

Observations of the summertime atmospheric pollutants vertical distributions and the corresponding ozone production in Shanghai, China

Chengzhi Xing^{1#}, Cheng Liu^{1,2,3,9##}, Shanshan Wang^{4*}, Ka Lok Chan^{5*}, Yang Gao⁶, Xin Huang⁷, Wenjing Su¹, ChengXin Zhang¹, Yunsheng Dong³, Guangqiang Fan³, Tianshu Zhang³, Zhenyi Chen³, Qihou Hu³, Hang Su^{8,10}, Zhouqing Xie^{1,2,3,9}, Jianguo Liu^{2,3}

¹School of Earth and Space Sciences, University of Science and Technology of China, Hefei, 230026, China

²Center for Excellence in Regional Atmospheric Environment, Institute of Urban Environment, Chinese Academy of Sciences, Xiamen, 361021, China

³Key Lab of Environmental Optics & Technology, Anhui Institute of Optics and Fine Mechanics, Chinese Academy of Sciences, Hefei, 230031, China

⁴Shanghai Key Laboratory of Atmospheric Particle Pollution and Prevention (LAP³), Department of Environmental Science and Engineering, Fudan University, Shanghai, 200433, China

⁵Meteorological Institute, Ludwig-Maximilians Universität München, Munich, Germany

⁶College of Environmental Science and Engineering, Ocean University of China, Qingdao, 266100, China

⁷School of Atmospheric Sciences, Nanjing University, Nanjing, 210093, China

⁸Institute for Environmental and Climate Research, Jinan University, Guangzhou 511443, China

⁹Anhui Province Key Laboratory of Polar Environment and Global Change, USTC, Hefei, 230026, China

¹⁰Biogeochemistry Department, Max Planck Institute for Chemistry, Mainz, 55020, Germany

[#]This two authors contributed equally

*Correspondence to: Shanshan Wang (shanshanwang@fudan.edu.cn), Ka Lok Chan (lok.chan@lmu.de), Cheng Liu (chliu81@ustc.edu.cn)

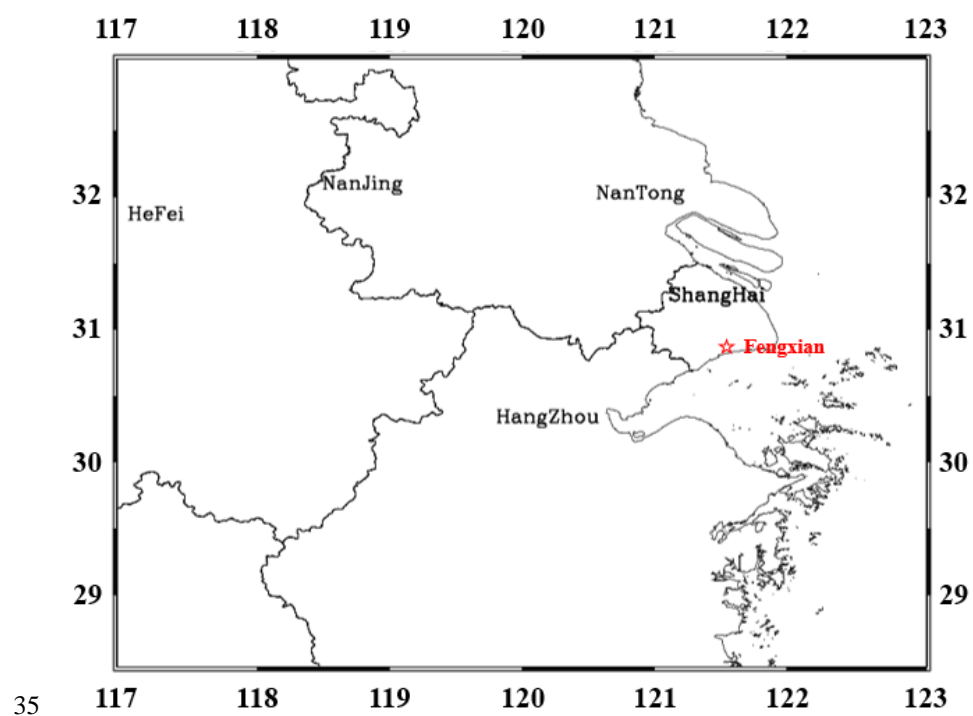


Figure S1: Location of the FengXian measurement site (red star) and neighbourhood.

