08/19/2022

RC2: 'Comment on amt-2022-185', Anonymous Referee #2, 20 Jul 2022

Author statement: The authors thank the referee for reviewing this manuscript. An itemized **response** for the rebuttal can be found below for each response given in blue. The tracked-changes version can be found below for each response in red and the already existing text is in *italic*.

General comments:

Authors have modified the commercial version of POPs by adding an external MCA card and changing the flow path, which have extended the use of POPs in laboratory studies and field measurements. For example, in tandem with DMA, and real-time processing of signals allows the high time resolution measurements of aerosols under high aerosol concentration conditions. The authors have detailed characteristics of concentration response, size response, time response of the modified one and compared them with the commercial one, and also showed an application example for phase state change detection. Overall, this is a good technique paper that facilitate the use of POPs, thus only have some minor comments.

Suggest authors give a picture of the modified version in Fig.1.

Response 1: We added a picture of the modified version of the POPS.

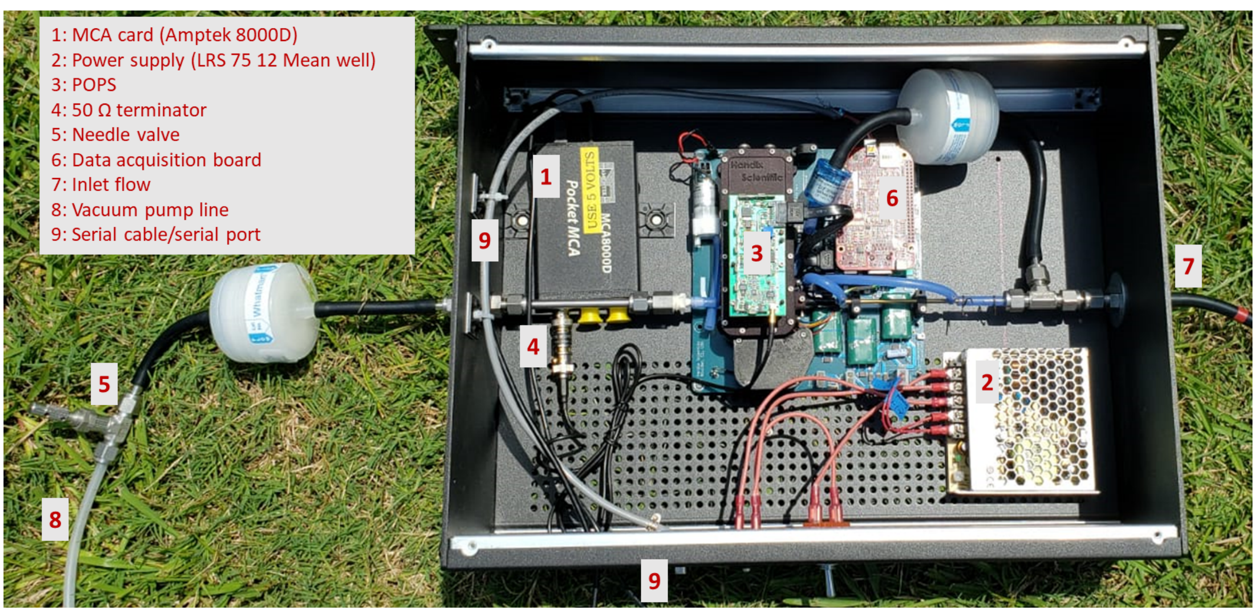

***Figure 2:** Photograph of the modified POPS.*

Suggest that Sect **2.2**, **2.3** and 2.4 should be merged correspondingly with Sect **3.1**, 3.2 **3.3**.

Response 2: Thank you for the suggestion. However, per standard convention, we prefer to keep Methods and Results as separate sections.

The commercial POPS is attractive for its relatively low cost, lightweight, low power consumption, thus very popular in characterizing vertical distributions of aerosols such as in unmanned aerial vehicle (UAV) measurements, does the light weight and power consumption of the modified version remain low? It might be better that authors add this information in discussion part, and discuss the potential usage of modified version in for example UAV measurements.

Response 3: Manuscript: *As shown in Fig. 2, the unit was placed inside a 19" rackmount enclosure. No effort was made to minimize the height and weight of the enclosure or the power consumption of the unit. The additional power requirement beyond the factory design depends on the vacuum pump. We used an ~400W model, but smaller pumps will be sufficient. The rackmount form factor is suitable for laboratory and field applications, including measurements from mobile platforms such as vehicles or airplanes where size and weight are less critical than in balloon-borne deployments. The cost to modify the factory supplied unit was ~US $6,500, including the MCA card, enclosure, vacuum pump, needle valve, power supply, Swagelok fittings, electrical connections, and particle filters*.

Specific comments:

L15 "The 90/10 rise and fall….." this sentence is too technical, it is hard to follow for readers without clear clarifications, I understand clearly what authors want to deliver only when I read L120 to 124.

Response L15: The text was revised as follows.

Manuscript: *The time required to change the concentration between 90-10 % and vice versa for a step change in concentration were measured to be 0.17 s and 0.41 s at a flow rate of 5* cm^3 s^{-1}

L182 The given typical refractive index of organics should have a larger range (Moise et al., 2015)

Response 182: Thank you for bringing this information to our attention. At 405 nm wavelength, the real part of the refractive index of secondary organic aerosols range is between 1.4-1.7 (e.g. naphthalene is 1.58-1.66 at 405 nm).

Manuscript: *Typically, organics have a refractive index of 1.4-1.7 (Flores et al., 2014; He et al., 2018; Nakayama et al., 2012; Moise et at., 2015).*

Moise, T., Flores, J. M., and Rudich, Y.: Optical Properties of Secondary Organic Aerosols and Their Changes by Chemical Processes, Chemical Reviews, 115, 4400-4439, 10.1021/cr5005259, 2015.