



Modeling LAI and leaf nitrogen control on carbon fluxes in agricultural and beech forest ecosystems

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Abstract

The carbon fluxes between atmosphere and biosphere play an important role in the climate system. Tower based eddy covariance method (EC) is the predominant method for measurements of CO₂ exchange between vegetation and atmosphere. However, it is quite challenging to scale beyond the small footprint by the flux data to the region. Leaf area index (LAI) is the principal scaling parameter for both gross photosynthesis and ecosystem respiration. The supply of nitrogen limits primary production of plants in many habitats and leaf nitrogen is very closely correlated with CO₂ uptakes under different conditions in many species. In this paper, a simplified net ecosystem CO₂ exchange rates (NEE) model controlled by LAI and leaf Nitrogen was developed and tested using eddy covariance CO₂ flux measurements and related biological and environmental measurements in agricultural and beech forest ecosystems in Denmark. The effects of variations of leaf nitrogen concentration and LAI on NEE of the two ecosystems was analyzed, compared and discussed.

Key words: Carbon flux; Leaf area index; Leaf Nitrogen; Modelling; Agricultural and forest ecosystem.