

Examination of the impact from biomass burning emissions on NO₂ column density over Southeast Asia

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In Southeast Asian countries, the emissions originated from biomass burning is one of the concerning issue during dry season. In this study, the impact from biomass burning emissions on the tropospheric NO₂ vertical column density (VCD) over continental Southeast Asia (Cambodia, Laos, Myanmar, Thailand, and Vietnam) was systematically analyzed using satellite observations by the SCanning Imaging Absorption spectroMeter for Atmospheric CHartography (SCIAMACHY) and a regional chemical transport model (CTM) during 2003–2008. NO₂ VCD over continental Southeast Asia showed a distinctive large peak from winter (December) to early spring (April). The regional CTM was configured with anthropogenic emissions taken from the Regional Emission inventory in Asia (REAS) version 2.1 and biomass burning emissions taken from the Global Fire Emissions Database (GFED) version 3.1. Overall, the model could reproduce the NO₂ VCD observed by space-borne sensors. Mismatch between satellite observations and the regional CTM was found only in January over Cambodia. A likely reason for this mismatch was diurnal variation in biomass burning emissions. During the analysis period, the largest biomass burning event was reported from December 2003 to April 2004, and a sensitivity analysis was conducted by omitting the biomass burning emissions in the CTM. It was found that the seasonal variations of NO₂ VCD, with the peak during winter to early spring, were caused by biomass burning emissions in all countries in continental Southeast Asia. The contribution of biomass burning emissions to NO₂ VCD over continental Southeast Asia was an average of 28% during this period and a maximum of 58% in March 2004.

Keywords: Southeast Asia, Biomass burning emissions, NO₂ vertical column density, Satellite observation, Regional chemical transport model

