Title:	Humidity, density, and inlet aspiration efficiency correction improve accuracy of a low-cost sensor during field calibration at a suburban site in the North-Western Indo-Gangetic plain (NW-IGP)
Authors:	Pawar, Harshita (/jspui/browse?type=author&value=Pawar%2C+Harshita) Sinha, B. (/jspui/browse?type=author&value=Sinha%2C+B.)
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Abstract:	Low-cost particulate matter (PM) sensors are now widely used by concerned citizens to monitor PM exposure despite poor validation under field conditions. Here, we report the field calibration of a modified version of the Laser Egg (LE), against Class III US EPA Federal Equivalent Method PM10 and PM2.5 β-attenuation analyzers. The calibration was performed at a site in the north-western Indo-Gangetic Plain from 27 April 2016 to 25 July 2016. At ambient PM mass loadings ranging from <1–838 μg m−3 and <1–228 μg m−3 for PM10 and PM2.5, respectively, measurements of PM10, PM2.5 from the LE were precise, with a Pearson correlation coefficient (r) >0.9 and a percentage coefficient of variance (CV) <12%. The original Mean Bias Error (MBE) of ∼−90 μg m−3 decreased to −30.9 μg m−3 (Sensor 1) and −23.2 μg m−3 (Sensor 2) during the summer period (27 April–15 June 2016) after correcting for particle density and aspiration losses. During the monsoon period (16 June–25 July 2016) the MBE of the PM2.5 measurements decreased from 19.1 μg m−3 to 8.7 μg m−3 and from 28.3 μg m−3 to 16.5 μg m−3 for Sensor 1 and Sensor 2, respectively, after correcting for particle density and hygroscopic growth. The corrections reduced the overall MBE to <20 μg m−3 for PM10 and <3 μg m−3 for PM2.5, indicating that modified version of the LE could be used for ambient PM monitoring with appropriate correction and meteorological observations. However, users of the original product may underestimate their PM10 exposure.
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