

# Estimation of Biomass Burning Emissions in Tropical Continents Based on Satellite Observations from 2001 to 2017

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Biomass burning emissions contribute significantly to the atmospheric CO<sub>2</sub> budget and the interannual variation of CO<sub>2</sub> concentrations in the troposphere. This study developed a high-resolution monthly inventory of biomass burning emissions across five land types in the tropical continents (Central and South America, Africa, and South and Southeast Asia) during 2001–2017. The inventory estimates of emissions from biomass burning are based on the newly released MCD64A1 Version 6 Burned Area data product, satellite and observational data of biomass density, and spatial and temporal variable combustion factors. Results from the inventory demonstrated that the average annual amounts in tropical continents during 2001–2017 were 1.73 Tg BC, 10.85 Tg CH<sub>4</sub>, 261.41 Tg CO, 6083.69 Tg CO<sub>2</sub>, 3.60 Tg NH<sub>3</sub>, 39.75 Tg NMOC, 11.99 Tg NO<sub>x</sub>, 18.40 Tg OC, 29.63 Tg PM<sub>2.5</sub>, and 2.19 Tg SO<sub>2</sub>. Taking CO<sub>2</sub> as an example, Africa was found to be the largest contributor to the total biomass burning CO<sub>2</sub> emissions in tropical continents (3765.41 Tg of CO<sub>2</sub>, 62%). Asia and Americas accounted for 20% (1204.60 Tg of CO<sub>2</sub>) and 18% (1113.68 Tg of CO<sub>2</sub>), respectively. After categorizing into five major land types based on the vegetation and fire sources, we found that woody savanna/shrubland fire was the largest contributor (3161.43 Tg, 52%), followed by savanna/grassland (1649.16 Tg, 27%), forest (1024.38 Tg, 17%), cropland (194.44 Tg, 3%), and peatland (54.27 Tg, 1%), respectively. However, these proportions varied between the continents; in the Americas and Asia, the largest biomass burning emissions came from forest fires, and in Africa the largest emissions were from fires in woody savanna/shrubland. The total CO<sub>2</sub> emissions in these tropical continents exhibited strong interannual variations from 2001 to 2017, with peak emissions in March and August to September, and forest fires were the primary land type controlling the interannual variations.

Keywords: biomass burning, CO<sub>2</sub> emissions, tropical continents

