Atmospheric
Measurement
Techniques

Supplement of

Development and field testing of an online instrument for measuring the real-time oxidative potential of ambient particulate matter based on dithiothreitol assay

Joseph V. Puthussery et al.

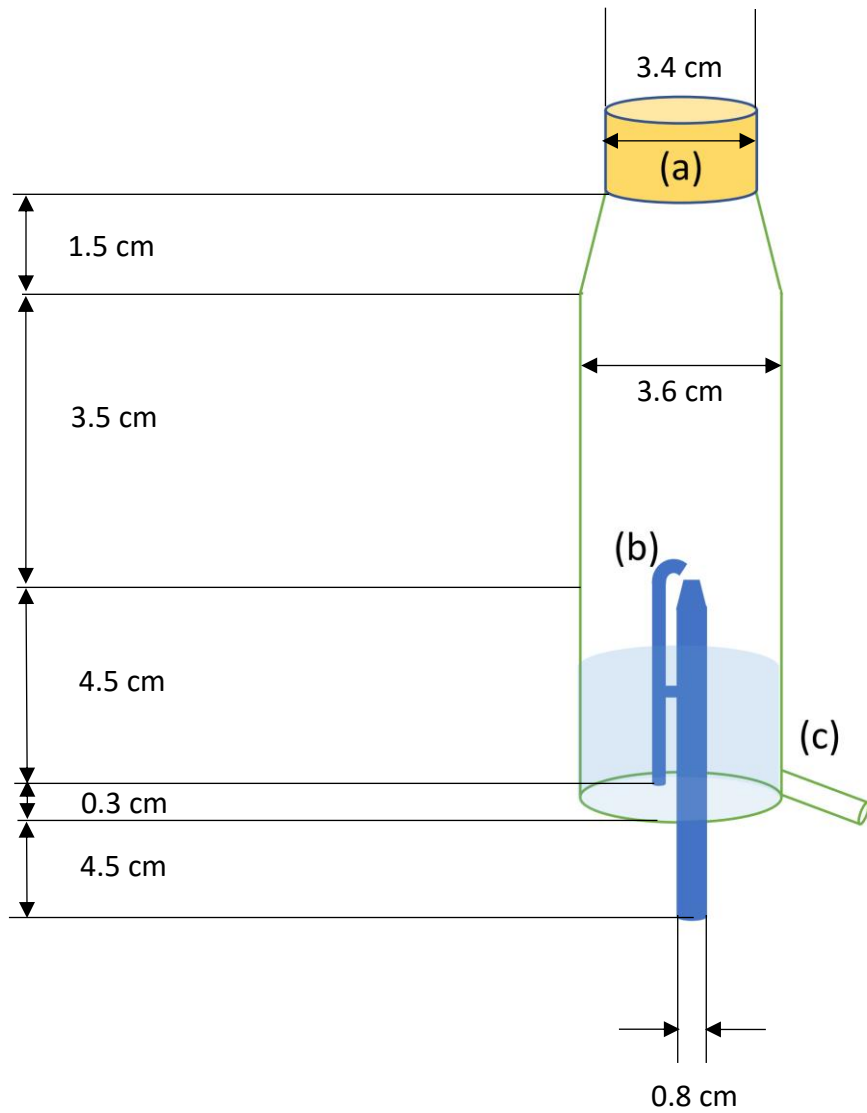*Correspondence to:* Vishal Verma (vverma@illinois.edu)

