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## The effect of COVID-19 restrictions of human activities on atmospheric chemical cocktail, new particle formation and air quality in in Eastern and Northern China

**Markku Kulmala**<sup>1,2,3</sup>, Chao Yan<sup>1,2</sup>, Lubna Dada<sup>1</sup>, Federico Bianchi<sup>1</sup>, Tom Kokkonen<sup>3,4</sup>, Jingkun Jiang<sup>5</sup>, and the Aerosol and Haze Laboratory Team\*

<sup>1</sup>University of Helsinki, Institute for Atmospheric and Earth System Research (INAR), Helsinki, Finland

(markku.kulmala@helsinki.fi)

<sup>2</sup>Aerosol and Haze Laboratory, Beijing Advanced Innovation Center for Soft Matter Science and Engineering, Beijing University of Chemical Technology, Beijing, China

<sup>3</sup>Joint International research Laboratory of Atmospheric and Earth System Research (JirLATEST), School of Atmospheric Sciences, Nanjing University, Nanjing, China

<sup>4</sup>Moscow State University, Russia

<sup>5</sup>State Key Joint Laboratory of Environment Simulation and Pollution Control, State Environmental Protection Key Laboratory of Sources and Control of Air Pollution Complex, School of Environment, Tsinghua University, Beijing, China

\*A full list of authors appears at the end of the abstract

The pandemic of SARS-CoV-2 has led to a substantial reduction in anthropogenic activities globally. This is particularly true for traffic, which was reduced by 40-80 % in Eastern and Northern China. The imposed lockdown provides a unique opportunity to investigate the direct and indirect effects of anthropogenic activities (particularly traffic) on atmospheric new particle formation, atmospheric chemical cocktail and haze formation in polluted urban environments in the case when the emissions were substantially lower. Here, we utilize comprehensive, long term ground-based and satellite observations to investigate changes in the atmospheric composition and connect them with a continental scale gas-to-particle conversion producing both fresh particles and new aerosol mass. We show that despite the reductions in emissions, both new particle formation (NPF) and haze events still occur. The observational evidence confirms that the main NPF mechanism remains similar because of non-linear response of NPF and growth to local and regional vehicle emission reductions. Furthermore we are able follow the growth from NPF to haze and show, in the case study, that regional NPF makes a dominating contribution to the haze.

**Aerosol and Haze Laboratory Team:** Chao Yan, Yicheng Shen, Ximeng Qi, Lubna Dada, Dominik Stolzenburg, Simo Hakala, Anu-Maija Sundström, Antti Lipponen, Tom V. Kokkonen, Yishuo Guo, Chang Li, Zhuohui Lin, Xiaolong Fan, Feixue Zheng, Chenjuan Deng, Yiran Li, Yifan Wen, Shaojun Zhang, Liangduo Chen, Wei Nie, Jouni Pulliainen, Lin Wang, Yiqun Lu, Gan Yang, Yiliang Liu, Yele Sun, Gen Zhang, Xiaohui Qiao, Ye Wu, Jenni Kontkanen, Juha Kangasluoma, Joni Kujansuu, Runlong Cai, Mona Kurppa, Tommy Chan, Antti Arola, Johanna Tamminen, Pauli Paasonen, Yongchun Liu, Federico Bianchi, Kaspar Dällenbach, Douglas R. Worsnop, Veli-Matti Kerminen, Tuukka Petäjä,

Aijun Ding, Jingkun Jiang, Markku Kulmala