

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.-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.

L53: 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:

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: 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<sub>2.5</sub> 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?