

Response to comments of Reviewer 1

1. The authors reported a good quality results of the important problem in the Kathmandu Valley, the did not defined anywhere in the paper about Semi-volatile aerosol they are targeting, what are the possible sources and what are the pollutants concentrations in Kathmandu valley.

Response: The definition was existing in the original manuscript on line no. 47-54. We modified the paragraph on the Kathmandu valley air quality situation and emission sources, which can be seen on line no. 74-91 of the modified manuscript and the same text is quoted below.

“The Kathmandu Valley in Nepal is a polluted area in South Asia and generates much interest due to its rapid urbanization, emission sources, topography and proximity to the Himalayas. Emissions from heavy traffic movements, brick-kilns, open burning of solid waste, as well as from households and industrial activities in particular are primary sources of pollution within the valley. Several studies have been conducted in the Kathmandu valley to quantify the mass of black carbon (BC), PM_{2.5} and PM₁₀ and to identify the seasonality of air pollution (Aryal et al., 2009; Majumder et al., 2012; Putero et al., 2015; Sharma et al., 2012). These studies showed the highest aerosol loading occurs during winter season: BC in winter was ~14 µg/m³ (Sharma et al., 2012) while PM₁₀ reached ~320 µg/m³ (Putero et al., 2015). This is due primarily to strong inversion and calm weather conditions during the winter months.

Studies on source apportionment of ambient air quality in the Kathmandu valley based on NMVOC's indicate that brick kilns (~10%), traffic (~17%), residential biofuel and waste disposal (~11%), and industries (32%) are the major sources of pollution (Sarkar et al., 2017). Similar findings but with slight variation in percentages were also observed when estimating sources of EC and OC from PM₁₀ (Kim et al., 2015), PAH's from TSP (Chen et al., 2015), PM_{2.5} and bulk aerosol studies (Shakya et al., 2010, 2017). Although none of the studies quantified the contribution of the semi-volatile aerosols to the ambient atmosphere directly. Source apportionment studies of PM_{2.5} and PM₁₀ within the valley indicate ~50% contribution from semi-volatile aerosols composed primarily of OC, NH₄ and SO₄. This fraction, however, varies from time to time depending upon the sampling period and sampling method. In this context, it important to study the impact of the semi-volatile aerosols on physical and optical properties of aerosols in the Kathmandu Valley. To the best of our knowledge, this is the first study of its kind in this area.”

2. In figure it has been shown that absorption of dry and wet aerosol species is maximum in the morning time from 05:00 to 10:00 hrs, while the absorption at during this time at 50 C and 300 C is less, what is the possible reason, need some explanation.

Response: The figure in original manuscript was also showing BC peak during morning hours. As the experiment started just after 10 a.m. and the figure X-axis scale was not able to capture this properly, hence it might be misleading. The modified figure with proper X-axis scale is given below (Fig A) as well as changed in the revised manuscript (Fig 8). However, at 300°C TDD set temperature, both wet and dry BC diurnal variations does not exhibit strong diurnal cycle like other days this may be due to change in local meteorological conditions. But still peak concentrations were observed during morning hours. For further verification we are providing similar experiment results from other day (plot given below Fig B) which clearly indicates BC peaks were observed in the morning hours.

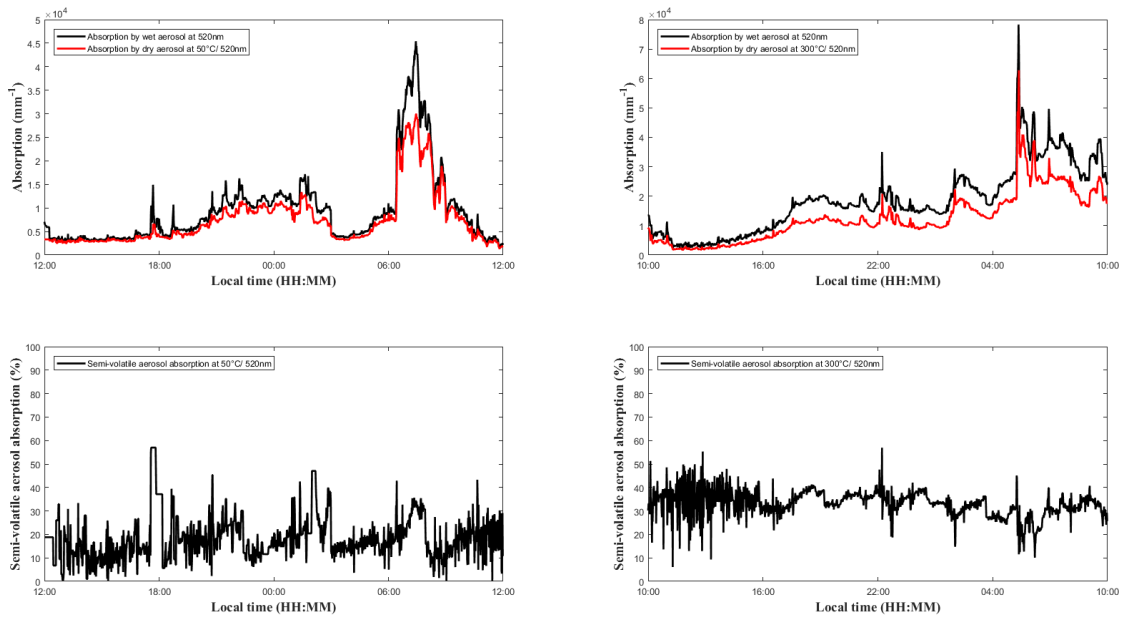


Fig. A. Comparison of wet and dry aerosol absorption diurnal variation at 520nm wavelength for TDD set temperatures of 50°C (a) and 300°C (b). Diurnal variation of semi-volatile aerosol absorption fraction at 520 nm wavelength for TDD set temperatures 50°C (c) and 300°C (d).

