1.118 Impact of Indonesian fires on air quality in Equatorial Asia between 2002 and 2015 .

Early Career Scientist

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Abstract:

Forest and peatland fires in Indonesia contribute to poor air quality across Equatorial Asia, with negative impacts on human health. Fires are common in Indonesia as they are used to clear forest and for agricultural management. Indonesia also contains large areas of peatland, which have become more susceptible to fire due to deforestation and drainage. Peatland fires typically emit larger amounts of particulate matter (PM) compared with vegetation fires.
 Vegetation and peatland fires in Indonesia are strongly regulated by climate, with greater fire emissions occurring in drought years. Fire emissions therefore exhibit strong interannual variability, and years with higher emissions can result in severe air pollution events. Previous research has generally focussed on specific pollution events and few studies have compared the impacts of fire emissions across multiple years.
We combine fire emissions datasets and a regional air quality model (the Weather Research and Forecasting model coupled with chemistry; WRF-chem) to simulate pollution events across Equatorial Asia over the period 2002 to 2015. The Fire Inventory from NCAR (FINN) is used to identify years with high fire emissions. The years 2002, 2004, 2006, 2009, 2013 and 2015 contain months where fire emissions in Indonesia exceeded the long-term monthly mean by more than one standard deviation.

We use the WRF-Chem model to attribute air quality degradation to different fire sources, by comparing three simulations with (a) emissions from both peat and vegetation fires, (b) only vegetation fires, and (c) no fire emissions. The PM and aerosol optical depth (AOD) from the different simulations are evaluated using ground and satellite observations. We demonstrate that fire emissions, in particular emissions from peatland fires, contribute substantially to regional PM2.5 concentrations. We compare population-weighted PM2.5 concentrations across years to identify which fire events had the largest impact on regional air quality and human health.