Measurement report: Investigation of Optical Properties of Different Fuels Diesel Exhaust by an Atmospheric Simulation Chamber experiment by Danelli et al., 2025 report the results of a study conducted to investigate the optical properties of aerosol produced from various diesel fuels. The experiments conducted were well designed and the resulting findings fit the scope of ACP. Results are of interest and demonstrate the effectiveness of using optical properties in evaluating EC; however, there are multiple instances where I could not follow the author's line of thought. The introduction and methods are well-written, with appropriate references to related literature. The results/discussion/conclusion as currently written do not adequately describe the measurements performed or aspects of how these measurements compare with existing literature. I favor publication after major revisions. I encourage the authors to carefully address the comments listed below to produce a revised manuscript for resubmission.

Major Comments

C1. L306 – *"The study successfully quantified the EC/OC composition."* Results and explicit discussion of EC:OC is lacking. A figure/table summarizing the analysis of the EC:OC (or EC:TC) ratio for the carbonaceous aerosol produced would strengthen the measurements rather that just a description of the mass concentrations of TC. Are their more results from the Sunset EC/OC analyzer to assist with this that are not currently included?

C2. Section 3.1 – Accordingly, with C1, the inclusion of a more thorough description/quantification for EC:OC is warranted.

C3. L77 – It was mentioned that a goal of this study/grant was to evaluate and compare different methods of sampling/analyzing carbonaceous aerosols. The paragraph beginning with 208 explains this well and Figure 2 effectively shows the size-selective samplers performed consistently. I'd encourage a similar description in the conclusions to emphasize this finding

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Minor/Technical Comments

C4. Throughout the manuscript there are odd paragraph breaks that produce a confusing structure when reading. Specific examples are listed below.

C5. Currently, the title does not accurately summarize the contents. Maybe: *"Measurement Report: Investigation of the Optical Properties of Carbonaceous Aerosols Produced by Diesel Fuel Combustion in an Atmospheric Simulation Chamber"*.

C6. L29 – The use of Indeed would better indicate agreement with the previous statement instead of Actually

C7. L30 – Replace clime with climate

C8. L35 – The use of Additionally would be a better adverb to include additional information to the previous statement.

C9. L79 – The use of alternatively here is confusing.

C10. L83 – Replace physic-chemical with physicochemical

C11. L88-L94 – I would move the citations of the full description of the chamber to the end of the brief description included.

C12. L96-L97 – I would try listing *"…online and offline gaseous composition and aerosol concentration and properties inside the volume:"* differently so the use of and isn't repeated. Maybe *"…online and offline gaseous composition in addition to aerosol concentration and properties inside the volume:"*

C13. L110-L112 – Confusing use of alternatively. Please reword this sentence to describe the two combustion techniques and their associated fuel type.

C14. L127-L128 – Paragraph break here is odd

C15. L128 – Move this sentence to the end of the paragraph ending on L120 so the description of MISG is condensed.

C16. Sect. 2.2 – All sentences within this section should be one paragraph.

C17. L159 – Rather than within the results, the method to calculate MAC value would be better placed in the methods.

C18. Table 3 – Change Particles in the third column header to Particle

C19. L209 – "… showed comparable EC concentrations."

C20. Figure 2 – Some x-axis labels overlap.

C21. L237 – The description of data acquisition for the SMPS should be in methods not results.

C22. L246 – "*…increased (Vernocchi et al., 2022 and references therein)."*

C23. L254 – Similar to C21 references should replace reference

C24. Figure 3 – Specify the fits are for a monomodal log-normal size distribution.

C25. L324 – Explicitly list the factors of importance

C26. L237 – This sentence could be improved with some restructuring. Needed to read it a couple times to understand it.