirely dependent on the infection level, population dynamics of the pests and on the measures of the crop protection.

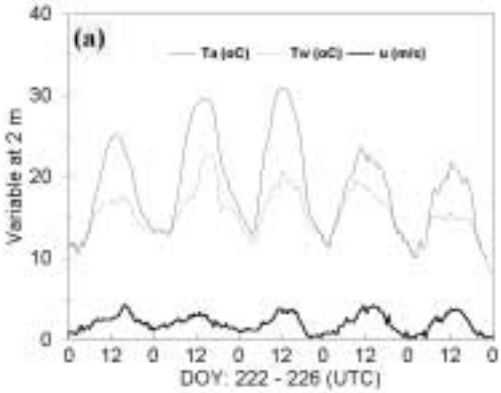


Figure 1: The daily courses of the most important meteorological variables

A micrometeorological data set for more than one-year measurements was available for a natural bog area. The A-g_s model has been applied to this data set and the model simulations for the evapotranspiration as well as the CO_2 fluxes have been compared with the experimental covariance evidence. The effect of nutrient shortage has been implemented in the present model.

In figure 1 the most important meteorological variables and fluxes have been plotted for the selected successive period of 5 days. From this result we can infer that the first three days are so-called fine days and the last days are cloudy.

In figures 2 and 3, the measured as well as simulated fluxes of H_2O and CO_2, respectively, have been depicted. From these results we conclude that the model simulates both fluxes well.

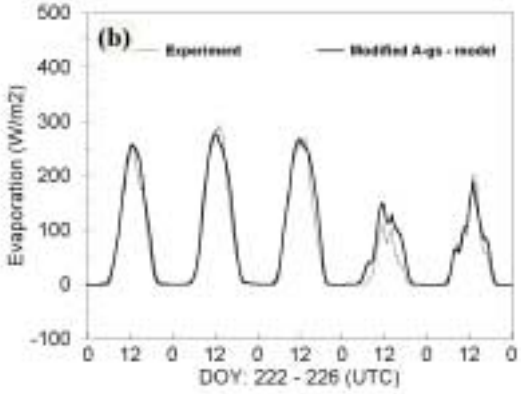
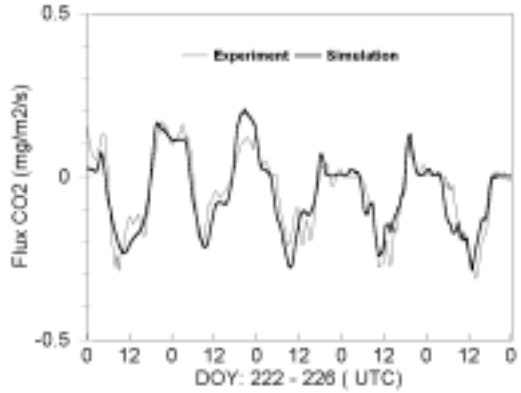


Figure 2: The daily course of the measured evapotranspiration and the simulated transpiration.



Figures 3. The course of the measured CO_2 flux at 8 m height and simulated sum of the assimilation and soil respiration.