Interactive comment on " Properties and emission factors of CCN from biomass cookstoves – observations of a strong dependency on potassium content in the fuel" by Thomas Bjerring Kristensen et al.

The manuscript discusses the properties of cloud condensation nuclei (CCN) emitted from biomass burning of solid fuels (seven different fuels) in different cookstoves (four different stoves). This study covers particle number size distribution, mixing state, particle density, chemical composition, CCN activation and particle hygroscopicity properties at the same time. The measurement results offer valuable insights for field measurements and global models regarding biomass burning particles.

Overall, the paper is well written and relevant to ACP. I recommend publication after the following comments are satisfactorily addressed:

Major comments:

1. There were a bunch of measurements clearly explained in the manuscript. But I think it would be nice to have an overview plot or measurement setup sketch. It should include biomass burning setup, chambers, sampling line, and instruments. It will help readers to understand your measurements better. A simple example can be found in Smith *et al.*, (2019).
2. Did you consider the particle wall losses and particle loss inside the inlets (diffusion, deposition, etc.)? For example, the emitted aerosols were injected into a chamber for 10-40 minutes. What is the wall loss affection of the size distribution?

Minor comments:

Line 205: I could not get why "aerosol particles present in the flue gas and initially injected into the aerosol storage chamber as freshly formed or primary, while particulate matter formed in the flow reactor will be considered secondary aerosol.". Could you please give more explanation about your definition of freshly formed and secondary aerosol?

Lines 241-242: Why the soot mode particle was unaffected in the storage for up to 60 minutes? Could you find previous studies that also support this? At least from your measurement, the aged

200 nm particles always had different (most probably higher) kappa values than primary particles.

Lines 269-270: It is good to adjust the PNSD for dilution rates and normalized to the corresponding consumption of dry fuel mass. I would suggest including the error bars in Fig. 1. The error bars could be 25^{th} and 75^{th} percentiles (with median lines) or one stand deviation (with mean lines). This will help us to understand the fluctuation of PNSD during the experiments.

Lines 305-308: Did you see relative higher slopes of the CCN activation spectra for the FDS, sw and NDS, sw-ch? Clear ultrafine and soot modes were observed for these two types of biomass burning particles. There is an overlap of ultrafine and soot modes in the size range around 100 nm. If we assume the ultrafine and soot mode particles have different chemical compositions, a relatively higher slope would be expected.

References:

Smith, D. M. *et al.* (2019) 'Construction and Characterization of an Indoor Smog Chamber for Measuring the Optical and Physicochemical Properties of Aging Biomass Burning Aerosols', *Aerosol and Air Quality Research*, 19(3), pp. 467–483. doi: 10.4209/aaqr.2018.06.0243.