Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2021-345

Anonymous Referee #1

Referee comment on "Characterization of the MISG soot generator with an atmospheric simulation chamber" by Virginia Vernocchi et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-345-RC1, 2021

This manuscript describes the properties of soot generated by a mini inverted soot generator in terms of optical and physical properties, such as particle size, EC/TC mass fraction and absorption coefficient. The soot particles were generated by combustion of propane and ethylene.

The paper is written in clear language and is technically sound. However, there have already been several papers published that characterize the MISG soot properties under various operating conditions (both with ethylene and propane combustion), and which are cited in this manuscript. The results of this paper are largely consistent with these prior papers (which is good), but the novelty of the results presented in this paper is not clear. No attempt was made to further develop the MISG or the atmospheric simulation chamber. Moreover, the link to atmospheric sciences is missing (for instance, an intercomparison of aerosol measurement instruments using MISG soot as test aerosol, validation of new measurement techniques or data analysis procedures etc.). In this sense, I believe that this manuscript does not fit so well into the scope of AMT.

I would suggest to streamline the discussion on the soot characterisation (some of the results can be shifted to Supplemental Information) and add new results related to atmospheric sciences (e.g. interactions of soot with gaseous pollutants and bio-aerosols as suggested in Section 4 "Conclusions"). This would enhance the novelty of the paper. Another option would be to submit the manuscript to another journal, which is focused more on laboratory instrumentation.

Technical comments:

Line 46: The authors state that "The Inverted-Flame Burner (Stipe et al. 2005) is often considered as an ideal soot source (Moallemi et al., 2019 and references therein), due to its capacity to generate almost pure-EC particles and for the stability of the flame and of its exhaust (Stipe et al. 2005). To such category belongs the Mini-Inverted Soot Generator (MISG) used in this work". I find this sentence somewhat misleading. The MISG is known to suffer from poor day-to-day reproducubility for particle sizes below 150 nm (Moallemi et al.). This might be the reason why in the current manuscript the authors only generated soot with mode diameters larger than 170 nm (Figure 4). Considering that most engines emit ultrafine soot particles (with GMDmob from about 20 nm for aircraft engines up to about 90 nm for diesel vehicles), it is not clear to me how the MISG can generate

realistic soot size distributions. Particles with mobility diameter <100 nm could potentially be size selected, e.g. with a DMA, but this was not investigated in this study. Moreover, it is not clear whether the number concentration of the size-selected particles (after being diluted in the chamber) would be sufficiently high for most type of experiments.