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Heat, water and carbon dioxide fluxes at the first Vietnamese eddy covariance site in tropical seasonal forest

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Investigation of the land-atmosphere mass and energy exchange is one of important issue concerning the understanfing of ecosystem functioning in conditions of global climate change. In this study the first results of eddy covariance observations in semievergreen tropical seasonal forest in Southern Vietnam, Cat Tien national park (N 11°27', E 107°24', 134 m a.s.l.), in 2011-2012 are presented. Three characteristic months (December, March, September) were chosen for comparing of fluxes in different meteorological conditions. According to Keppen-Geiger climate classification Southern Vietnam has tropical monsoon climate with dry-warm...hot winter and rainy-warm summer. December, the month of the first part of dry period, had lowest (24.0º) average canopy temperature, not so big precipitation rate (49.8 mm) and medium soil moisture content (25 %vol.). March was the hottest month (26.9º) in the end of dry period with both lowest precipitation (24.1 mm) and soil moisture content (15 %vol.). September was the peak of rainy season (607.6 mm of rain per month) with flooding of vast areas in Cat Tien and highest soil moisture content (38 %vol.).

Highest radiation sums were recorded in March (426.0 MJ m-2 mon-1). December and September sums (336.7 and 342.1 MJ m-2 mon-1) were not so high due to increased hade of sunlight in the first case and cloudiness in the second case. Sensible heat flux (H) rate rose sharply in the second half of dry season (from about 35 MJ m-2 mon-1 in December and September to 155.4 MJ m-2 mon-1 in March). Evapotranspiration (LE) dominated considerably in the heat expenditures during all the year (216.7...271.6 MJ m-2 mon-1). Bowen ratio (H/LE) varied from 0.13 in September to 0.71 in March.

For the whole period of observation, the tropical forest was a slight carbon sink from the atmosphere (calculation included u*-correction with threshold of 0.4 m s-1, which appreciably heighten NEE value). Highest rate of CO_2 absorption was observed in December (-19.6 g m-2 mon-1). The hottest month of the year with lowest precipitation caused forest to become a small carbon source (8.1 g m-2 mon-1) for the atmosphere. Interesting is the fact the forest was not the most intensive carbon sink in the wettest month (NEE was -11.2 g m-2 mon-1), because of higher temperature in comparison with December and so higher ecosystem respiration, and probably because of high level of ground water.