Figure S1: MC Dimensions (a) filter pack, (b) 0.3 cm internal diameter (ID) glass capillary tube and, (c) MC inlet/outlet tube (0.3 cm ID) connected to the automated DTT activity measurement system
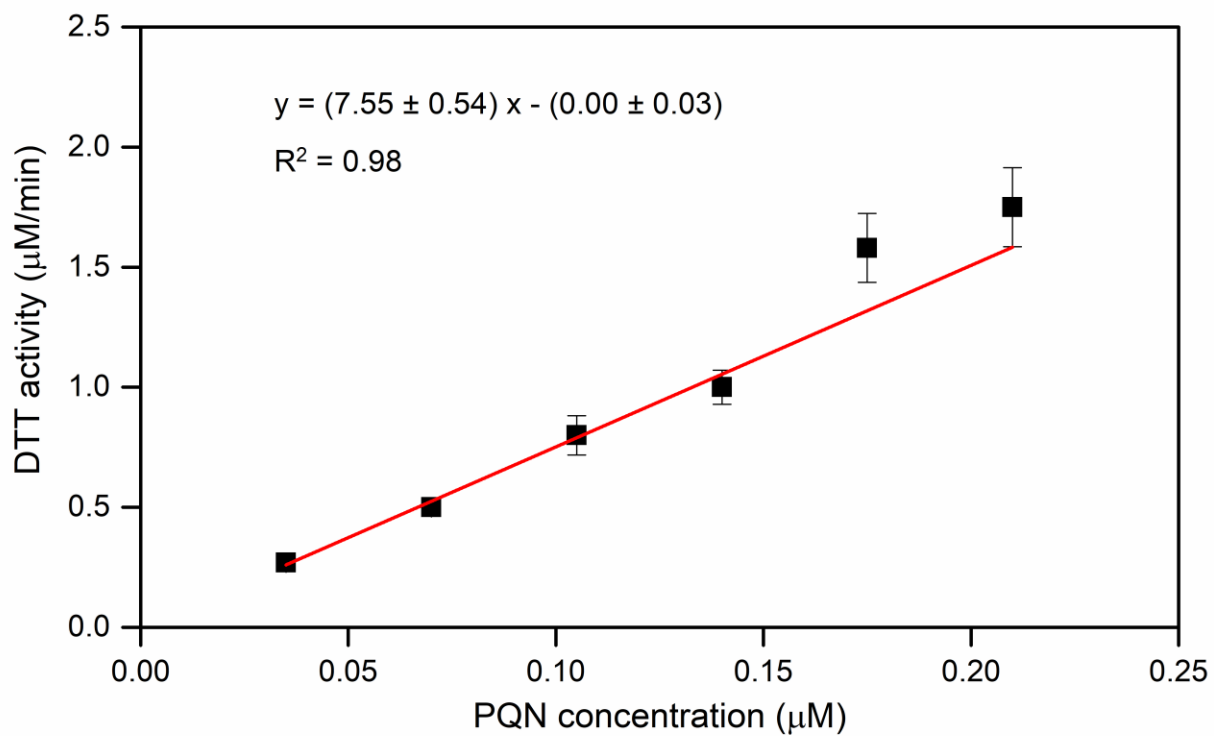
Figure S2: Calibration of the analytical (DTT activity determination) part of the online instrument using PQN standards. Error bars denote standard deviation (1 σ) of triplicate