Patterns of CO_2 and water fluxes measured by flux towers across tropical forest, ecotone and savanna ecosystems in Brazil

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Measurements of water vapour, heat and CO2 fluxes over micrometeorological towers in LBA experiment (Large scale biosphere-atmosphere experiment in Amazonia) are discussed on the mean diel and seasonal patterns. The eddy covariance technique was deployted over five sites in Brasil: (Woodlland savanna) Cerrado sensu strictu; Amazonian tropical forest in Rondonia; Amazonian tropical forest in Santarem km83; Amazonian tropical forest in Manaus, and ecotone (seasonally flooded savanna) in Bananal island, Amazonia. The set of experimental sites comprise an interesting transect of forest phisionomies across the tropical ecossystems, since the tropical forest in central Amazonian (Manaus), to the eastern (Santarem) and southern (Rondonia) amazonian sectors, and moving on the ecotone (forest-savanna transition) in Para-Tocantins states, and to the Cerrado sensu strictu (woodland savanna) ecosystem in Southeast Brazil. It is discussed how differences in the dry season patterns among the sites (varying from three to five months in extension, and with differences in temperature amplitude year round), help to control the seasonal patterns of gross primary productivity, based on estimates of the mean diel CO2 flux at flux towers (Fig. 1). The evergreen tropical forest sites in Amazonia had not ever been reported to experience water stress [1,2]. However, in the tropical forest site in Santarem km83, in some years where the dry season was severe, we observed that the Bowen ratio measured at the top of tower appears as high as those measured over water-stressed vegetation, like the pastureland sites.

References

[1] Rocha, H.R. da, M. Goulden, S. Miller, M. Menton, L. Pinto, H.Freitas, A.S. Figueira (2004). Seasonality of water and heat fluxes over a tropical forest in eastern Amazonia. *Ecological Applications*, **14:4**, S22-32.

[2] Goulden, M. L., S. Miller, S.D., H. Rocha, M.C. Menton and H.C. Freitas. 2003. Physiological controls on tropical Forest CO2 exchange. *Ecological Applications*, **14:4**, S42-55.

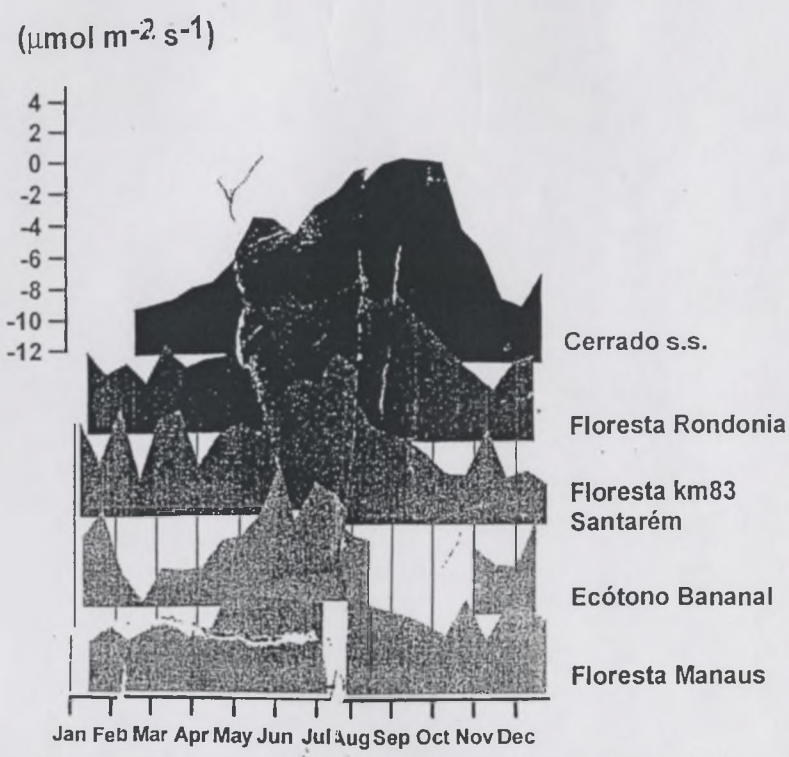

Fig 1. Daytime surface-atmosphere CO_2 flux (15 day mean, in μmol CO^2 m^{-2} s^{-1}) measured by eddy covariance over five sites in Brasil: (Woodland savanna) Cerrado sensu strictu; Amazonian tropical forest in Rondonia; Amazonian tropical forest in Santarem km83; Amazonian tropical forest in Manaus, and ecotone (seasonally flooded savanna) in Amazonia.