



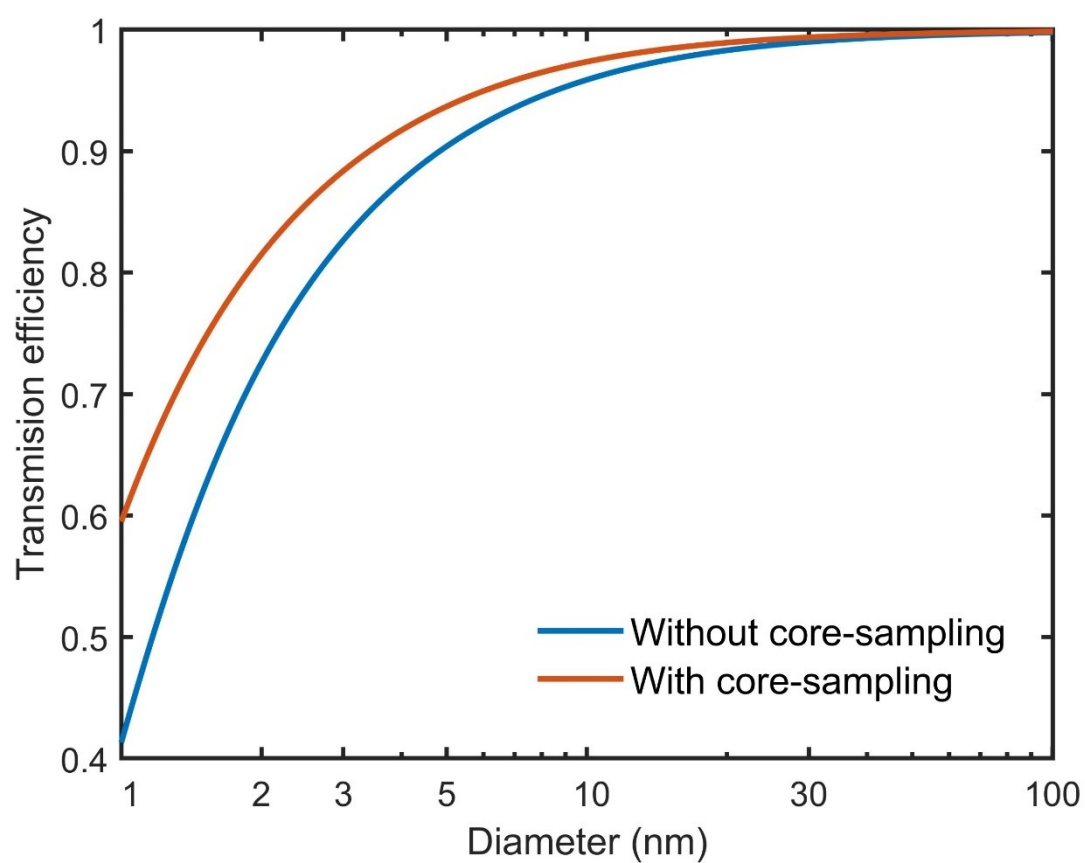
Supplement of

Measurement report: Number size distribution of sub-40 nm particles in the Amazon rainforest

Jianqiang Zhu et al.

Correspondence to: Hang Su (suhang@mail.iap.ac.cn)

The copyright of individual parts of the supplement might differ from the article licence.



15

Figure S1. The transmission efficiency for inlet systems with and without core-sampling. The size-dependent transmission efficiency was calculated with the way introduced by Von Der Weiden et al. (2009).

