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Application of a SVAT model for estimation of contribution of vertical advection and storage terms to NEE of CO_2 for a tropical forest ecosystem under eddy covariance flux measurements

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An accurate estimation of net ecosystem exchange (NEE) of CO_2 between forest ecosystems and the atmosphere using an eddy covariance approach needs information about vertical and horizontal advections of CO_2 as well as the carbon storage change data in the layer below the eddy flux sensors (e.g. Finnigan 1999, Feigenwinter et al. 2004, Aubinet et al. 2005). To quantify these vertical advection and storage terms under field conditions simultaneous measurements of vertical profiles of CO_2 within and above a forest stand are obviously required. In case if such profile data either are not available or include many gaps in time series we suggest to use a SVAT model for simulation of these vertical profiles of CO_2 within and above a forest stand.

Within the frameworks of this study the contributions of vertical advection and storage terms to NEE of CO_2 for a tropical rain forest area in Central Sulavesi in Indonesia were derived using modelling results provided by a 1D process-based Mixfor-SVAT model (Olchev et al. 2002, Ibrom et al. 2007). Mixfor-SVAT takes into account a vertical heterogeneity of a forest stand and its possible multi-species structure, and predicts energy, water and CO_2 fluxes between forests and the atmosphere, as well as vertical profiles of meteorological parameters and CO_2 within and above a forest stand. Vertical profiles of CO_2 were modelled by Mixfor-SVAT using input meteorological

data obtained from the measurements above the forest stand. Eddy covariance flux measurements were continuously provided using equipment installed on a 70 meters tower at the 48 m level (about 12 m above the forest).

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