6) POSTER
Carbon Budgets at the Stand Scale in Amazonia

Estimation of Amazon night-time CO_2 fluxes and flux losses and effects on inferring ecosystem physiology

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Several years of CO_2 flux data now exist for four flux towers in the Brazilian Amazon, collected within the scope of the international LBA project. These data sets show many similarities in the diurnal and seasonal behaviour of fluxes, as well as in the physiological responses of NEE to radiation, VPD and CO_2 concentration. Clear differences exist, however, in seasonality. One overriding aspect of the results is the very high rates of carbon uptake on an annual scale, and these rates are subject to much skepticism. Nevertheless, despite rigorous sensitivity tests we cannot identify the reason for this discrepancy in eddy correlation methodology. It is often found in eddy correlation studies that the system seems to underestimate CO_2 emission fluxes during the night, if turbulent mixing is reduced. Even if properly corrected for storage of CO_2 inside the canopy, ecosystem exchange in these conditions appears lower than expected from values measured during windy nights. If we apply such analysis to the data collected in some of the Amazon sites, this effect is present to such a large extent, that it could take away the full annual carbon uptake if it were corrected for. For another Amazon forest site, with equally high uptake, the effect is completely absent. We here subject the data to some alternative analysis, shedding a rather different light on Amazon night-time flux losses. For example, if we consider 24-hour totals of NEE, there is only little dependence of these
totals on night-time turbulence. Also, there often is a consistent high emission peak during early morning which is NOT compensated for by storage fluxes. We analyse these morning fluxes in more detail by comparing them with the expected light response during these hours, and find that light response is significantly 'stalled' at low light. Also we attempt to interpret respiration, photosynthesis and night-time leakage from a simple combined mass balance-turbulence model. This observation may be used to construct a more realistic method to assess the real total night-time losses. Also, this may be used to correct *day-time* values to determine real canopy photosynthesis. We will explore this approach and investigate how this affects analysis of canopy physiology through, for example, canopy-scale light response and A-Ci curves.