EMS Annual Meeting Abstracts
Vol. 15, EMS2018-378, 2018

Determination of mixing-layer, stable-layer, and residual-layer from surface-based remote sensing instruments

Jae-Sik Min, Moon-Soo Park, Jung-Hoon Chae, and Minsoo Kang
Research Center for Atmospheric Environment, Yongin-si, Gyeonggi-do, Korea, Republic Of (min_jaesik@hufs.ac.kr)

Mixing-layer height (MLH), stable-layer (SL), and nocturnal residual-layer (NRL) are one of the most important factors in many atmospheric boundary layers (ABL) studies and processes. In convective conditions, in particular, MLH is important to air quality models determining pollutant diffusion, because pollutants are emitted into mixed layer (ML) become gradually dispersed and mixed by turbulent fluctuations. Despite this importance, there is no direct MLH determination method. Recently, MLH from surface-based remote sensing measurements has been studied as well as NRL and SL determination methods such as gradient method, wavelet method, and ideal backscatter profile method. Although the MLH determination method using surface-based remote sensing is relatively well known, the uncertainty is very large in complex atmospheric structures, and there are few studies on NRL and SL heights determination techniques. In this study, the MLH, NRL and SL height in the urban area where the Seoul in Korea were determined using the ceilometer backscatter profiles, and the ABL characteristics of urban area were analyzed in Seoul mega-city during summer 2017. In addition, the optimal methodology was also investigated among the determination methods mentioned above. The determined urban characteristics MLH, NRL, and SL heights were verified by microwave radiometer-derived ABL heights, which use the bulk Richardson number method. By analyzing the characteristics of ABL structures such as MLH, NRL and SL in the urban area, and accurately determining those heights, it can be contributed to directly improve fine dust, fog, and mist forecasting and indirectly improve prediction performance of NWP and air quality model.