Geophysical Research Abstracts, Vol. 7, 04667, 2005
SRef-ID: 1607-7962/gra/EGU05-A-04667

Can the aerosol growth and activation be predicted without the knowledge of organic aerosol? - a case study in the Amazon Basin.

M. Mircea (1), M.C. Facchini (1), S. Decesari (1), F. Cavalli (1), L. Emblico (1), S. Fuzzi (1), E. Swietlicki (2), G. Frank (3), Y. Rudich (4) and P. Artaxo (5)

(1) Istituto di Scienze dell'Atmosfera e del Clima, Consiglio Nazionale delle Ricerche, I-40129 Bologna, Italy, (2) Division of Nuclear Physics, Lund University, P.O. BOX 118, S-221 00 Lund, Sweden, (3) Biogeochemistry Department, Max Planck Institute for Chemistry, P.O. BOX 3060, D-55020, Mainz, Germany, (4) Department of Environmental Sciences, Weizmann Institute, 76100 Rehovot, Israel, (5) Instituto de Fisica, Universidade de Sao Paulo, CEP 05508-900 Sao Paulo, Brazil (m.mircea@isac.cnr.it)

Several studies have shown the importance of organic aerosol on hygroscopic growth and activation. In this work we show that the detailed knowledge of chemical and physical properties of organic fraction is mandatory for truthful modelisation of aerosol growth (wet aerosol size) and aerosol activation (cloud condensation nuclei concentration). We use the unique set of data acquired during SMOCC experiment (10 Sep.- 14 Nov.2001) in Amazon basin, which includes a detailed chemical characterization of water-soluble organic aerosol (WSOA) and simultaneous measurements of aerosol number size distribution, diameter growth factor of aerosol (DGF) and cloud condensation nuclei concentration (CCN). The detailed chemical composition of aerosol (organic and inorganic fraction) obtained by a complex analytical set-up has been reduced to simplified representations which capture the properties important for modeling aerosol hygroscopic growth and aerosol activation. The DGFs and CCN spectra has been computed using the modified equation of Köhler, which includes properties of organic aerosol: molecular weight, density, surface tension, solubility and different degrees of dissociation for acids. The comparison of theoretical predictions with measured DGF and CCN number concentration during wet, transition and dry period clearly shows that neither the hygroscopic behavior of aerosol particles at 90% relative humidity nor the aerosol activation is explained only by the presence

of inorganic compounds in aerosol. In particular, at 90% relative humidity, it can be seen that the detailed knowledge of organic compounds, especially of their solubility, substantially improves the agreement between the predicted and measured DGFs with respect to the case when the organic compounds are considered infinitely soluble. Moreover, the best agreement between CCN predictions and measurements is obtained when the solubility of the organic species is known and when the degree of dissociation is maximum.