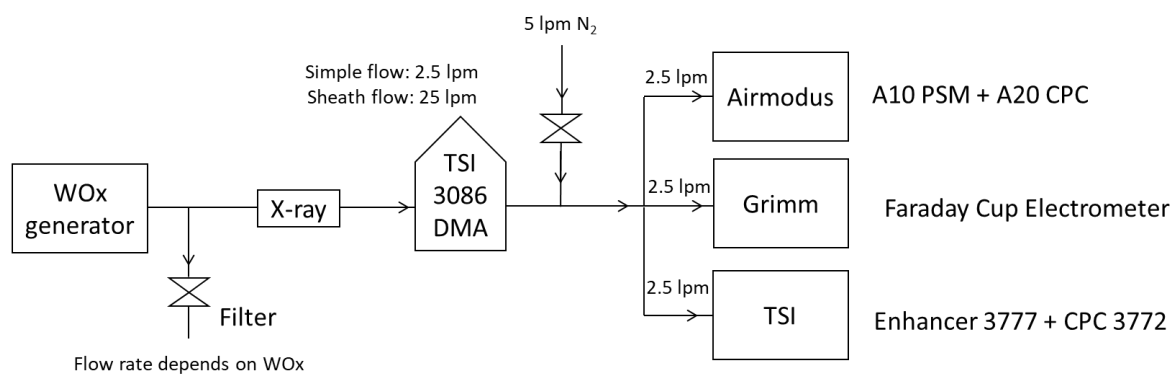


Figure S2. Sketch of the experimental setup for the intercomparison experiments between the Airmodus (A10 PSM + A20 CPC) and the TSI instruments (3777 Enhancer + 3772 CPC).

