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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Measurement report: Characteristics and sources of non-methane VOCs and their roles in SOA formation during autumn in a central Chinese city" *by* Haixu Zhang et al.

Anonymous Referee #1

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The authors describe result of a field campaign in a city in Central China, in which VOCs were measured by online PTR-MS and by GC from canister samples. Additional information about meteorological parameters and inorganic compounds is given. The aim of the paper was to characterize sources of VOCs and their role for SOA formation. The design of the study only allowed observing a rather incomplete picture concerning the goal of the study. The limitations of the study and consequences for the results, however, are insufficiently discussed in the paper. The authors try to calculate various quantities such as chemical age of air masses, OH concentrations at the location of measurements, radical production rates using approaches that cannot be easily justified to be applicable for conditions of the campaign and with the limited number of

measurements that were done. Overall the paper reads as if the authors mainly try to calculate various parameters from measured values in a similar way as reported in literature, but without discussing the science behind. The main part of the paper is describing VOCs measurements, but does not give any new results about chemical processes or state of the atmosphere. VOC data are further analysis with respect to source of VOCs by a PMF analysis, which can be done with the limited number of measurements. Overall, however, the content of the paper is mainly a description of the level of a limited number of VOC concentration that were measured for one month in a city in China and attributing these VOCs to sources that are to be expected. Therefore, the paper does not contain sufficient new results to be published in ACP. In addition, scientific quality of the manuscript is not good enough, because limitations of applied methods are not discussed.

Some specific comments:

Radical sources: The authors claim that photolysis of OVOCs is the major source of radicals. This has been shown for a specific environment in the center of oil- gas-fields in the US, but cannot be generalized. The limited number of measurements in the campaign described in this paper does not allow to analyse source of radicals, neither appropriate radiation measurements were done nor important radical precursors such as nitrous acid were detected. Though mentioned in the text, the authors continue stating that carbonyl photolysis yields OH (Eq 9), which is not true.

OH concentration: The authors use a parameterization for calculating OH concentrations, for which important parameters like photolysis rates are only estimated. However, even if they had measurements, this approach is not applicable, because the parameterization was achieved for a totally different environment and location. There cannot be expectation that this parameterization can be used to calculate OH for the conditions of this campaign. Chemical age: The authors use the ratio of isoprene to MVK+MACR to estimate the OH dose that give the chemical age of the air mass. This approach would only be applicable, if the air mass contained VOCs from approximately

co-located emission sources that are transported to the measurement site without significant mixing of air masses from other sources. As the authors show there is little biogenic sources, but the majority of VOCs stem from anthropogenic sources. Therefore, it cannot be expected that the chemical age of anthropogenic sources can be estimated by using the degradation of isoprene which is emitted by plants. The location of the measurements is in a city, where anthropogenic sources of VOCs are presumably very close to the site. As a consequence, also the estimate for SOA production is based on questionable assumptions.

VOC measurements: The authors do not discuss consequences of the limited number of VOC species that were detected. For example, small alkenes, which often make a larger contribution to the total number of reactants in anthropogenic environments like here, are missing. Concerning the data quality there is only good agreement between PTR and GC measurements for benzene stated, but nothing said, if good agreement was also found for other species. Figure 2 gives a comparison of VOCs concentrations with other locations, but no conclusions can be drawn, because VOC levels highly depend on the distance to sources, time of the year etc. The authors do not make an attempt to give any interpretation, when they compare their VOC levels with those found in other locations. Figure 5 gives a correlation between observed TVOC and predicted TVOCs. It is insufficiently explained how predictions of TVOCs were derived, but it seems as if predictions rely on the PMF analysis. If this was the case, a good correlation is certainly expected, because the PMF factors themselves are based on measured VOCs. The effect of prediction would only be smoothing out some of the variability of concentrations of single VOCs.

Technically: The quality of figures is poor due to small font sizes, small sizes of bars in bar plots and small legend sizes.

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