Influence of biomass burning on aerosol optical properties in Indonesia and Vietnam

N. Bukowiecki[1], B. Satria[2], E. Kurniawan[2], L. Duong Hoang[3], G. Wehrle[1], M. Gysel[1] and U. Baltensperger[1]

[1]Laboratory of Atmospheric Chemistry, Paul Scherrer Institute, Villigen, 5232, Switzerland
[2] Badan Meteorologi Klimatologi dan Geofisika, BMKG, Jakarta, Indonesia
[3]National Hydro-Meteorological Service of Viet Nam, Hanoi, Viet Nam
Keywords: biomass burning, aerosol optical properties, Asian aerosol
Presenting author email: nicolas.bukowiecki@psi.ch

Anthropogenic biomass burning is a regular and major activity in the Southeast Asian region. The aerosol emissions produced by these activities represent a large burden for the ambient air. Within the usually widely dispersed biomass burning plumes, the ambient aerosol concentrations reach very high values. These concentrations are not only relevant for public health, but they also influence the regional radiative forcing of the atmosphere. One approach to study the influence of regional biomass burning on radiative forcing properties is to measure aerosol absorption and scattering coefficients. These parameters allow for the determination of a number of relevant aerosol optical properties which enter the quantification algorithms for radiative forcing (single scattering albedo SSA, aerosol optical depth).

This study describes the temporal evolution of aerosol optical properties in Indonesia and Vietnam, with help of aethalometer (AE31, Magee Scientific) and nephelometer measurements (Aurora 3000, Ecotech Inc.). The GAW global station in Bukit Kototabang (BKT), Indonesia, is located on the island of Sumatra near Bukittinggi in a remote elevated area (865 m asl) which guarantees sufficient distance from human induced emissions. This setting allows for measurements of atmospheric parameters to be representative for a larger region in Southeast Asia. Similarly, the GAW regional station Pha Din (PDI), Vietnam, is located on a mountain hill area in Northwestern Vietnam (1460 m asl). Pha Din station is distant from relevant residential areas, and the low human activity in the vicinity provides an ideal setting for establishing atmospheric measurements representative for a larger region.

Figure 1 shows the monthly variation of equivalent black carbon (EBC) concentrations for the two stations. The distinctly higher concentrations in certain months were confirmed using satellite data to coincide with biomass burning. Figure 2 shows the corresponding blue single scattering albedo, confirming the clear presence of absorbing aerosol in case of low SSA values. It is however obvious that the biomass burning related EBC maxima do not necessarily correlate with the SSA minima, illustrating that biomass aerosol has a strong scattering component. Using the multiwavelength data from both instruments, the angstrom coefficients for absorption, scattering and the SSA will be calculated to further assess the chemical and physical properties of the biomass burning aerosol.

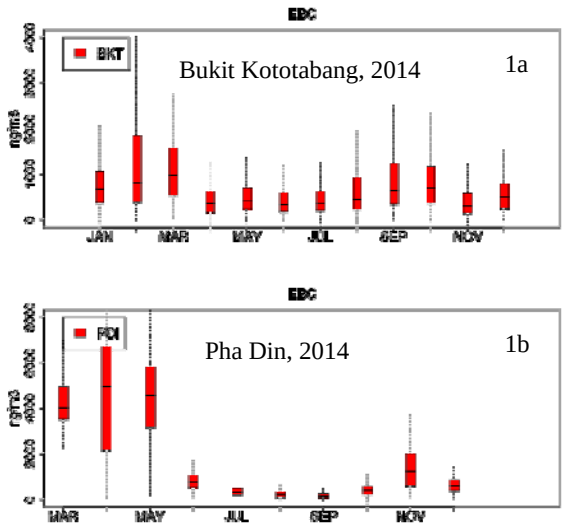

Figure 1. Equivalent black carbon concentrations

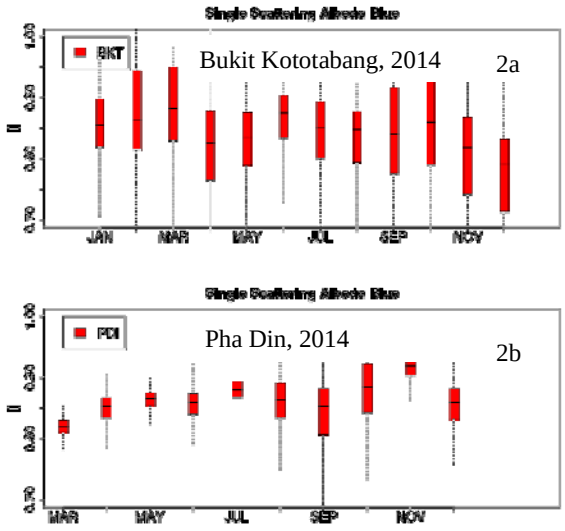

Figure 2. Single scattering albedo (470 nm)

We acknowledge the support of the Federal Office of Meteorology and Climatology MeteoSwiss through the project Capacity Building and Twinning for Climate Observing Systems (CATCOS) Phase 2, Contract no. 81025332 between the Swiss Agency for Development and Cooperation (SDC) and MeteoSwiss.