

Interactive comment on “Shipborne measurements of total OH reactivity around the Arabian Peninsula and its role in ozone chemistry” by Eva Y. Pfannerstill et al.

Anonymous Referee #2

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General Comments

As is an important region for global change, the Arabian Peninsula is an area with intense photochemistry caused by strong solar radiation and strong emissions from the sea traffic, petrol chemical industry and the urban centers. Nevertheless, the Arabian Peninsula is in general lack of measurements of NO_x, VOCs and the total OH reactivity. To fill this gap, a ship campaign with comprehensive suite of atmospheric measurements was conducted and the in-situ OH reactivity measurements was shown systemically to be a very useful parameters to characterize the impact of the anthropogenic emissions. Overall, I recommend publication at ACP after the authors have

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addressed the following comments.

Specific Comments

1. Page 5 L15, what is the exact frequency to change the PTFE filter? It should be stated.
2. Page 5 L17-21, The interference by NO, NO₂ and O₃ toward the total OH reactivity (kOH) measurements determined in the lab on average seems to be quite different from those of the total OH reactivity comparison experiments presented by Fuchs et al., 2017. Details of the lab experiments shall be presented in this paper (maybe partly in the supporting materials) so that the measurement quality of the data is with higher transparency. The highest correction 7.4 s⁻¹ at high NO_x is actually comparable to the observed values. In this case, it might be useful to present a frequency distribution of the corrected kOH as the high NO_x conditions seems to be frequently encountered during this ship campaign as shown by Figure 1.
3. Page 5 L23-25, are these test hydrocarbons representative for the air masses characterized in this study?
4. Page 10 L17, I don't quite understand how can be the ratio of the C₃ carbonyls toward that of propane can be used as an indicator of oxidation state. The C₃ carbonyls can be produced from larger NMHCs from propane and the degradation products can be C₂ and C₁ carbonyls. As the lifetime of C₃ carbonyls and propane is different by one order of magnitude, the ratio is not good to characterize the oxidation state. It is probably still better to rely on the ratio of toluene to benzene or xylene to toluene for the analysis of the oxidation state.
5. Page 10 L29-30, what is the detection limit of the used total OH reactivity instrument?
6. Sect. 3.5.1 the ozone production regime is analyzed the ratio of the OH reactivities of VOCs to that of NO_x. This is plausible but not accurate enough as the primary

production rate of ROx radicals will influence the ozone production regime as well. And since the NO₂/NO ratio may be different for different VOCs/NO_x ratio, the ozone production regime could still be different even under same VOCs/NO_x ratio. So I suggest the influence of the ROx primary production rates (e.g. O₃, HONO and carbonyls photolysis, etc) as well as the influence of the NO₂/NO ratio shall be further analyzed.

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