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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Technical note: Boundary layer height determination from Lidar for improving air pollution episode modelling: development of new algorithm and evaluation" *by* Ting Yang et al.

Anonymous Referee #2

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This paper examined the existing algorithms of the BLH determination and found some of their persistent critical limitations, particularly over polluted episodes under weak thermal convection with high aerosol loading. They hardly can fully capture the diurnal cycle of the BLH due to pollutant insufficient vertical mixing in the boundary layer. A new approachïijŇthe cubic root gradient method (CRGM)ïijŇis proposed to overcome such weakness and to accurately reproduce the fluctuations of the BLH under various atmospheric pollution conditions. In comparison with the existing retrieval algorithms, the CRGM significantly reduced uncertainties in the BLH determination, largely increased the correlation coefficient from 0.44 to 0.91 and decreased the root mean

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square error from 643 m to 142 m. The proposed method likely contributes to improve the accuracy of the BLH determination and air quality modelling and forecasting systems. The results are of interests to the community. Personally, I recommend it to be published. However, I also have some concerns about the rationale and scientific basis of the CRGM approach. The authors put their cubic root gradient method in an analog to the cubic law of gravity wave-turbulence spectrum. This sound plausible, provided that two major issues can be addressed in more details.

(1) How the gravity wave hypothesis can explain the diurnal cycle of the BLH? Is this due to tidal effects similar to that of gravity waves, or due to tidal modulation of gravity waves through their interaction, or both?

(2) As mentioned in the paper, the topography and meteorological conditions were favorable for the generation of gravity waves. Is there any observational evidence showing the existence of the gravity waves and strong vertical mixing associated with the waves during the discussed observation period? Such evidence would be a strong support to the hypothesis.

Some minor corrections are suggested in the commented pdf file.

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