

2.045 Contribution of post-harvest agricultural paddy residue fires in the N.W. Indo-Gangetic Plain to ambient carcinogenic benzenoids, toxic isocyanic acid and carbon monoxide.

Early Career Scientist

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Abstract:

In the North West Indo-Gangetic Plain (N.W.IGP), large scale post-harvest paddy residue fires occur every year during the months of October–November perturbing the regional air quality posing health risks for the population exposed to high concentrations of carcinogens such as benzene and toxic VOCs such as isocyanic acid. These gases and carbonmonoxide are known to be emitted from biomass fires along with acetonitrile. Yet no long-term in-situ measurements quantifying the impact of this activity have been carried out in the N.W. IGP. Using real time in-situ measurements of these gases at a strategic downwind site over a three year period (2012–2014), we demonstrate the strong impact of this activity on their ambient concentrations. In contrast to the pre-paddy harvest period, excellent correlation of benzenoids, isocyanic acid and CO with acetonitrile (a biomass burning tracer); ($r \geq 0.82$), distinct VOC/acetonitrile emission ratios and high ambient concentrations of these species were observed during the post-paddy harvest period. The average concentrations of acetonitrile, benzenoids and CO in the post-paddy harvest periods were about 1.5 times higher than the annual average concentrations. Moreover, annual and post-harvest concentrations of isocyanic acid is close to 1ppb, the concentration considered to be sufficient to enhance risks for cardiovascular diseases and cataracts. The annual average concentrations of benzene (class A carcinogen), exceeded the annual exposure limit of 1.6 ppb at NTP. We show that mitigating the post-harvest paddy residue fires can lower the annual average concentration of benzene and ensure compliance with the National Air Quality Standard. Calculations of excessive lifetime cancer risk due to benzene amount to 25 and 10 per million inhabitants for children and adults, respectively, exceeding the USEPA threshold of 1 per million. Thus, there is an urgent need for enforcement/implementation of economically viable solutions to mitigate the paddy residue fires.