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Characterizing two distinct biomass burning regimes over Southeast Asia and their impacts on regional air quality

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Mainland and maritime Southeast Asia is home to more than 655 million people, representing nearly 10% of the global population. The dry season in this region is typically associated with intense biomass burning activity, which leads to a significant increase in surface air pollutants that are harmful to human health, including ozone (O_3) and fine (radii smaller than 2.5 microns) particulate matter ($PM_{2.5}$). Latitude-based differences in dry season timing and land use distinguish two regional biomass burning regimes: (1) agricultural waste burning on the peninsular mainland from February through April and (2) coastal peat burning across the equatorial islands in September and October. The type and amount of material burned determines the chemical composition of emissions and subsequently their impact on regional air quality. Understanding the individual and collective roles of these biomass burning regimes is a crucial step towards developing effective air quality mitigation strategies for Southeast Asia. Here, we use the nested GEOS-Chem atmospheric chemistry transport model (horizontal resolution of 0.25° x 0.3125°) to simulate fire-atmosphere interactions over Southeast Asia during March and September of 2014, when emissions peak from the two regional burning seasons. Based on our analysis of model output, we report how these two distinct biomass burning regimes impact the photochemical environment over Southeast Asia and what the resulting consequences are for surface air quality. We will also present a critical evaluation of our model using ground-based and satellite observations of atmospheric composition across the region.