Characterization of Transported Biomass-Burning Smoke from Indochina to Mt. Lulin Based on a Super Event in March of 2009

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Biomass burning (BB) in Indochina during springtime plays a great impact on the air quality of downwind regions, that was continuously obtained at the 2,862 m Lulin Atmospheric Background Station (LABS). In this study, we will combine the data from LABS, Modern-Era Retrospective analysis for Research and Applications (MERRA) reanalysis, and satellites to study the largest BB event (March 17-18, 2009) in the historical record. The event time lasted over 29 hours and the average concentrations of carbon monoxide (CO), ozone (O_3), gaseous elemental mercury (GEM) and PM_{10} was found to be 586 ± 165 ppb, 105 ± 23 ppb, 2.1 ± 0.2 ng.m^{-3} and 105.2 ± 23.4 µg.m^{-3}, respectively. During the event, ΔGEM/ΔCO ratio significantly decreased from 0.0027 to 0.00079 (ng.m^3/ppbv) and the slope of $\Delta O_3/\Delta CO$ was calculated to be 0.123 (r^2 = 0.75). The carbonaceous contents on 18 March showed high EC1-OP, OC3 concentration which dominated due to the BB aerosols. The aerosol single-scattering albedo and char-EC/soot-EC ratios were 0.87±0.04 and 29.4, respectively, indicating the plume contained high absorption aerosol. All measurements and indexes show that the BB plume experienced weak mixing and chemical transformation before reaching Mt. Lulin. We suggest that this event could be served as a good benchmark for identifying a relatively pure BB long-range transport from Indochina to Mt. Lulin, which would be useful for future event identification.

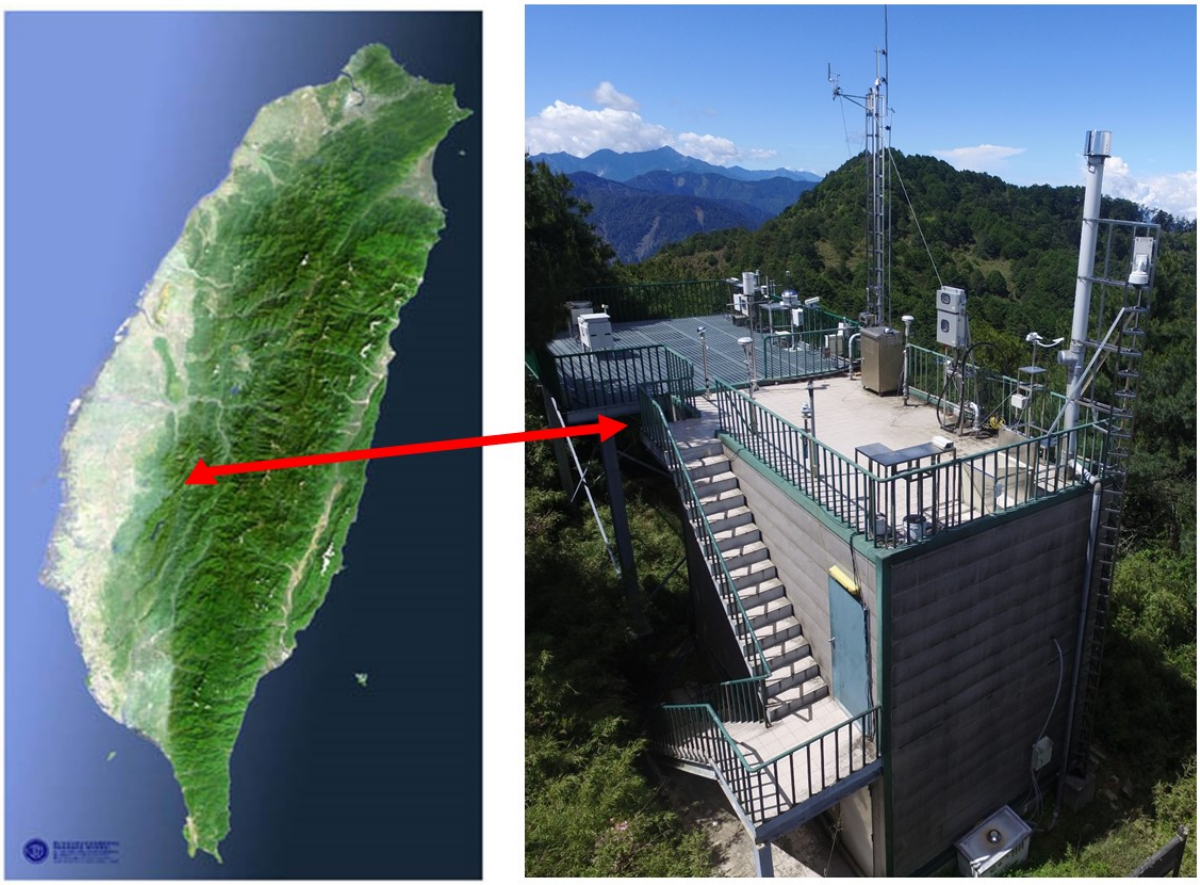

Figure 1. The geographic location and main building of LABS in Taiwan.