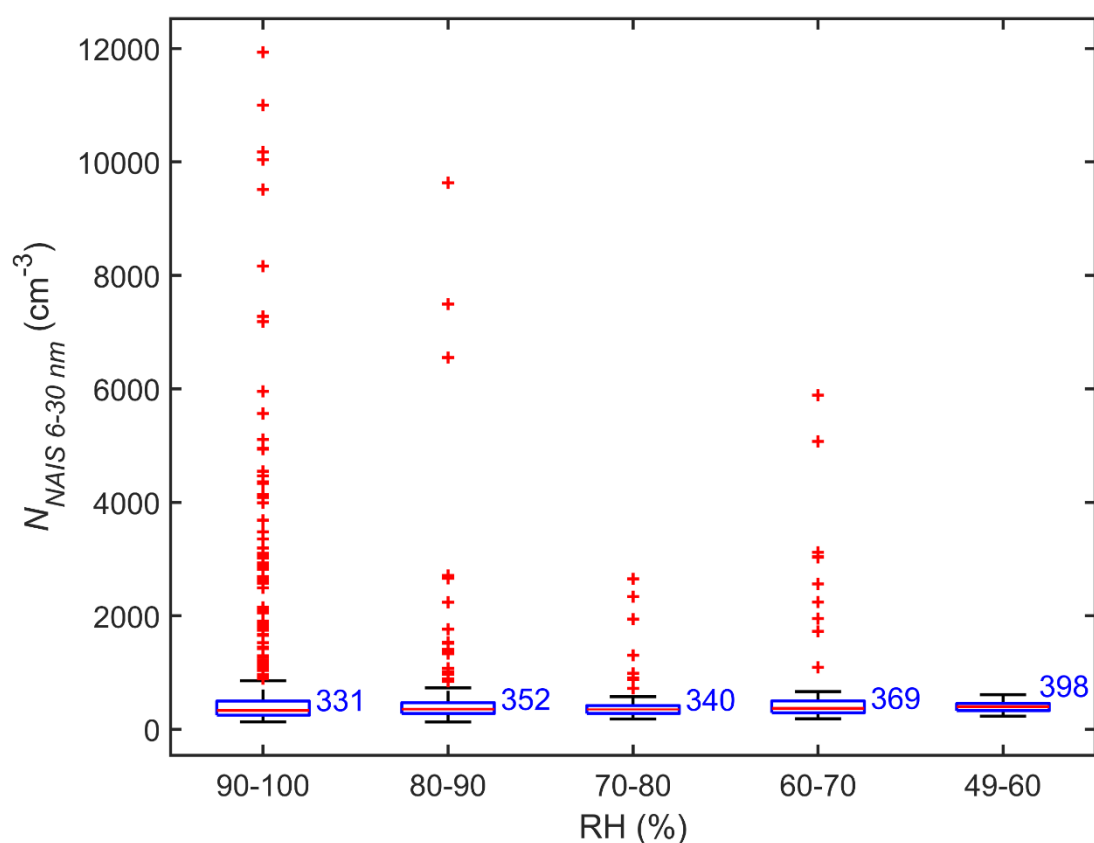


Figure S3. Ambient relative humidity at different range bins versus particle number concentration (size range 6-30 nm) measured by NAIS. The boxes represent the interquartile range (IQR), with the 25th percentile (Q1) at the bottom and the 75th percentile (Q3) at the top. The whiskers extend to the furthest points within $Q1 - 1.5 * IQR$ (lower whisker) and $Q3 + 1.5 * IQR$ (upper whisker). The red points beyond the whiskers are considered outliers and are marked individually. The red lines inside each box represent the median values given next to the boxes (cm⁻³).

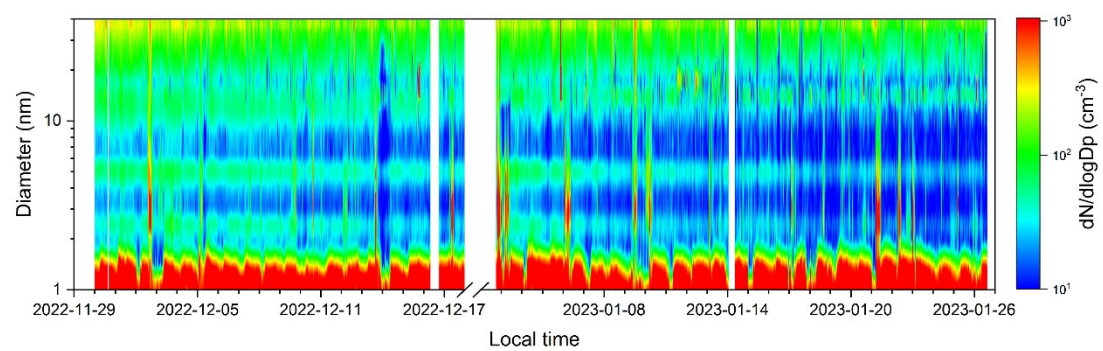


Figure S4. The negative ion number size distribution throughout the measurement period.

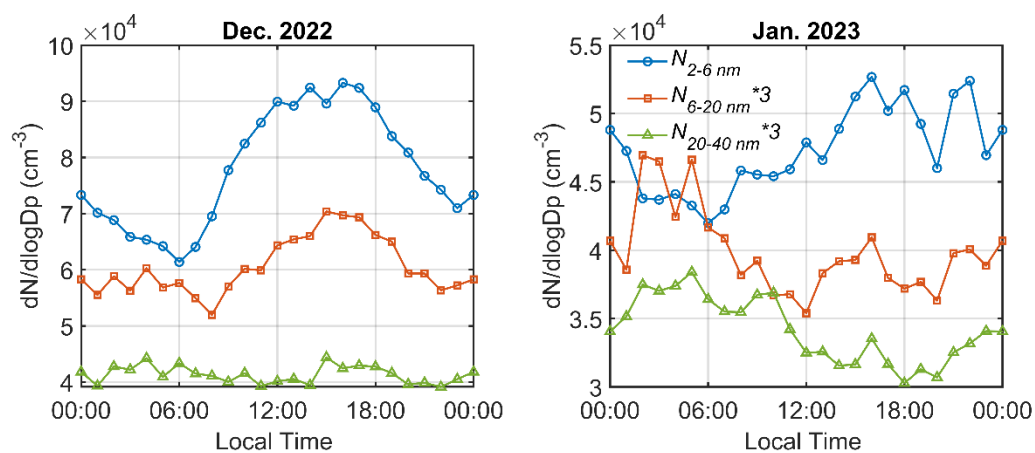


Figure S5. Diurnal variation of particle number concentrations in the 2-6 nm (blue), 6-20 nm (orange), and 20-40 nm (green) size ranges measured by NAIS during December 2022 (left panel) and January 2023 (right panel). Note: particle number concentrations for the 6-20 nm and 20-40 nm ranges have been multiplied by a factor of 3 for better visualization.

