Oxidation flow reactors are widely used in the study of formation and aging of organic aerosols, especially simulating OH radical dominated daytime oxidation process. In this study, the authors extended the use of OFR for studying NO_3 radical initialed nighttime oxidation and the aging process by online producing N_2O_5 as the source of NO_3. By model simulation and measurements, the authors investigated the controlling factors of NO_3 exposure, NO_3:O_3, NO_2:NO_3 ratios and provided guidelines for experimental design. I believe it will help researchers in using OFR for nighttime chemistry studies. I recommend to accept it after minor revision.

General comments

Regarding the NO_3 estimation equation for the ORF-iN_2O_5, I wonder how would multiple generation oxidations influence the estimation of NO_3 exposure. For example, NO_3 radical oxidation of typical BVOCs (isoprene, monoterpenes, sesquiterpenes) produces carbonyls and even products with carbon double bonds. These products are highly reactive toward NO_3 radicals which may affect the NO_3 exposure estimation. However, these are not considered in the KimSim simulations. Secondly, NO_3 oxidation of BVOCs has high SOA yields. I wonder how the uptake of NO_3 and N_2O_5 by the produced particles affect the simulations.

Specific comments：

(1) BBCES measuring the NO_3. 1) The author stated that “$I(\lambda)$ and $I_0(\lambda)$ were the measured transmitted intensities in the presence and absence of NO_3”. How was the “absence of NO_3” achieved? 2) The equation grading the calculation of $\alpha(\lambda)$ is not correct. The $\alpha(\lambda)$ in the cavity also contributed by the bath gas beyond the NO_3 radicals. 3) The NO_3 radicals are highly reactive and can easily lose to the walls. What is the transmission efficiency of NO_3 from the OFR to the cavity? 4) Due to different loss rates of NO_3 and N_2O_5 to the wall, the equilibrium of NO_3 and N_2O_5 may change. How good is the measured NO_3 concentration in the CRD represent the NO_3 radical concentration in the reactor?

2) The description of the results in section 3.4 is not consistent with the results in the figure.

“First, at $[O_3]_{0,LFR}$ < 1000 ppm and $[NO_2]$0,LFR:$[O_3]_{0,LFR}$ = 0.1 to 1.8, maximum NO_{3exp} increased with decreasing $[NO_2]_{0,LFR}$:$[O_3]_{0,LFR}$ (Fig. 7a).” It is very hard to see the results in the figure when $[O_3]_{0,LFR}$ < 100 ppm. For me, it looks like maximum NO_{3exp} first increase with increasing $[NO_2]_{0,LFR}$:$[O_3]_{0,LFR}$ ratio and then decrease with it, especially when $[O_3]_{0,LFR}$ was in the range of 100-1000 ppm

“Above $[O_3]_{0,LFR} \approx 2000$ ppm, NO_{3exp} was less sensitive to $[NO_2]_{0,LFR}$:$[O_3]_{0,LFR}$.”. This is true except for $[NO_2]_{0,LFR}$:$[O_3]_{0,LFR}$=2.0

“Second, maximum NO_3:O_3 increased with increasing $[NO_2]_{0,LFR}$:$[O_3]_{0,LFR}$ (Figure 7c).” This statement is true only when the O_3 was above 1000 ppm, even get rid of the results from $[NO_2]_{0,LFR}$:$[O_3]_{0,LFR}$=2.0.

“conversion of O_3 to N_2O_5 inside the LFR” I fell more comfortable to say “conversion of O_3 to O_2 inside the LFR”.

3) The authors tried to investigate the RO_2 fate and considered “RO_2 react with NO, NO_2, NO_3, HO_2, or other RO_2 to generate alkoxy (RO) radicals, peroxynitrates (RO2NO2), hydroperoxides or organic peroxides, and may additionally undergo autooxidation via sequential isomerization and O_2 addition.” Recent studies by Berndt et al. (2018) revealed that self- and cross-reaction of RO_2 radicals would produce dimers effectively. How could this process affect the fate of the RO_2 radical?

1. Berndt, T.; Mender, B.; Scholz, W.; Fischer, L.; Herrmann, H.; Kulmala, M.; Hansel, A., Accretion Product Formation from Ozonolysis and OH Radical Reaction of alpha-Pinene: Mechanistic Insight and the Influence of Isoprene and Ethylene. Environ. Sci. Technol. 2018, 52, (19), 11069-11077.

2. Berndt, T.; Scholz, W.; Mentler, B.; Fischer, L.; Herrmann, H.; Kulmala, M.; Hansel, A., Accretion Product Formation from Self- and Cross-Reactions of RO2 Radicals in the Atmosphere. Angew Chem Int Edit 2018, 57, [1], 3820-3824.