

Improved Estimate of Aerosol Emissions from South Asian Forest Fire

Kumari Aditi

Institute of Environment and Sustainable Development, Banaras Hindu University, Varanasi, India, India

Author list (excluding presenting author)

Tirthankar Banerjee

Abstract

Biomass burning emissions contribute significant proportion of aerosols over continental scale, thereby effecting regional climate and air quality. There are reports of emissions of aerosols, especially of carbonaceous aerosols from burning of agriculture residues over South Asia but till date no attempt has been made to quantify the contribution of forest fire emission of aerosols over South Asia. Globally, forest fire has been reported to contribute CO₂ emission equivalent to 20% of fossil fuel emission, majority of these emissions were traced over North and South America, tropical Asia and in Africa. However, a significant proportion of South Asian Forest undergoes repetitive burning during pre-monsoon period, thereby releasing huge amount of aerosols from the sequestered carbon, which essentially transform the entire forest land as a carbon source instead of sink. Likewise, roughly 13-15 thousand sq. km of forest across South Asia are prone to frequent forest fires, especially in India, Nepal and in Bhutan. In this research, the active fire anomaly product from Terra/Aqua Moderate Resolution Imaging Spectroradiometer (MODIS) 1 km fire product (MCD14ML) was compared with Visible Infrared Imaging Radiometer Suite (VIIRS) I-band 375 m active fire product (VNP14IMG) to assess comparability of these two fire products. We note, VIIRS was able to detect 5.1 times more fire signals compared to MODIS product owing to its higher resolution and thermal saturation point of sensor. In terms of fire radiative power (FRP), VIIRS retrieved FRP was 2.7 times higher than that of MODIS FRP mainly due to detection of large number fires across South Asia. Both sensors (MODIS and VIIRS) were, however strongly correlated in term of retrieving fire count. The VIIRS based Fire Emission Inventory (VFEI, Version 0) was further used to assess aerosol emissions, in terms of PM_{2.5} (Tga⁻¹) at 0.05 km resolution. We note emission of aerosols from forest fire across South Asia remain in between 1.5 to 2.2 Tga⁻¹, with strong annual variations depending on the fire count and forest burnt area. Our result could be useful in improving output of regional climate model and in air quality forecasting experiment.

Early Career Scientist

YES, I am an early career scientist.

IGAC Activities

ACAM: Atmospheric Chemistry and the Asian Monsoon, GEIA: Global Emissions Initiative, MAP-AQ: Monitoring, Analysis and Prediction of Air Quality

IGAC Regional Working Groups

MANGO: Monsoon Asia and Oceania Networking Group