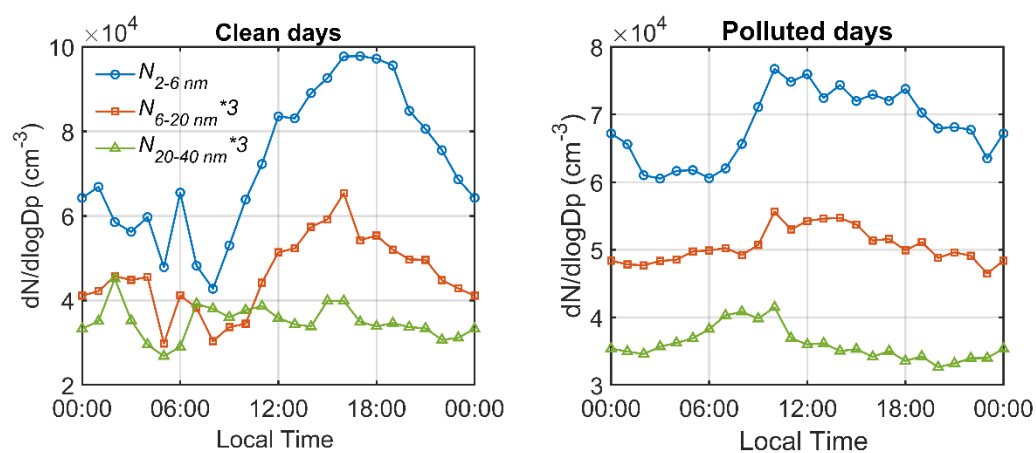


Figure S6. Diurnal variation of particle number concentrations in the 2-6 nm (blue), 6-20 nm (orange), and 20-40 nm (green) size ranges measured by NAIS during clean days (left panel) and polluted days (right panel). Note: particle number concentrations for the 6-20 nm and 20-40 nm ranges have been multiplied by a factor of 3 for better visualization.

Table S1. The summary of the sub-3 nm particle number concentration measurements using PSM across different global environments

Location	Time period	Size range (nm)	Concentration* (cm ⁻³)	Environmental type	Literature
Helsinki, Finland	Jan 2015 – Dec 2015	1.1 – 3.0	6.0E+03	Urban, city	(Kontkanen et al., 2017)
Nanjing, China	Dec 2014 – Jan 2015	1.1 – 3.0	1.7E+04	Urban, city	(Qi et al., 2015)
Shanghai, China	Nov 2013 – Jan 2014	1.3 – 3.0	8.5E+03	Urban, city	(Xiao et al., 2015)
San Pietro Capo Fiume, Italy	Jun 2012 – Jul 2012	1.5 – 3.0	8.5E+03	Urban, city	(Kontkanen et al., 2016)
Centreville, US	Jun 2013 – Jul 2013	1.1 – 2.1	5.9E+02	Urban, farm/forest	(Yu et al., 2014)
Kent, US	Dec 2011 – Jan 2012	1.3 – 3.0	4.7E+02	Urban, town	
Brookhaven, US	Jul 2011 – Aug 2011	1.3 – 3.0	8.0E+02	Rural, coast	
Puy de Dôme, France	Jan 2012 – Feb 2012	1.3 – 2.5	5.0E+02	Rural, mountain	(Rose et al., 2015)
Hyytiälä, Finland	Aug 2010; Mar 2011 – Apr 2011; Aug 2011 – Sep 2011; Apr 2012 – May 2012; May 2013 – Jul 2013; May 2015 – Apr 2016	(1.1/1.3) – 3.0	1.6E+03	Rural, forest	(Kontkanen et al., 2017)
	April 2014 – April 2020	1.1 – 2.5	4.1E+02	Rural, forest	
Amazonian, Brazil	Dec 2022	1.5 – 3.5	3.7E+02	Rural, forest	This study
Amazonian, Brazil	Jan 2023	1.5 – 3.5	5.7E+02	Rural, forest	This study

