

## ***Interactive comment on “Identifying and Quantifying Source Contributions of Air Quality Contaminants during Unconventional Shale Gas Extraction” by Nur H. Orak et al.***

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Received and published: 20 October 2020

Q: The authors should be made aware of this report that is of similar scope and should be a useful comparison.

[https://www.colorado.gov/airquality/tech\\_doc\\_repository.aspx?action=open&file=CSU\\_NFR](https://www.colorado.gov/airquality/tech_doc_repository.aspx?action=open&file=CSU_NFR)

A: We would like to thank the reviewer for the suggestion, we will compare the results.

Q: "The objective of this study is to investigate the effect of unconventional natural gas development activities on local air quality as observed at an active Marcellus Shale well pad" it would seem the objective is better stated as investigating the "emissions at the well pad", not the effect on local air quality, which is still interesting,

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but different. "Moreover, model results suggest that the major contributions to the regional transport/photochemistry factor occurred during horizontal drilling and drillout stages." This is just a relative shift where there are less emissions at the site so the background factor appears more pronounced. As it reads, one could think it was contributions to photochemistry or nearby photochemistry—worth clarifying. A: We regret for the confusion, we will rewrite the sentences. Q: Fig 3 caption seems to end abruptly. Also, adding dates in the caption for each phase would be extremely helpful. A: We regret for the mistake. We corrected the format of the Figure 3 caption. There is not enough space for the dates. If we add the dates, it would be difficult to read the figure. Instead, we shared the unconventional natural gas production process activity diagram with dates in the SI.

Q: The SI states there is a lot more VOC data, anything interesting in there? Are there indeed significant aromatics in the Marcellus natural gas emissions? A: We have analyzed all VOCs before deciding the parameters for the PMF model. The most significant compounds are included in the study. The rest of the VOCs are listed in the SI but excluded in the model.

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Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-833>, 2020.

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