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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Enhancement of biogenic emissions of VOCs in the semi-arid region of India during winter to summer transition period: Role of meteorological conditions" *by* Nidhi Tripathi and Lokesh Kumar Sahu

Anonymous Referee #2

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General Comments:

The manuscript entitled "Enhancement of biogenic emissions of VOCs in the semi-arid region of India during winter to summer transition period: Role of meteorological conditions" by Nidhi Tripathi and Lokesh Kumar Sahu reports high monoterpene mixing ratios using PTR-TOF-MS in Ahmedabad, India. The authors suggest that the monoterpenes mixing ratios show increasing trend from evening to midnight due to high temperature. They have also tried to establish the biogenic contribution to monoterpenes using monoterpenes/benzene emission ratios and from regional trans-

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Discussion paper

port. Although the manuscript provides information about biogenic and anthropogenic sources of monoterpenes from a part of the world where VOC data are scarce, it lacks scientific significance and needs to be presented in a more convincing way to the readers. The manuscript is not logically written and not well organized. It was very hard to understand what the main points are in the result and discussion section. Therefore, I recommend that the manuscript needs major revision and cannot be accepted for publication in ACP in the current format.

Specific Comments:

Title: The title "Enhancement of biogenic emissions of VOCs. . ." doesn't reflect the content of the manuscript in my opinion. In this manuscript, the authors tried to investigate the emission sources (that includes both biogenic and anthropogenic sources such as biomass burning and during Holi festival) of monoterpenes in the semi-arid region in India. As isoprene is the primary biogenic VOC and authors did not discuss the biogenic emission sources of isoprene in detail, I think the title does not justify the content of the manuscript and it needs to be revised.

Abstract: P1, L10-11: The authors themselves mentioned here that "This study is based on the measurements of monoterpenes" which was exactly what I pointed out in the Title of the manuscript.

P1, L12: The authors should mention the months here when they mention "winter-to-summer transition"

P1, L13-16: These sentences are kind of confusing to the readers. The authors first mentioned that "monoterpenes showed strong diurnal variation with elevated values from evening till midnight and lowest in the afternoon." Nighttime elevated monoterpenes mixing ratios cannot be attributed to biogenic emissions entirely as there can be contributions from other anthropogenic sources. This nighttime emission sources of monoterpenes need to be investigated in detail.

The next sentence they mentioned “The daily data does not show clear trends with monthly means of ∼0.35 ppbv during each month”. This contradicts with the previous sentence where it is mentioned that “monoterpenes showed strong diurnal variation. . .” In addition, if we look at Table 1, the monthly means for February and March is different. Therefore, “monthly means of ∼0.35 ppbv during each month” doesn’t make any sense.

Section 1: The authors should provide only the information relevant to the manuscript. If the authors are trying to focus only to address biogenic emissions, they should avoid providing information about anthropogenic emissions such as in P2, L40: “Major sources of anthropogenic VOCs (AVOCs) include combustion of fossil fuel, biomass burning, use of solvents, industrial production, refineries, etc.(Sahu, 2012).” and elsewhere.

The authors should also rearrange the information they want to provide in the Introduction section. Currently, it reads like several information gathered from previous works and the authors put that in the introduction section but most of the places there is no connection between the previous sentence and the next one which confuses the readers and is hard to follow.

Additionally, the authors should cite some previous work performed in urban areas in South Asia using PTR-TOF-MS e.g. Sarkar et al. (2016) reported a valuable dataset from urban Kathmandu Valley using PTR-TOF-MS.

Sarkar, C., Sinha, V., Kumar, V., Rupakheti, M., Panday, A., Mahata, K. S., Rupakheti, D., Kathayat, B., and Lawrence, M. G.: Overview of VOC emissions and chemistry from PTR-TOF-MS measurements during the SusKat-ABC campaign: high acetaldehyde, isoprene and isocyanic acid in wintertime air of the Kathmandu Valley, Atmos. Chem. Phys., 16, 3979-4003, https://doi.org/10.5194/acp-16-3979-2016, 2016.

Section 2: Authors should provide detailed information regarding the PTR-TOF-MS calibrations i.e. how many calibrations were performed during the measurement period, details of the standard and dilution flows of GCU, sensitivity plots, how the sensitivities

varied during the measurement period and effect of RH on MT sensitivity.

How was the transmission curve of the PTR-TOF looks like?

How was the estimation of monoterpenes mixing ratios using at m/z 137.131 performed since monoterpenes fragmentation also gives signal at 81.070?

How often was the zero-air test performed in a day and during the measurement period?

All this detailed information should be there (within the manuscript or as a supplementary information) to establish that the data presented in the manuscript is reliable.

Section 3.1: Is the measurement site α-pinene dominant? Monoterpenes fragmentation pattern depends on instrumental condition as well as different monoterpene species as shown in Tani et al., 2004. Thus, if this site is characterized as an α-pinene dominant area, the uncertainty in estimating MT concentration can be minimized. Otherwise, m137.131 reported in this study will imply a big uncertainty. Therefore, if this is the former case, please provide appropriate references or data.

Section 3.2: P8, L198: 16 March

P8, L202-205: What about the MT/acetonitrile ratios during nighttime for rest of the measurement period? The authors are emphasizing here on the emission of MT from biomass burning during the evening till next early morning during the Holi festival. However, in many places of the manuscript, the authors ignored this fact of biomass burning contribution to MT mixing ratios and emphasizing only on emissions from storage pool from plants due to high temperature during nighttime. The activity of biomass and wood burning is a common practice in India at evening and nighttime during wintertime.

Section 3.3: P10, L246-250: The statement “Therefore, in the absence of sunlight, higher MTs/isoprene ratios indicate higher nighttime biogenic emissions of monoterpenes than those of isoprene.” is absurd as biogenic emission of isoprene do not occur at night.

The authors should explain how they estimated isoprene mixing ratios as in urban areas isoprene could be overestimated due to isomers from other sources. For instance, in smoke the “isoprene peak” is 20% pentadiene + cyclopentene.

What about the contribution of 232-MBO to isoprene mixing ratios?

It is well known that isoprene emissions can occur from traffic and BB and that can rationalize nighttime isoprene and contribute to daytime isoprene. Isoprene can have $\sim$ 20% interferences though from other compounds even at high mass resolution (Yokelson et al. 2013, Sarkar et al, 2016) in fresh smoke. Can the author estimate the fraction of observed isoprene from vegetation and combustion?

P11, L263: MT/isoprene ratios during early morning clearly indicates that there is anthropogenic contribution to the MT mixing ratios.

Section 4.1: P12, L290-293: It was unclear to me what authors are trying to say here since both the sentences read contradictory to me.

P13, L332-333: “Mixing ratios of monoterpenes were high in the lower visibility conditions (< 4 km) but showed lower values under high visibility conditions (> 4 km)” Shouldn’t it be the opposite since reduction of visibility will cause after the photooxidation of MT?

Figure 4. a) and Figure 5: The diurnal profile and variations of nighttime MT mixing ratios seems highest from 16-28 February as compared to the other periods which contradicts the conclusions drawn by the authors that MT mixing ratios are higher during March than February.

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