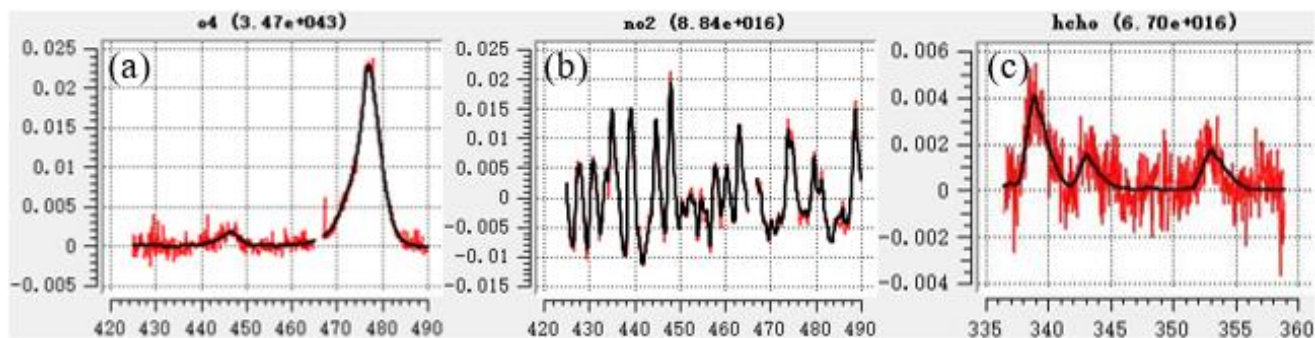


Figure S2: DOAS fit examples of (a) O₄ and (b) NO₂ at 08:24 LT on 17 May, as well as (c) HCHO at 08:24 LT on 18 May 2016. The fitted absorption structures (black curves) and the derived absorption structures from the measured spectra (red curves) are shown, respectively.

