1.150 Indoor particulate matter, trace elements, and temperature variations: a case study in rural Giyani, Limpopo, South Africa.

Early Career Scientist

Presenting Author:

Brigitte Language, Unit for Environmental Science and Management, North-West University, Potchefstroom, South Africa, bl23034149@gmail.com

Co-Authors:

Caradee Wright, Environment and Health Research Unit, South African Medical Research Council, Pretoria, South Africa

Roelof P. Burger, Unit for Environmental Science and Management, North-West University, Potchefstroom, South Africa

Stuart J. Piketh, Unit for Environmental Science and Management, North-West University, Potchefstroom, South Africa

Abstract:

Indoor air pollution contributes significantly to the burden of disease as it has numerous associated health impacts. Here, the aim was to assess and compare respirable particulate matter (PM_4 – particles equal to or less than 4µm in diameter) in residential homes in 4 villages in rural South African community. The objectives were to i) investigate differences in mass concentration for particulate size fractions of PM_{10}, PM_4, $PM_{2.5}$, and PM_1, ii) assess seasonal variations of respirable PM and trace elements, and iii) investigate the association between respirable PM and temperature. Measurement campaigns were conducted during spring (6-15 September 2016), summer (6 February – 8 March 2017), and winter (3-31 July 2017). The spring campaign consisted of three randomly-selected households in one village, whereas summer and winter included two households (~7 days per household) from each of the four villages. Indoor PM was measured using the DustTrak II continuous monitoring instrument at a 5-minute average time as well as 24-hour gravimetric filter sampling. Temperature and relative humidity were measured both indoors and outdoors. A collocated experiment was conducted in a single household (during spring) to investigate the relationship between various size fractions. The collocated study showed that mass concentrations of PM_{10}, PM_4, and $PM_{2.5}$ were closely related making it possible to compare PM_4 measurements to PM_{10} guidelines and standards. The continuous measurements allowed for time-series analysis and the identification of seasonal and diurnal patterns. The trace element mass concentrations were obtained by subjecting the gravimetric filter samples to wavelength dispersive x-ray fluorescence (WD-XRF) analysis suggesting possible sources, such as soil dust, that contribute to indoor particulate matter. Results provide insight into the level of indoor particulate pollution experienced in a rural setting and help to identify possible interventions to reduce exposure and reduce indoor air pollution-associated health impacts.