We would like to thank the Editor (Dr. Chan) for appreciating and highlighting the importance of our work and for recommending the manuscript for publication in ACP subject to minor revisions. We have reworded the manuscript as suggested by the Editor, and these are now reflected in the revised submission. The comments from the Editor are in black and our responses are in blue. The texts that have been modified/added to the manuscript are in **bold blue**.

Comments to the Author:

Thank you for your interesting manuscript on a potentially important topic in atmospheric chemistry. After considering reviewers' comments, I find that the identification of ketene is not sufficiently strong from an analytical chemistry point of view. The only clear conclusion from the results is that the abundance of m/z 43.018 is very significant. The laboratory investigation to rule out vinyl acetate is useful and convincing. It is, however, difficult to positively identify ketene as the species behind m/z 43.018. (Ruling out VA is useful, but not sufficient.) While ACP is not an analytical chemistry journal, it is still useful to follow some of the principles for chemical identification. The lack of authentic standards or separations, and the possibility of fragmentation in PTR pose serious problems to the identification. In my view, it would take more to convince readers about the ketene identification.

I understand that more experimental work is useful but just drags out the review process. I propose that the authors reword the manuscript and focus on the observations (i. e. abundance of 43.018 ion with a flux comparable to other well-known VOCs) and propose ketene as a possible species, which would be more consistent with the level of certainty in species identification. It is still a useful and important contribution to show that this one ion is representing some unknown species. I am happy to accept a manuscript that conveys this message.

Thank you for the suggestions. We have now reworded several sentences in the manuscript to convey the message that ketene is assigned tentatively as a possible species at m/z 43.018 and future studies are needed to explore the role of this potentially important VOC in the atmosphere. In addition to this, we have changed the title of the manuscript that we believe is best suited for this revised version of the manuscript. The previous title of the manuscript was:

"Evidence of ketene emissions from petrochemical industries and implications for ozone production potential".

The new title is:

"**Unexplored VOC emitted from petrochemical facilities: implications for ozone production and atmospheric chemistry**".

The sentences that were modified in different sections of the manuscript are as follows:

P2 L30-33:

A compound was observed using airborne PTR-TOF-MS measurements in the emission plumes from Daesan petrochemical facility in South Korea. The compound was detected at m/z 43.018 on the PTR-TOF-MS and was tentatively identified as Ketene, a rarely measured

reactive VOC. Estimated Ketene mixing ratios as high as ~ 50 ppb were observed in the emission plumes.

P2 L42-45:

Our study suggests that ketene, or any possible VOC species detected at m/z 43.018, has the potential to significantly influence local photochemistry and therefore, further studies focusing on the photooxidation and atmospheric fate of ketene through chamber studies is required to improve our current understanding of VOC OH reactivity and hence, tropospheric O_3 production.

P3 L79-82:

In this study, we present results from an aircraft measurement campaign conducted in the summer (May-June) and fall (October) of 2019 that shows that a compound emitted from a petrochemical facility in South Korea, was detected at m/z 43.018 by a high sensitivity proton transfer reaction time-of-flight mass spectrometry (PTR-TOF-MS) technique and tentatively identified as ketene.

P5 L168-170:

Although PTR-TOF-MS signal at m/z 43.018 could potentially originate from several other VOC species (e. g. acetic acid, glycolaldehyde, vinyl acetate etc.) due to the fragmentation process, our results suggest that ketene is the most probable species detected at this mass during this study.

P11 L364-368:

Ketene, a rare and highly reactive VOC, was tentatively identified and quantified as the major species at m/z 43.018 using PTR-TOF-MS technique in the emission plumes of Daesan petrochemical facility in South Korea during aircraft measurement campaigns conducted in the summer (May-June) and Fall (October) of 2019. Ketene mixing ratios of as high as ~ 50 ppb were measured in the emission plumes.

P12 L387-389:

Although based on our observation, we strongly believe that the m/z 43.018 signal corresponds to ketene, the possibility of the contribution from vinyl acetate and other species cannot be ruled out completely and therefore, further laboratory and field studies focusing on this aspect are needed.