

Topic: Characterization of Carbonaceous Aerosols from Tropical Deciduous Forest Fires in Ratchaburi Province, Thailand

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ABSTRACT

This study focused on the characterization of carbon content and emission factor of carbonaceous aerosols from dry dipterocarp forest (DDF) and mixed deciduous forest (MDF) fires that occurred in Mae Nam Phachi Wildlife Sanctuary, Ratchaburi Province, Thailand. The vegetation in DDF is composed of 15 families, 27 genus, 30 species and one unknown. The *Shorea obtuse*, *S. siamensis* and *Dipterocarpus obtusifolias* constitute the top dominant species. For MDF, the vegetation is composed of 17 families, 28 genus and 34 species. The top dominant trees in MDF are *Xylia xylocarpa*, *Millettia brandisiang* and *Vitex peduncularis*. *T. siamensis* a bamboo is found dominant species. Research from field experiments showed that the biomass fuels in DDF and MDF of 3.42 ± 1.10 and 5.31 ± 0.87 tons/ha, respectively. Leaf litter is the major component of biomass fuel in DDF and MDF. Trace elements present in the leaf litter of DDF and MDF were mainly Mg, Al, K, Ca, and Fe. It was found that the flame length and the fireline intensity did not exceed 300 kW/m for both forest types. The combustion completeness in DDF and MDF was $80.88\% \pm 4.56\%$ and $57.83\% \pm 10.29\%$, respectively. Black carbon (BC) emitted from DDF fires is higher than MDF fires while the Organic carbon (OC) composition in MDF. Using the carbon mass balance method, the estimated emission factors for DDF fires of CO₂, CO, BC, OC and PM_{2.5} were $1,416 \pm 19$, 98, 0.84, 5.29 and 10.22 g/kg_{dry biomass}, respectively. In MDF fires, the emission factors of CO₂, CO, BC, OC and PM_{2.5} are $1,146 \pm 42$, 72 ± 4 , 0.54 ± 0.18 , 11.37 ± 1.51 and 19.86 ± 2.52 g/kg_{dry biomass}, respectively. The study confirmed that the emissions of carbonaceous aerosols from tropical deciduous forest fires are strongly influenced by the forest type, which characterized by the forest structure and biomass fuel load; moisture content, leaf litter load depth and environmental conditions.

Keywords: Black carbon, carbon balance, dry dipterocarp forest, emission factor, forest fires, mixed deciduous forest