

Comments on “A broad supersaturation scanning (BS2) approach for rapid measurement of aerosol particle hygroscopicity and cloud condensation nuclei activity”

General comments

The manuscript “A broad supersaturation scanning (BS2) approach for rapid measurement of aerosol particle hygroscopicity and cloud condensation nuclei activity” described a novel approach based on a CCN counter to rapidly measure the cloud condensation nucleation (CCN) activity. In this approach, the supersaturation setting(temperature) can be kept constant and the continuous SS profile in the activation unit was used. Therefore, it does not need scan over different SS, which can improve the time resolution and potentially enhance the measurement stability. The application of this approach was shown using a nano-CCN measurement. Such an approach could be applied the commonly used CCN counter and may be useful especially for CCN measurement requiring fast time resolution such as airborne measurement. This manuscript is well written and clear and the idea is novel and very interesting. I recommend it to be published on AMT after addressing some specific comments.

Specific comments

1. Pg 9715, line 22, “BS2-CCNC may be built with simple modifications of existing DMTCCNC...”,it would be useful if the authors can briefly elaborate what kind of modifications should be done in order to achieve the approach.
2. Pg 9717, line 4, Eq. (1) , S_{tube} is a function of r . It is more informative to express in “ $S_{\text{tube}}(r)$ ”.
3. Pg 9718, line 3, for “Application” section, a brief description of main details of the setup used in Sect. 3.3 is desirable.
4. Pg 9718, line 15, I suggest that the authors explicitly remind the reader that the results are from model results.
Also here, if I understand correctly, in order to derive κ , the size-resolved/selected measurement is needed. It would be helpful to mention this explicitly.
5. Pg 9719, line 26 (and Fig. 5a), specifying the exact probability density function used here is appreciated.

Technical comments

1. Pg. 9715, line 19, “infinitely small”, may be not the right wording. For the time resolution of DMT-CCNC, it is 1s.
2. Fig. 6, panel (b), the number of x-axis should be 0.3-0.9.