

Comment on amt-2022-231

Anonymous Referee #1

Referee comment on "In situ particle sampling relationships to surface and turbulent fluxes using large eddy simulations with Lagrangian particles" by Hyungwon John Park et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-231-RC2>, 2022

This study shows deep research on the surface flux estimates from different numerical approaches and compares the observation, eddy covariance, simulated instrumentation and the theoretical flux-profile method results have been provided, turbulent transport impact on aerosol particles found has estimated. This article could be accepted after minor revisions.

L14: MABL(marine atmospheric boundary layer) first-time appearance should add the full name.

L31: Coarse mode aerosols have many influences focusing on lighting and also growth larger contribute to air pollution, related reference also includes the following

articles:

Pan, Z., Mao, F., Rosenfeld, D. et al. Coarse sea spray inhibits lightning. *Nat*

Commun 13, 4289 (2022). <https://doi.org/10.1038/s41467-022-31714-5>.

Lee, S.â□□H., Gordon, H., Yu, H., Lehtipalo, K., Haley, R., Li, Y., & Zhang, R. (2019).

New particle formation in the atmosphere: From molecular clusters to global

climate. *Journal of Geophysical Research: Atmospheres*, 124,

7098–7146. <https://doi.org/10.1029/2018JD029356>

Wu, Hao & Li, Zhanqing & Jiang, Mengjiao & Liang, Chun-Sheng & Zhang,

Dongmei & Wu, Tong & Wang, Yuying & Cribb, Maureen. (2021). Contributions of

traffic emissions and new particle formation to the ultrafine particle size distribution

in the megacity of Beijing. *Atmospheric Environment*. 262. 118652.

[10.1016/j.atmosenv.2021.118652](https://doi.org/10.1016/j.atmosenv.2021.118652).

L53ï¼□ Atmospheric stability is a key parameter impact on particle transport, using

Monin–Obukhov stability theory (MOST) has many progress the related reference:

Irwin JS and Binkowski FS. Estimation of the Monin-Obukhov scaling length using on-site instrumentation. Atmos Environ 1981; 156: 1091–4.

Srivastava P and Sharan M. An analytical formulation of the Monin–Obukhov stability parameter in the atmospheric surface layer under unstable conditions.

Bound-Layer Meteor 2017; 165: 371–84.

L58: “other field-based studies” many launched in the atmospheric boundary layer found that interaction between aerosol exists in the atmospheric boundary layer, could relate to $\frac{1}{4}$ □

Li Z, Guo J and Ding A et al. Aerosol and boundary-layer interactions and impact on air quality. Natl Sci Rev 2017; 4: 810–33.

Lauros J, Sogachev A and Smolander S et al. Particle concentration and flux dynamics in the atmospheric boundary layer as the indicator of formation mechanism. Atmos Chem Phys 2011; 11: 5591–601.

L101 $\frac{1}{4}$ □ direct numerical simulation(DNS) and other models also can simulate flux

measurements has a high correlation to the aerosol turbulence interaction(ATI).

Chen S, Yau MK and Bartello P et al. Bridging the condensation–collision size gap: a direct numerical simulation of continuous droplet growth in turbulent clouds. Atmos Chem Phys 2018; 18: 7251–62.

Eaton JK and Fessler JR. Preferential concentration of particles by turbulence. Int J Multiph Flow 1994; 20: 169–209.

Li D, Wei A and Luo K et al. Direct numerical simulation of a particle-laden flow in a flat plate boundary layer. Int J Multiph Flow 2016; 79: 124–43.

Wei W, Zhang H and Wu B et al. Intermittent turbulence contributes to vertical dispersion of PM_{2.5} in the North China Plain: cases from Tianjin. Atmos Chem Phys 2018; 18: 12953–67.

L153: “while $K(x_p)$ is the average subgrid momentum diffusivity obtained from the LES model, interpolated to the particle location”, this parameter should provide more methods or pathways to explain how to get it.

L214: the concentration vertical distribution of aerosol has rare research, but we can find some evidence based on some UAV measurements, such as:

Mehta, Manu & Khushboo, Richa & Raj, Rahesh & Singh, Narendra. (2020).

Spaceborne observations of aerosol vertical distribution over Indian mainland

(2009-2018). Atmospheric Environment. 117902. 10.1016/j.atmosenv.2020.117902.

Kemppinen, Osku & Laning, Jesse & Mersmann, Ryan & Videen, Gordon & Berg,

Matthew. (2020). Imaging atmospheric aerosol particles from a UAV with digital

holography. Scientific Reports. 10. 16085. 10.1038/s41598-020-72411-x.

L338: "The disaggregation technique employed here demonstrates the importance of areal coverage and directional sampling when calculating aerosol mass flux", the aerosol mass flux method and parameter setting in L286, and the reference?

L495: "a horizontal average over the entire domain" how to deal with the surface layer and the ABL?

Please also note the supplement to this comment:

<https://amt.copernicus.org/preprints/amt-2022-231/amt-2022-231-RC2-supplement.pdf>