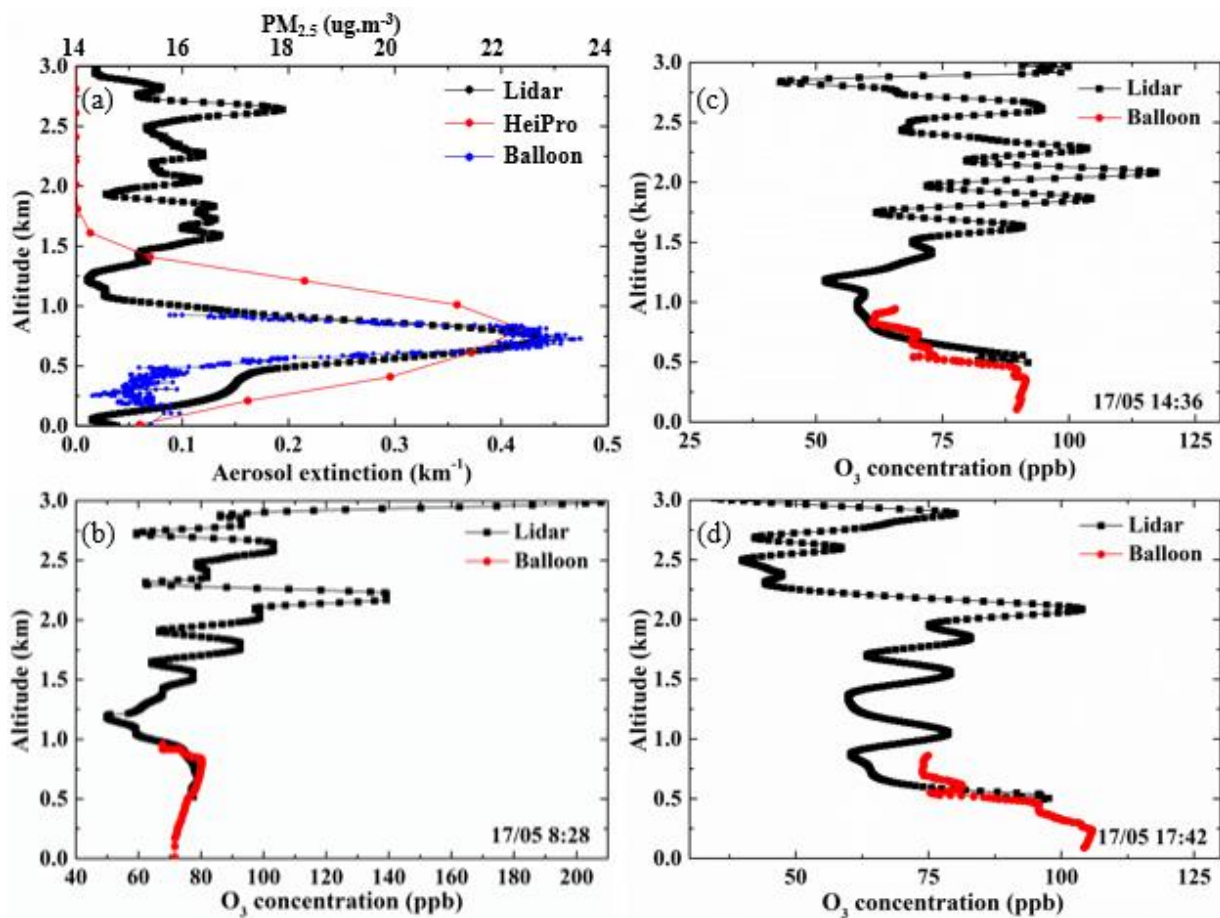
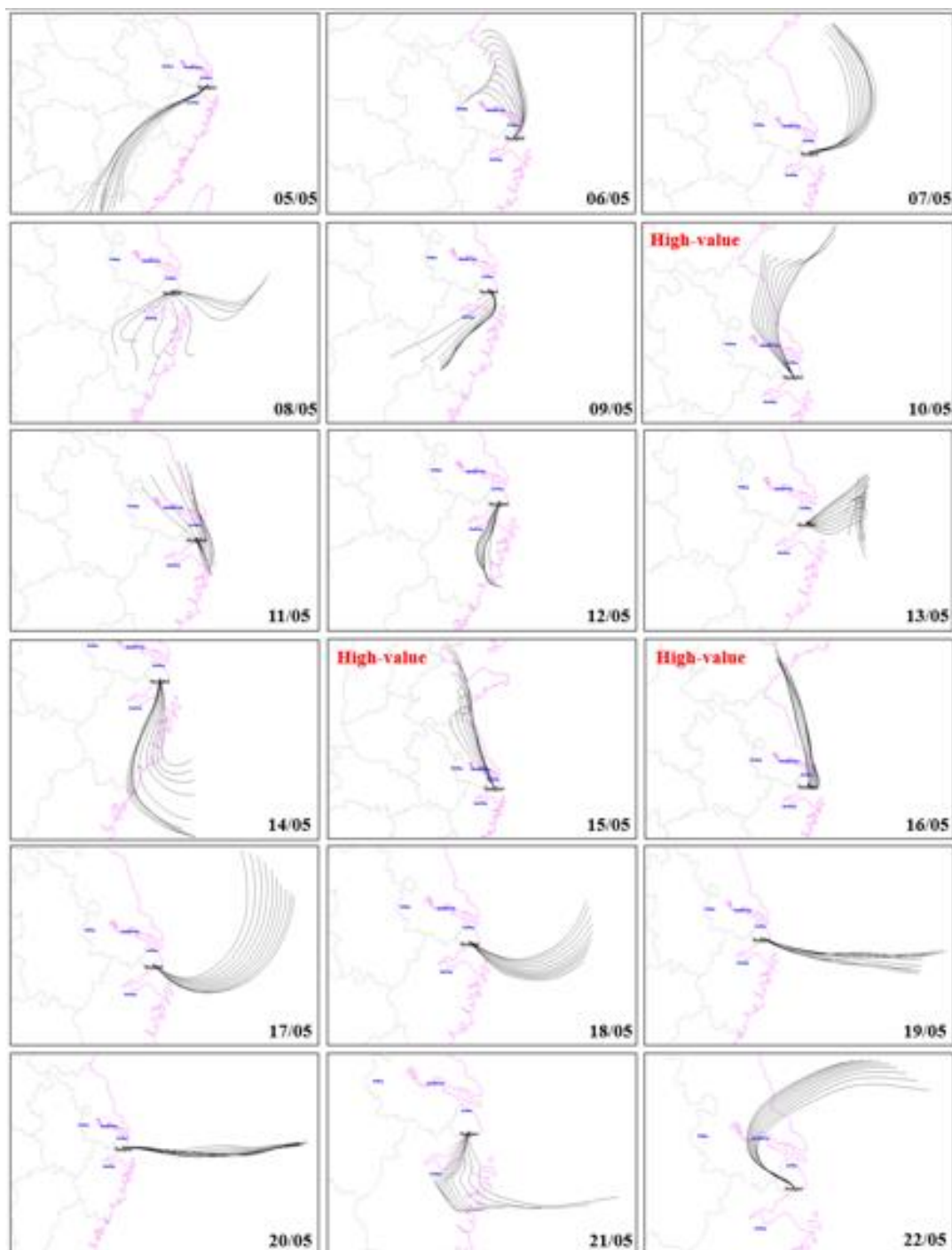


