## Statistical Assessments of PM<sub>10</sub> and Distribution of PM<sub>1</sub>, PM<sub>2.5</sub> and PM<sub>10</sub> in Ambient Air due to Extreme Fireworks Episodes in Megacity Delhi

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The objectives of the present study are (i)  $PM_{10}$  temporal variations from January, 2007 to December, 2008 and regression analysis, between  $PM_{10}$  and gaseous pollutants as well as meteorological parameters, and (ii) assessments of  $PM_{10}$ ,  $PM_{2.5}$  and  $PM_1$  data during two extreme fire-works episodes (Diwali-2007 and Diwali-2008) at megacity Delhi.

The  $PM_{10}$  levels are varied between  $42\mu gm^{-3}$  and  $200\mu gm^{-3}$  during January to December, with average  $114.1\pm 81.1\mu gm^{-3}$ .  $PM_{10}$  levels are lower than National Ambient Air Quality (NAAQ) standard during monsoon and are close by to NAAQ standard during summer. The  $PM_{10}$  levels are much higher than NAAQ standard during winter.  $PM_{10}$  shows good correlation with CO as compared to NO<sub>2</sub> and SO<sub>2</sub> and  $PM_{10}$  levels depletes with rainfall, temperature and wind speed.

The PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub> concentrations are peaked at mid-night on Diwali day and at 0500 hrs on next day. The averages of PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub> over festive days were 723µg/m<sup>3</sup>, 588µg/m<sup>3</sup> and 536µg/m<sup>3</sup> in 2007 and 501µg/m<sup>3</sup>, 389µg/m<sup>3</sup> and 346µg/m<sup>3</sup> in 2008 respectively. The lower levels of PM<sub>10</sub>, PM<sub>2.5</sub> and PM<sub>1</sub> during Diwali-2008 relative to Diwali-2007 can be linked with increased Mixing Height (446m), temperature (~23.8°C) and wind (0.36ms<sup>-1</sup>) in Diwali-2008 as compared to 301m, ~21.1°C and 0.1ms<sup>-1</sup> respectively in Diwali-2007.

It is worthy to mention that  $PM_1$  and  $PM_{2.5}$  measurements are rare within Delhi. Also many developing countries including India do not have national standards for  $PM_1$  and  $PM_{2.5}$ .

Keywords: Gravimetric method, fireworks, mixing height, air quality, vehicular pollution