Emission and dry deposition of accumulation mode particles in the Amazon Basin

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Size-resolved vertical aerosol number fluxes of particles in the diameter range 0.25–2.5 μm were measured with the eddy covariance method from a 53 m high tower over the Amazon rain forest, 60 km NNW of Manaus, Brazil. This study focuses on data measured during the relatively clean wet season, but a shorter measurement period from the more polluted dry season is used as a comparison.

Size-resolved net particle fluxes of the five lowest size bins, representing 0.25–0.45 μm in diameter, were in general dominated by deposition in more or less all wind sectors in the wet season. This is an indication that the source of primary biogenic aerosol particles may be small in this particle size range. Transfer velocities within this particle size range were observed to increase linearly with increasing friction velocity and increasing particle diameter.

In the diameter range 0.5–2.5 μm, vertical particle fluxes were highly dependent on wind direction. In wind sectors where anthropogenic influence was low, net upward fluxes were observed. However, in wind sectors associated with higher anthropogenic influence, deposition fluxes dominated. The net upward fluxes were interpreted as a result of primary biogenic aerosol emission, but deposition of anthropogenic particles seems to have masked this emission in wind sectors with higher anthropogenic influence. The net emission fluxes were at maximum in the afternoon when the mixed layer is well developed, and were best correlated with horizontal wind speed according to the equation

$$\log_{10} F = 0.48 \cdot U + 2.21$$

where F is the net emission number flux of 0.5–2.5 μm particles [m−2 s−1] and U is the horizontal wind speed [ms−1] at the top of the tower.

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