

An Inexpensive Method for Estimating Particle Pollution

M.M. Seltzer

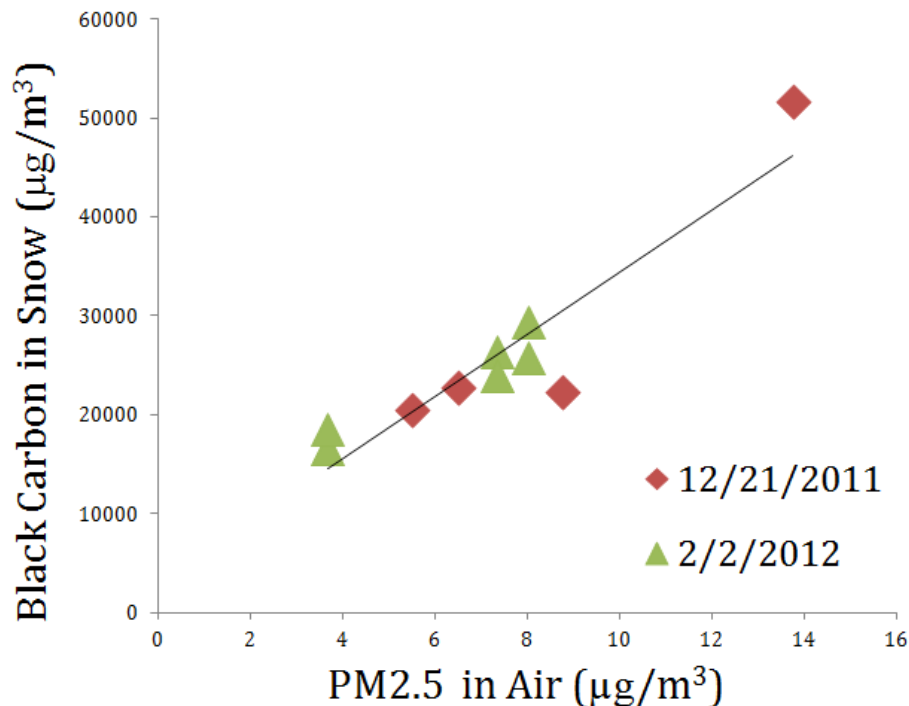
Fairview High School, 1515 Greenbriar Blvd, Boulder, CO 80305, ; 720-939-6873, E-mail: michael@theseltzers.com

Air Pollution is crucial to understanding the health and environmental hazards that exist around us. Current real time measurement methods (such as PM_{2.5} which measures the mass concentration of particles that are under 2.5 μg) are expensive, require extensive training, and are not portable. Through measuring the mass concentration of black carbon filtered through snow, this experiment seeks to create a viable, inexpensive, and transportable method of estimating particle pollution. Given that precipitation serves as the dominant method of air particulate cloud scavenging, there may be a relationship between PM_{2.5} and black carbon in snow.

Snow was collected from four sites around Denver, Colorado where PM_{2.5} air quality monitors were available. The snow was melted and filtered onto Pallflex membrane filters. The filters were then analyzed for their darkness (light ratio) and using Beer's Law and were compared to the PM_{2.5} data for each site.

PM_{2.5} in air and black carbon in snow showed a statically significant relationship. The data showed that this method is a viable way of estimating particle pollution.

The process of estimating particle pollution through measuring black carbon in snow yields many important implications. Most states in the U.S. have few air monitoring stations and these stations don't necessarily reflect the particle pollution at every area surrounding them. This method could provide a far increased amount of data. Finally, in developing nations, this method could empower individuals to cheaply measure their air pollution and understand the hazards around them.



¹PM_{2.5} readings from colorado.gov air pollution control division [6]

Figure 1. Black carbon in snow vs 3-hour average of PM_{2.5} mass concentration at local site.