

5.116 The aerosol radiative effects and global burden of mortality from uncontrolled combustion of domestic waste.

Early Career Scientist

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Abstract:

Open combustion of domestic waste (i.e. trash) is a potentially significant source of pollutants in developing countries; however, it is not currently included in many emission inventories. Globally, open waste burning emits 9.2 Tg yr^{-1} of organic aerosol and 0.6 Tg yr^{-1} of black carbon (Wiedinmyer et al., 2014). The proximity to largely populated urban areas has created concerns for both local air quality and climate. We incorporate the Wiedinmyer et al. (2014) open waste burning inventory into GEOS-Chem-TOMAS, a chemical transport model with online aerosol microphysics, and estimate the direct radiative effect (DRE), cloud-albedo indirect effect (AIE), and premature mortality due to chronic exposure to $\text{PM}_{2.5}$. Owing to uncertainties regarding aerosol optical properties as well as emission mass and size distributions, we estimate the globally averaged DRE to range from -40 mW m^{-2} to $+4 \text{ mW m}^{-2}$ and the AIE to range from -4 mW m^{-2} to -49 mW m^{-2} . In the source regions of Southeast Asia, Western Africa, and Central America, these radiative effects exceed -0.4 W m^{-2} . We estimate chronic exposure to ambient $\text{PM}_{2.5}$ from domestic-waste combustion to cause 284,000 adult mortalities per year, most of which occur in developing countries. Exposure to $\text{PM}_{2.5}$ increases the risk of premature mortality by more than 0.5% for greater than 50% of the population. This estimate

equates to approximately 9% of the adult mortalities from PM_{2.5} exposure reported in the Global Burden of Disease Study 2010.

Wiedinmyer, C., Yokelson, R. J. and Gullett, B. K.: Global emissions of trace gases, particulate matter, and hazardous air pollutants from open burning of domestic waste., *Environ. Sci. Technol.*, 48(16), 9523–30, doi:10.1021/es502250z, 2014.