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Single particle analysis of the accumulation mode aerosol over the northeast Amazonian tropical rain forest, Surinam, South America

R. Krejci[1,2], J. Ström[1], M. de Reus[1,3], and W. Sahle[4,*]
[1] Institute of Applied Environmental Research, Air Pollution Laboratory, S 106 91 Stockholm, Sweden
[2] Department of Meteorology, Stockholm University, S 106 91 Stockholm, Sweden
[3] Max Planck Institute for Chemistry, Department of Air Chemistry, P. O. Box 3060, 55 020 Mainz, Germany
[4] National Institute of Working Life, S 171 84 Solna, Sweden
[*] now at: Studsvik Nuclear AB, Microstructure and microanalysis, Hot Cell Laboratory, S 611 82 Nyköping, Sweden

Abstract. Single particle analysis of aerosols particles larger than 0.2 µm diameter was performed on 24 samples collected over Surinam tropical rain forest and in the adjacent marine boundary layer (MBL) during the LBA-CLAIRE 98 campaign in March 1998. Elemental composition and morphology of 2308 particles was determined using SEM-EDX. The aerosol particles were divided into seven groups according to their chemical composition: organic particles, mineral dust, aged mineral dust, sea salt, aged sea salt, Ca-rich, and biogenic aerosol. However the organic material in aerosol particles cannot be identified directly by SEM-EDX, we present indirect method of detection of organic material using this technique. Samples were further divided with respect to the distinct atmospheric layers present in the tropical troposphere including MBL, continental mixed layer, cloud convective layer, free troposphere and region of deep convection outflow. The organic and mineral dust particles are two major groups observed over the rainforest. In the MBL also sea salt particles represented a large fraction between 15 and 27%. The organic particles control much of the chemical characteristic of the aerosol in the continental tropical troposphere. Their abundance ranged from less than 20% in the MBL to more than 90% in the free troposphere between 4.5- and 12.6-km altitude. During the transport of the air masses from the MBL over the rain forest, fraction of organic aerosol particles more than doubled, reaching 40–60% in the continental boundary layer. This increase was attributed to direct emissions of biogenic aerosols from the tropical vegetation. The high fraction of the organic accumulation mode particles in the upper tropical troposphere could be a good indicator for the air masses originated over the tropical rain forest.

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