Referee Comment

Measurement Report: Development of a portable peroxy radical measurement system and application for diagnosing local ozone formation and transport.

1. Definition and terminology of RO_2*

Lines 15 and 42: It may be more precise to define RO_2* as HO_2 + ΣRO_2, rather than HO_2 + RO_2. It would also be helpful to ensure consistent treatment of RO_2* as a sum of radical species throughout the manuscript.

2. Chain length (CL) calibration and radical interferences

The CL calibration described in Section 2.2 may introduce a systematic overestimation of CL.

Photolysis of H_2O produces both OH and H radicals, which may introduce OH into the reactor. If OH reaches the inlet, it can participate in amplification (starting with R4) but is not accounted for in the S2 signal.

A possible validation approach would be to add sufficient CO in the HO_2 source to convert OH into HO_2. Extra caution should be taken while adding CO to the source to avoid CL interference coming from the added CO triggering chain reaction in the background mode. It should also be acknowledged that PERCA systems amplify OH and RO radicals, which may become relevant during calibration conditions.

3. Representativeness of CL for RO_2 species

CL for RO_2 is generally lower than for HO_2, and this difference depends strongly on system-specific factors such as wall losses and reactor design. Therefore, adopting uncertainties from other instruments (Kartal et al., 2010) may not be appropriate without justification. The authors should consider calibration with at least one RO_2 species or clearly state this as a limitation.

4. Instrument description

As this is the first publication of the PWRCA system used, additional details such as flow rate, residence time, reactor pressure, detector flow conditions, etc should be included for reproducibility.

5. Valve configuration

There is inconsistency between the text and schematic regarding valve configuration.

- Line 156 refers to **one three-way solenoid valve**,
- Figure 1 shows **four two-way valves**
- Line 160 also mentions **four solenoid valves**.

This should be clarified.

6. HO_2 source in the schematic diagram

The schematic suggests N_2 is humidified prior to photolysis, but HO_2 formation requires O_2. The authors should clarify how O_2 or synthetic air is introduced and whether it is always present. The publication will benefit from including additional details about the source (e.g. Flow rates)

7. PERCA interferences

A discussion of PAN thermal decomposition and related interferences would improve the scientific completeness.

8. Interpretation of chain length comparisons

CL comparisons should consider reactor material, reactor design, working pressure, humidity, and wall losses. Instruments such as Horstjann et al. (2014) include pre-reactor chambers that increase wall losses. The comment about influence of detection technique on CL should be reconsidered.

9. Simplifications in ozone production analysis

The assumption $k\_eff \approx k(HO_2 + NO)$ and simplified $D(O_3)$ estimates should be discussed as sources of uncertainty.

10. Interpretation of VOC influence

The attribution to VOC reactivity in Line 326 requires supporting evidence or should be presented more cautiously.

11. Interpretation nighttime RO_2^*

If the nighttime RO_2* is attributed to NO_3 driven chemistry, more detailed scientific explanation is necessary since NO_3 measurement are not given.

Minor Comments

Line 76: wording correction.

Line 264: extra space.

Line 275: define abbreviations and use LOD.

Line 313: 'deceased' should be 'decreased'.

O_3 range appears reversed.

Language and Style

The manuscript would benefit from careful language editing to improve clarity and readability.

Recommendation

The manuscript presents valuable work but requires major revisions before publication.