

Interactive comment on “A global view on atmospheric concentrations of sub-3 nm particles measured with the Particle Size Magnifier” by J. Kontkanen et al.

Anonymous Referee #2

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This paper compares measurements of sub-3nm particles from nine different locations. Overall the paper is well written the topic is relevant to the ACP audience. The paper discusses the current available data collected with the Particle Size Magnifier (PSM). Some sites have long-term measurements, whereas others are short field campaigns (1-2 months). Several of these studies are currently available in the literature. The value of this paper is comparing data from the different sites (albeit with the constraints discussed below).

I do have several major concerns to be address prior to publication.

1. As stated, the PSM measurements were collected by different research groups using different instruments. To my knowledge, there has not been a comparison study

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between the PSM measurements within this paper (or the inlet sampling systems). As stated within the paper, the differences in the lowest size cut-off can affect the comparability of the data.

One of the main conclusions of the paper is that sub 3nm particles are highest at sites with strong anthropogenic influence (Nanjing, Shanghai, and San Pietro Campofiume). Yet, measurements at the North American site on Long Island, which does have strong anthropogenic influence, demonstrated sub 3nm concentration that was significantly less than at the remote Hyytiälä station. Is it possible that these differences are within the uncertainty of comparing the different measurements, and thus have little physical value?

Statements within the paper need to reflect the uncertainty of comparison. For example, I do expect the comparison between the measurements made at Hyytiälä and Helsinki to be valid, where the data inversion and inlet system was identical, including a core sampling probe and automatic background measurements. Yet, what is the specific impact in the comparison at other sites, after considering the differences between the data inversion techniques and inlet system? The ratios between ion spectrometers and PSM measurements greater than 1 further emphasize concerns pertaining to the measurement uncertainty.

A more quantitative description of uncertainty pertaining to the instrument intercomparison is required to provide a global view of the sub-3nm particles. Instead, this paper represents a review of current measurements available, and provides strong justification for intercomparisons of PSMs and development of a global standardized measurements and calibration technique.

Overall, there is value in comparing trends observed between the sites (rather than focusing on absolute values of concentration). I would encourage the authors to rework the paper to reflect.

2. For section 3.4.2 – Correlation between sub-3nm particle concentration and envi-

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ronmental variables. Throughout this section, the correlation coefficients (R) are listed, and the confidence interval ranges are found in Table 5. Please add a description of exactly how the confidence interval range was calculated.

Without reasonable confidence in the correlation, there is no reason for a meaningful discussion pertaining to potential physical explanation. For example, the correlation between sub 3nm particles and condensation sink at Puy de Dome had a Pearson's correlation of 0.26 ($R^2 = .07$) with a listed confidence interval of (0.13 – 0.38) was explained with transport. This correlation is meaningless and overemphasized. This section should be greatly reduced and only statistically significant correlations should be acknowledged (i.e. correlations with confidence at the 95% level). In other words, significance level is chosen before data analysis, and typically set to 5%.

[Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2016-847, 2016.](#)

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