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MODELLING EVAPOTRANSPIRATION AND CARBON DIOXIDE FLUXES AT PLOT AND LANDSCAPE SCALE

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This paper describes the application of a distributed soil-vegetation-atmosphere transfer (SVAT) model to prediction of evapotranspiration rates and CO2 fluxes for an agricultural catchment. The main objective of the study was to evaluate the predictive ability of a distributed model to describe the spatial heterogeneity and seasonal variations of evapotranspiration and plant growth dynamics using eddy-correlation methods to measure fluxes at the plot and landscape scale. A distributed SVAT model is developed by coupling the distributed hydrological modelling code MIKE SHE with the column-based SVAT code DAISY. Independent validation of the SVAT model has been carried out at the plot scale using a version of DAISY modified for remote sensing (van der Keur et al 2000). The coupled model was then applied to a 10 km2 agricultural catchment in Denmark. A comprehensive field measurement campaign was carried out during 1997-1999 which together with satellite remote sensing was used to establish the distributed model parameters. A set of 4 masts were established using footprint analysis to ensure that the observed fluxes represent one particular plot. In this manner, a more consistent model validation is achieved where the observation scale and modelling scale are more closely matched. A tall (48m) mast was established to measure integrated fluxes at the landscape scale and thereafter evaluate the ability of the distributed agro-hydrological model to predicted integrated water vapour and CO2 fluxes over the study area. The temporal variation and the magnitude of both evapotranspiration rates and CO2 fluxes is simulated convincingly during most of the measuring period. An exception is the simulation of CO2 fluxes during the autumn (September and October), where particularly the respiration during night is underestimated.