Figure S3: Inter-comparison of vertical distributions retrieved from MAX-DOAS measurement, lidar and balloon-borne observation on 17 May, 2016. (a) denotes balloon-based $\text{PM}_{2.5}$ vertical profile measured during 08:10-08:40, lidar measured aerosol extinction profile at 08:25 and HeiPro retrieved aerosol extinction profile during 08:15-08:30. (b) to (d) shows balloon-based and lidar measured O_3 profiles at three different periods, respectively.



50 **Figure S4:** 24-h air mass back trajectories at 500 m computed from 8:00 to 17:00 LST (Local Standard Time) in Shanghai campaign site (30.8 °N, 121.5 °E).

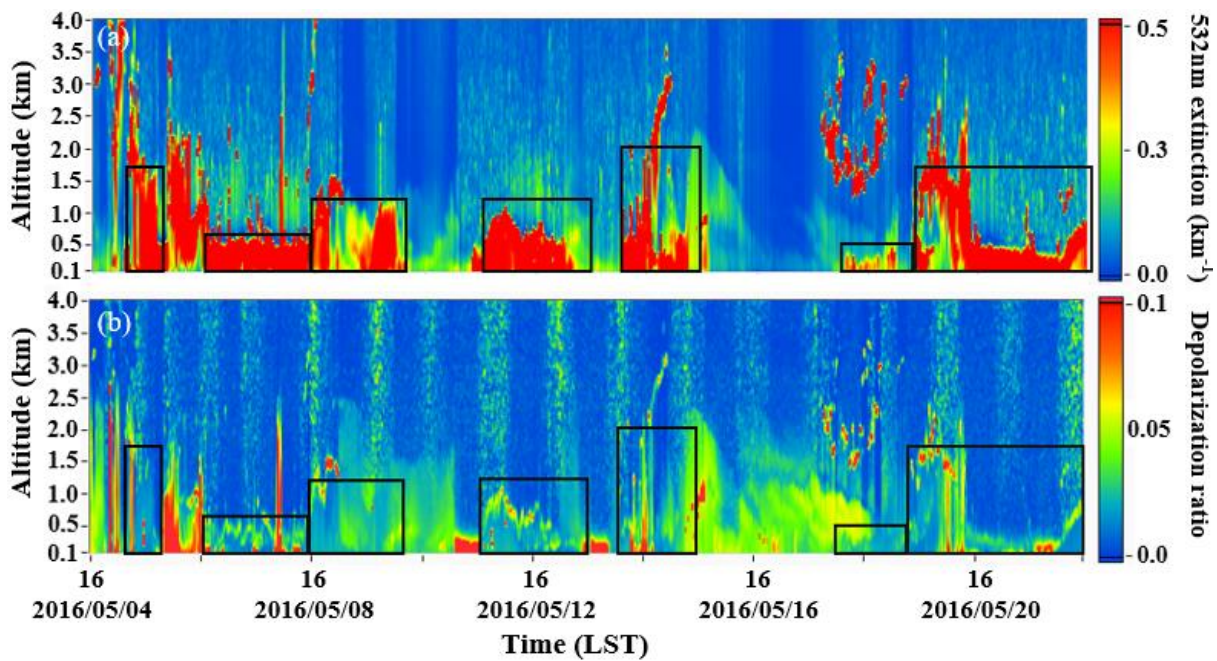


Figure S5: Time series of (a) aerosol extinction coefficient and (b) depolarization ratios.