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Carbon Budgets at the Stand Scale in Amazonia

The long term measurements of energy and CO₂ fluxes over LBA pasture and forest sites in Rondônia

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On the scope of BR/EU LBA Flux Tower Consortium, the turbulent fluxes of sensible and latent heat, CO₂ fluxes and general meteorological variables have been measured continuously in a forest site (Rebio Jaru, 10.08° S, 61.93° W) and in a pasture site (Fazenda Nossa Senhora, 10.75° S; 62.37° W) in state of Rondonia, since February 1999. The technique used to measure the fluxes is the eddy covariance technique. On this work, results from these three-year measurements are presented. Seasonal variations of energy and CO₂ fluxes are analyzed at both sites. Due to the higher reflectivity and net long wave loss at pasture than at the forest, the net radiation is 16 – 22 % lower in the pasture, with the larger differences occurring during dry seasons. The partition of this energy in sensible and latent heat is also different in the two vegetation covers and sensitive to the season. Three-month averaged Bowen ratios (ratio between sensible and latent heat fluxes) ranged from 0.21 during wet seasons to 0.28 during dry seasons at forest and from 0.33 (wet season) to 0.81 (dry season) at the pasture. The major differences between CO₂ fluxes at the two sites also occur during dry seasons, when the humidity of the top layers of soil is severely reduced. Both the daytime-averaged Net Ecosystem Exchange (NEE), which is mainly influenced by photosynthesis activity, and nighttime-averaged NEE, which is dominated by respiration, show clear variations between the seasons, especially at the pasture site, being higher (more negative in the case of daytime) at the wet seasons. The daily NEE values, which represent the difference between photosynthesis and respiration, are negative throughout the year, leading to a high annual uptake at both sites. At the forest, the annual uptake ranges from 4 to 6 ton C / ha / year. In the pasture, the preliminary values are similar, however, a recent analysis indicate that fluxes might be underestimated in calm nights at this site. After applying an appropriate filter for underestimation at low turbulence conditions, final values for the pasture site will be presented. At the forest, apparently there is no underestimation of nighttime fluxes in calm nights.