measurement, and PQN concentration shown on X-axis is the concentration inside the reaction vial.
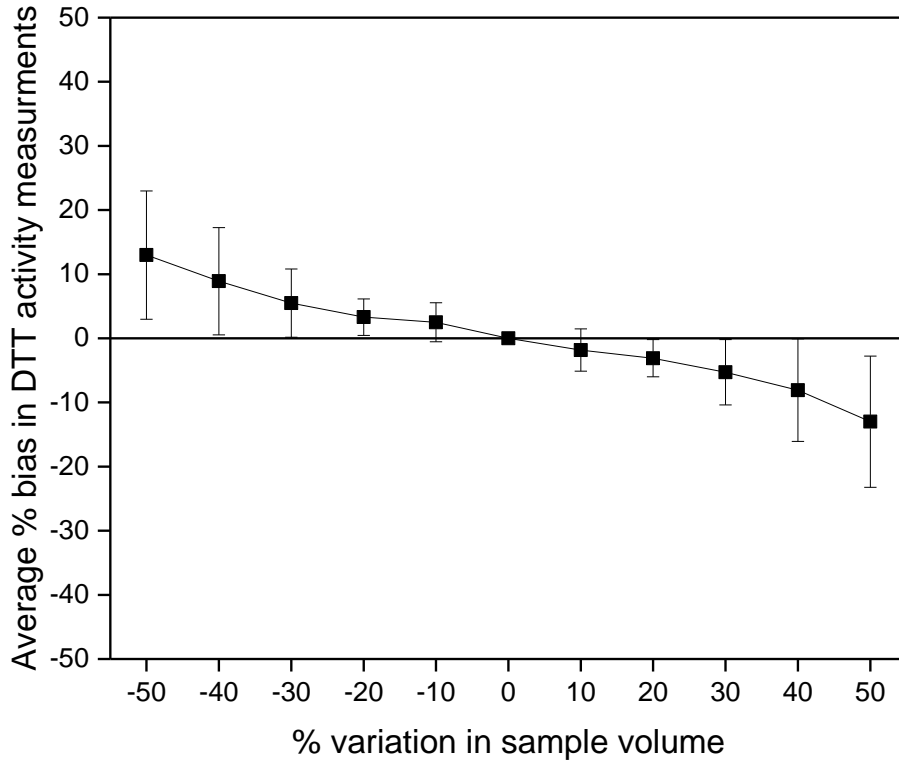
Figure S3. Effect of variation in the sample volume obtained from MC on the bias in DTT activity measurements. The data shown here is obtained from four different PM$_{2.5}$ filters extracted in water. The error bars denote standard deviation (1 σ) from the average bias.

