The impact of the direct radiative effect of the aerosol particles on the calculation of the photolysis rates: a case study for an Amazon site during the biomass burning season

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The impact of the direct radiative effect of the aerosol particles on the calculation of the photolysis rates and consequently on the atmospheric chemistry in the regional smoke cloud due to biomass burning over Amazon basin is addressed in this work. The TUV radiation model is used for the photolysis rates calculation considering the layer aerosol optical depth from the CATT-BRAMS. The temperature and pressure vertical profiles used are from radiosondes data of the RACCI/SMOCC-LBA field experiment, during the dry to wet transition season (September-November 2002). Climatological spectral single scattering albedo and asymmetry parameter of scattering phase function of smoke particles are from the three years optical properties retrieval obtained at the Amazone observational site of the AERONET. These intrinsic optical properties are actually a function of the aerosol loading of the atmosphere and so a complex look-up table was generated for them as function of the aerosol optical thickness at 500 nm. A simulation of the ozone production carried out using the one-dimensional photochemical box model OZIPR for FNS RACCI/SMOCC-LBA experimental site is shown. The chemical mechanism used in OZIPR includes reactions that emphasize the processes of tropospheric ozone and its precursor's production. The trace gases emissions were obtained by multiplying the total amount of biomass burned within a grid cell during 24 hours by the respective species' emission factor. The tropospheric ozone production, with the simulated maximum value of 70 ppb ozone reasonably matching the observations, is dominated by the reactions involving HO2 and NO.