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Vertical distribution of aerosols in Amazonia and its effects on the stability of the atmosphere

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Microphysical properties of aerosol particles have been measured in the Amazon Basin in Brazil during several ground based and aircraft experiments covering dry and wet seasons. Dry season aerosols are predominantly composed by light absorbing biomass burning particles whereas wet season aerosols are a combination between local biogenic and long range transported particles, including dust and sea salt in some areas. During aircraft experiments in the dry seasons of 1995 and 1999, various vertical profiles measuring aerosol physical properties were obtained in several regions of Amazonia. These measurements included multi-wavelength scattering and absorption coefficients, backscattering ratios, average mass concentration, elemental composition, cloud condensation nuclei, etc. Vertical profiles obtained in 1995 showed very well mixed aerosol layers with high aerosol concentrations going up to 4.5km altitude. Similar measurements in 1999 showed the presence of several layers of aerosols in the atmosphere mainly related with the presence of clouds, with average aerosol concentrations up to 250ug/m³, and instantaneous scattering coefficients up to 0.8cm⁻¹. The overall radiative effect of biomass burning aerosols in the top of the atmosphere (TOA) have been estimated as producing instantaneous cooling varying between 0 to -100W/m² per unit of optical depth. Analyses of these vertical profiles using a 1-D radiative transfer model shows the distribution of this radiative forcing along the vertical column, including sensitivity studies in the presence of clouds and clear sky. The structure of the atmosphere is strongly influenced by this forcing due to the significant difference in forcing between the surface and TOA.