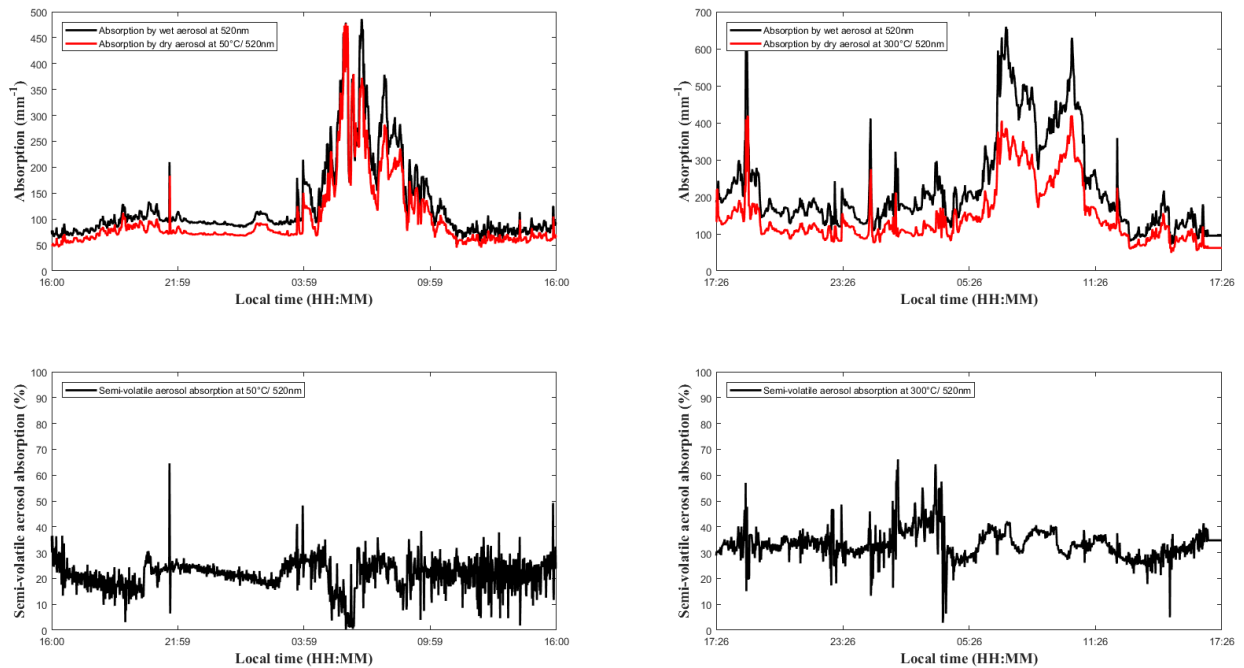


Fig B. Comparison of wet and dry aerosol absorption diurnal variation at 520nm wavelength for TDD set temperatures of 50°C (a) and 300°C (b). Diurnal variation of semi-volatile aerosol absorption fraction at 520 nm wavelength for TDD set temperatures 50°C (c) and 300°C (d).

3. The ambient meteorological conditions of the study period has not been defined, need to discuss.

Response: Taking into account the reviewer's suggestion, we have incorporated a separate paragraph in section 2 of the modified manuscript (Line no. 104-111) discussing the prevailing meteorological condition over the experimental site during the study period.

The text has been quoted below for your reference.

“The general meteorology in Kathmandu during the observation period (<https://www.wunderground.com/>) included a mean temperature of 21.8 ± 3.1 °C and average relative humidity of 75 ± 10.2 %. The daily average wind speed was approximately 1.3 m s^{-1} indicating prevalence of light air conditions during the sampling time period. The dominant wind direction during this period was westerlies (South West-North West) and easterlies (South East-North East) due to the presence of high mountain peaks on the northern and southern fringes of the Kathmandu valley (Panday et al., 2009; Regmi and Maharjan, 2015). Atmospheric pressure was also observed to be ~ 868 hPa. In these weather conditions, all measurements were carried out within the span of few months (Table 1). Care was taken so that no experiments were conducted during any occasional rain events”

4. Table 3 shows that with increase in temperature loss of absorption at both wavelength (370nm and 880nm) shows similar linear trend, does it indicate something about composition of semi-volatile aerosol.

Response: The similar trend observed in loss of absorption at both 370nm and 880nm with the increase in temperature indicates uniform mixing of aerosols. This linear trend can also be attributed to intrinsic properties of the semi-volatile aerosols like refractive index, size, mixing state or brown carbon (BrC). To understand the actual contribution of this absorption of organic or in-organic aerosol fraction requires a different set of experiments. This will be the future scope of this study.

The necessary changes can be observed in section 4.3 line no. 342-344 while the text has been quoted below for your reference below.

“If we assume BC mixing state absorption effects are similar at 370nm and 880nm wavelengths, then the difference between 370nm to 880nm wavelength absorption may be attributed to changes in the intrinsic properties of the semi-volatile aerosol, the size of aerosols, mixing state or brown carbon (BrC), which is unknown at present.”

5. The English used in paper should be improved, many times it has been written We did, we computed etc it should be avoided and corrected.

Response: The present manuscript has been thoroughly edited by a native English speaking editor who has been acknowledged in the ‘Acknowledgement’ section.