

An Online Chemical Characterisation of Wood Burning Emissions from a Modern Stove using Extractive Electrospray Ionization Time-of-Flight Mass Spectrometer (EESI-TOF)

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Abstract

Domestic burning of wood is one of the major sources of PM (higher than road-traffic) in the UK. Further, the UK PM emissions caused by the burning of wood at home have increased over last two decades. A new 'EcoDesign' stove standard has been introduced and the sale of wet wood has been banned to reduce the impact of user on combustion and to mitigate PM. The UK data on wood burning emissions is based on laboratory tests of stoves, these may not necessarily be representative of real-world combustion. Knowing that a major amount of the total emissions per burn is produced during transient events such as ignition and reloading, the per-kilowatt emissions could be reduced/varied by stove design and fuel type. The primary aerosol from modern stove emissions, the Condensable AeRosol from non-Ideal Stove Emissions (CLARISE) experiments took place early in 2024. A modern 'EcoDesign' stove used in a new test facility at the University of Manchester, equipped with a suite of real time aerosol and gas-phase analysers including a newly-commissioned online Extractive Electrospray Ionisation (EESI) mass spectrometer suited to capture transient emissions. A variety of solid fuels with varying water content were tested. The operating conditions of the stove were also varied to represent different forms of wood stacking in combustion chamber (*e.g.*, overstacking) and/or maloperations. Initial results showed that large quantities of particulate matter including PAHs are released during pre-ignition phase and the average size of the particles emitted is significantly smaller (about 10 folds) during the smouldering phase. Varying stacking and maloperations impact burning through the duration of phases and therefore impacting the total emissions.

Early Career Scientist

NO, I am not an early career scientist.

IGAC Activities

GEIA: Global Emissions Initiative, MAP-AQ: Monitoring, Analysis and Prediction of Air Quality, BBURNED: Biomass Burning Uncertainty: ReactioNs, Emissions and Dynamics

IGAC Regional Working Groups

ANGA: African Group on Atmospheric Sciences, China Working Group, Southern Hemisphere Working Group