The bias in the measured DTT activities due to change in the sample volume was determined as below:

$$\% \ bias \ in \ DTT \ activity = \frac{DTT \ Activity_{Sample} - DTT \ Activity_{Ref}}{DTT \ Activity_{Ref}} * 100 \qquad (S1)$$

Where, $DTT \ Activity_{Ref}$ is the DTT activity of the reference vial (1.75 mL sample volume) and $DTT \ Activity_{Sample}$ is the DTT activity of the vial containing a different (than 1.75 mL) sample volume.

And, percentage variation in the sample volume is calculated as:

$$\% \ variation \ in \ sample \ volume = \frac{Volume_{Sample} - Volume_{Ref}}{Volume_{Ref}} * 100 \qquad (S2)$$

Where, $Volume_{Ref} = 1.75$mL and $Volume_{Sample}$ varies from 0.875 mL to 2.625 mL
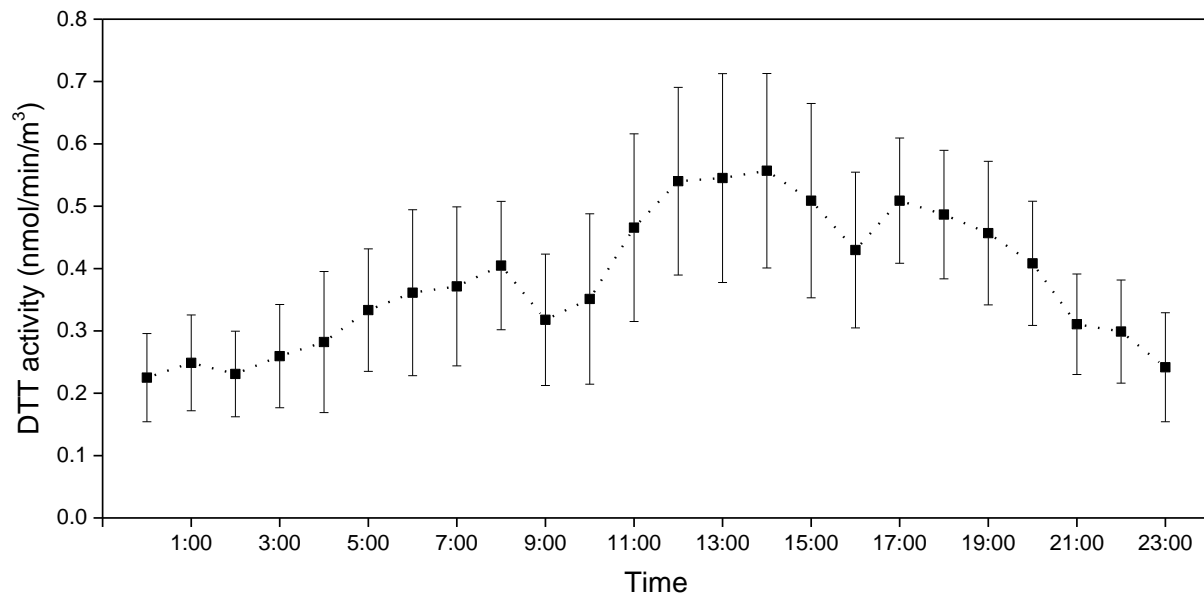
Figure S4: Diurnal profile of the ambient $PM_{2.5}$ DTT activity measured at the sampling site during time-segregated sampling (August 4-16, 2017). Weekends were not included in plotting this profile.
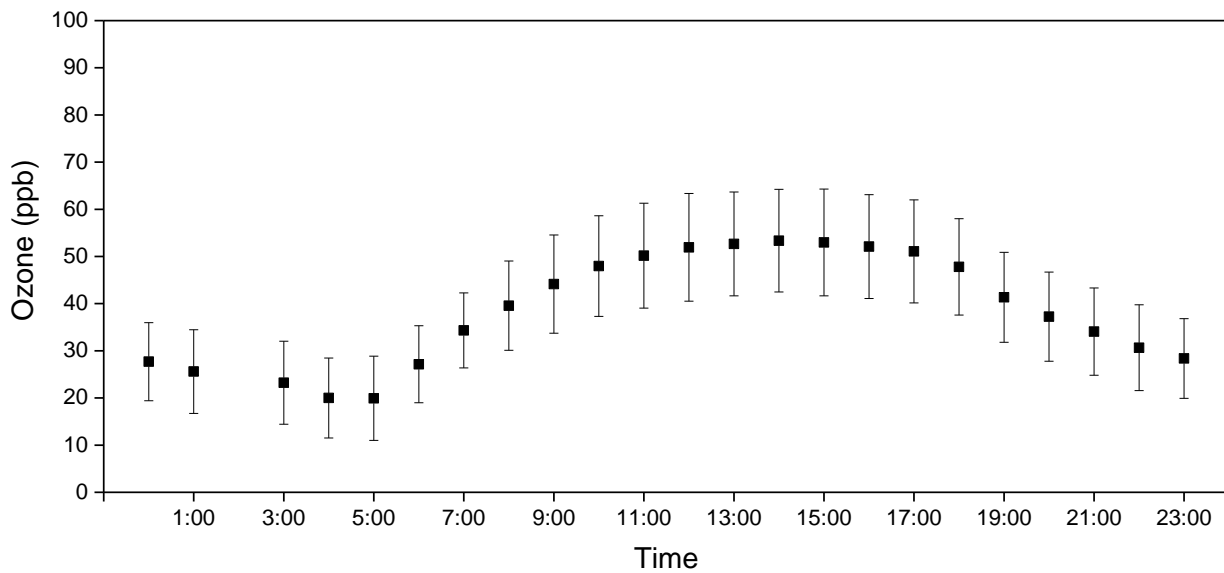

