

Analyzing the influence of biomass burning on ambient air pollution in mainland Southeast Asia from 2001 to 2016

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In this study, various remote sensing data, modeling data and emission inventories were integrated to analyze the tempo-spatial distribution of biomass burning in mainland Southeast Asia and its effects on the local ambient air quality from 2001 to 2016. With such a long time span, land cover changes have been considered in dividing the biomass burning into four types: forest fires, shrubland fires, crop residue burning and other fires. The results show that the monthly average number of fire spots peaked at 34,512 in March and that the monthly variation followed a strong seasonal pattern, which was closely related to precipitation and farming activities. The four kinds of biomass burning fires presented totally different tempo-spatial distributions and forest fires and shrubland fires are more dominant than other types. Moreover, the monthly Aerosol Optical Depth (AOD), particulate matter with a diameter less than $2.5\ \mu\text{m}$ ($\text{PM}_{2.5}$) and carbon monoxide (CO) concentrations also peaked in March with values of 0.62, $73.97\ \mu\text{g}/\text{m}^3$ and 426 ppb, respectively. There are significant correlations between the monthly AOD, $\text{PM}_{2.5}$, and CO concentrations and the number of fire spots. On an annual scale, we also found certain correlations between the AOD and $\text{PM}_{2.5}$ concentrations and the number of fire spots. With respect to the spatial distribution, the AOD, $\text{PM}_{2.5}$ and CO concentrations are always higher in intense biomass burning regions. Southeast Asia is one of the most populated and fastest growing economic regions in the world. Therefore, in order to objectively and accurately analyze the influence of biomass burning on local air quality over a long time span, it is imperative for this study to consider the effects of anthropogenic activities. Two anthropogenic CO_2 emission inventories, the Emission Database for Global Atmosphere Research (EDGAR) and the Carbon Dioxide Information Analysis Center (CDIAC), were used. The results further prove that biomass burning is the dominant cause of the variation in the local air quality in mainland Southeast Asia. Although government authorities have taken measures to control biomass burning, the number of fire spots did not decrease; the numbers exceeded 100,000 each year from 2012 to 2016.

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