* Median values

References

- Kontkanen, J., Järvinen, E., Manninen, H. E., Lehtipalo, K., Kangasluoma, J., Decesari, S., Gobbi, G. P., Laaksonen, A., Petäjä, T., and Kulmala, M.: High concentrations of sub-3nm clusters and frequent new particle formation observed in the Po Valley, Italy, during the PEGASOS 2012 campaign, *Atmos. Chem. Phys.*, 16, 1919-1935, 10.5194/acp-16-1919-2016, 2016.
- Kontkanen, J., Lehtipalo, K., Ahonen, L., Kangasluoma, J., Manninen, H. E., Hakala, J., Rose, C., Sellegri, K., Xiao, S., Wang, L., Qi, X., Nie, W., Ding, A., Yu, H., Lee, S., Kerminen, V. M., Petäjä, T., and Kulmala, M.: Measurements of sub-3 nm particles using a particle size magnifier in different environments: from clean mountain top to polluted megacities, *Atmos. Chem. Phys.*, 17, 2163-2187, 10.5194/acp-17-2163-2017, 2017.
- Qi, X. M., Ding, A. J., Nie, W., Petäjä, T., Kerminen, V. M., Herrmann, E., Xie, Y. N., Zheng, L. F., Manninen, H., Aalto, P., Sun, J. N., Xu, Z. N., Chi, X. G., Huang, X., Boy, M., Virkkula, A., Yang, X. Q., Fu, C. B., and Kulmala, M.: Aerosol size distribution and new particle formation in the western Yangtze River Delta of China: 2 years of measurements at the SORPES station, *Atmos. Chem. Phys.*, 15, 12445-12464, 10.5194/acp-15-12445-2015, 2015.
- Rose, C., Sellegri, K., Asmi, E., Hervo, M., Freney, E., Colomb, A., Junninen, H., Duplissy, J., Sipilä, M., Kontkanen, J., Lehtipalo, K., and Kulmala, M.: Major contribution of neutral clusters to new particle formation at the interface between the boundary layer and the free troposphere, *Atmos. Chem. Phys.*, 15, 3413-3428, 10.5194/acp-15-3413-2015, 2015.
- Sulo, J., Sarnela, N., Kontkanen, J., Ahonen, L., Paasonen, P., Laurila, T., Jokinen, T., Kangasluoma, J., Junninen, H., Sipilä, M., Petäjä, T., Kulmala, M., and Lehtipalo, K.: Long-term measurement of sub-3 nm particles and their precursor gases in the boreal forest, *Atmos. Chem. Phys.*, 21, 695-715, 10.5194/acp-21-695-2021, 2021.
- von der Weiden, S. L., Drewnick, F., and Borrmann, S.: Particle Loss Calculator – a new software tool for the assessment of the performance of aerosol inlet systems, *Atmos. Meas. Tech.*, 2, 479-494, 10.5194/amt-2-479-2009, 2009.
- Xiao, S., Wang, M. Y., Yao, L., Kulmala, M., Zhou, B., Yang, X., Chen, J. M., Wang, D. F., Fu, Q. Y., Worsnop, D. R., and Wang, L.: Strong atmospheric new particle formation in winter in urban Shanghai, China, *Atmos. Chem. Phys.*, 15, 1769-1781, 10.5194/acp-15-1769-2015, 2015.
- Yu, H., Gannet Hallar, A., You, Y., Sedlacek, A., Springston, S., Kanawade, V. P., Lee, Y.-N., Wang, J., Kuang, C., McGraw, R. L., McCubbin, I., Mikkila, J., and Lee, S.-H.: Sub-3 nm particles observed at the coastal and continental sites in the United States, *Journal of Geophysical Research: Atmospheres*, 119, 860-879, <https://doi.org/10.1002/2013JD020841>, 2014.