Figure S5: Diurnal trend in the hourly averaged ozone concentration (June 1–June 30, 2017) measured at Bondville (AirNow-Tech, 2017).
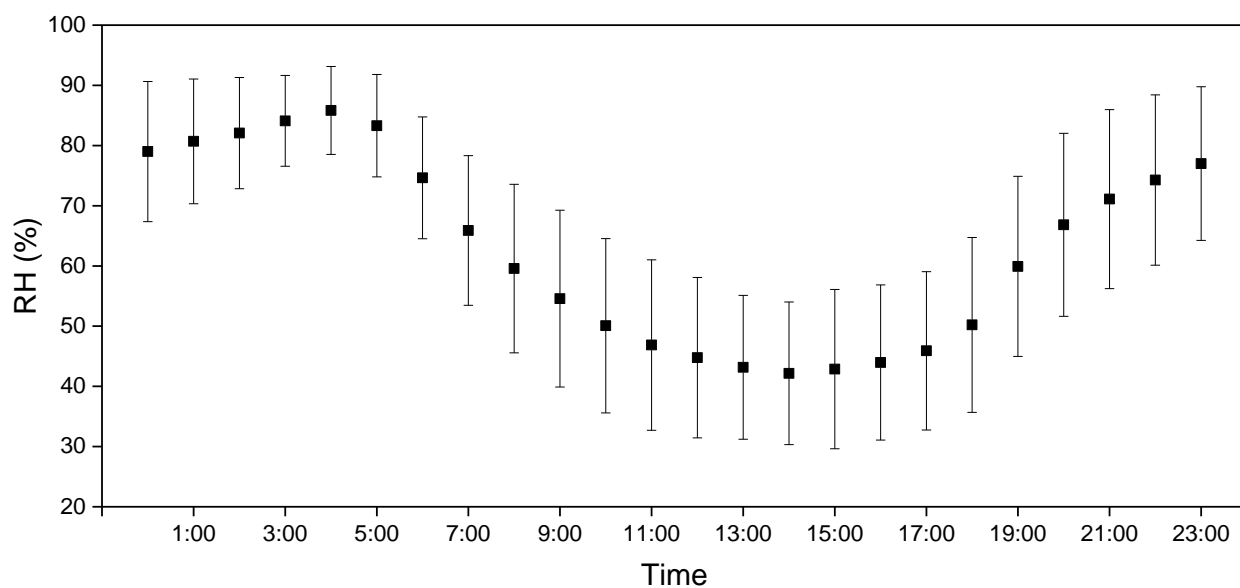
Figure S6: Diurnal trend in the hourly averaged ambient RH (June 1 – June 30, 2017) measured at Bondville (AirNow-Tech, 2017).

Table S1: Details of sampling (e.g. dates, number of samples, additional remarks, etc.) for various experiments

Experiment	Sample ID/Number of samples	Date	Remarks
Online versus offline comparison (a) Water extraction	Total number of filters: 20	1/24/2017 1/25/2107 1/30/2017 2/1/2017 2/2/2017 2/5/2017 2/6/2017 2/7/2017 2/8/2017 2/9/2017 2/10/2017 2/11/2017 2/13/2017 2/14/2017	For offline DTT activity analysis, PM samples were collected for a duration of 1hour parallel to the online system.
Online versus offline comparison (b) Methanol extraction	Total number of filters: 16	1/24/2017 1/25/2017 2/5/2017 2/6/2017 2/7/2017 2/8/2017 2/9/2017 2/10/2017 2/11/2017 2/13/2017 2/14/2017	For offline DTT activity analysis, PM samples were collected for a duration of 1hour parallel to the online system.
Time-segregated sampling	QS1, TS1 QS2, TS2 QS3, TS3 QS4, TS4	8/3/2017 8/4/2017 8/7/2017 8/8/2017 8/9/2017 8/10/2017 8/11/2017 8/14/2017 8/15/2017 8/16/2017	Composite $PM_{2.5}$ samples were collected for 10 days on each filter. Filter sampling was not conducted over the weekends.

Table S2. Initial volume (i.e. at the start of the sampling run) of Milli-Q water added to the MC based on ambient RH

Ambient RH (%)	Volume of water (mL)
< 45	16
45 - 60	12
60 -75	10
75 - 85	5
> 85	3

These volumes of water were determined by numerous trials on MC in the field at extreme RH conditions.

References

AirNow-Tech: AirNow-Tech:Home, [online] Available from: http://airnowtech.org/ (Accessed 10 April 2018), 2017.