Supplementary Information for

Determination and climatology of diurnal cycle of atmospheric mixing layer height over Beijing 2013-2018: Lidar measurements and implication for air pollution

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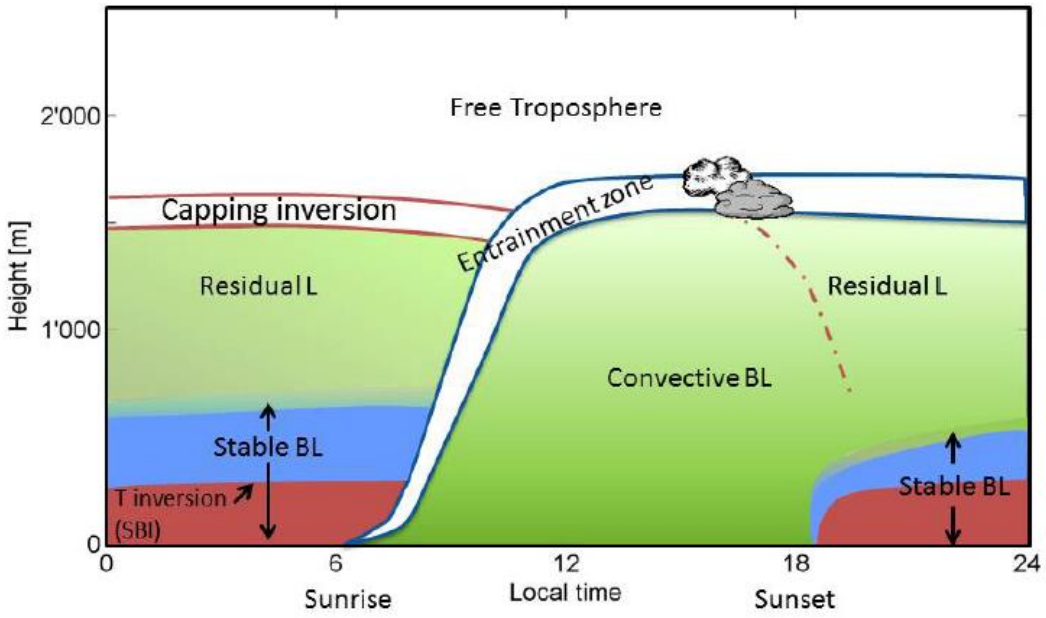

Fig.S1. Diurnal cycle of the PBL height over land for a clear convective day (adapted from Collaud et al., 2014).

S2. $PM_{2.5}$ is calculated following PMRS model as:

$$PM_{2.5} = \frac{AOD}{PBLH} \cdot \frac{FMF \cdot VE_f(\mathrm{FMF}) \cdot \rho_{2.5,\ \mathrm{dry}}}{f_0(\mathrm{RH})},$$

Where AOD indicates aerosol optical depth and FMF represents fine mode fraction; VE_f is the ratio of volume and extinction of fine mode aerosol, which can be calculated from FMF, following as $VE_f(\mathrm{FMF}) = 0.2887\mathrm{FMF}2 - 0.4663\mathrm{FMF} + 0.356$. The parameter $\rho_{2.5,\ \mathrm{dry}}$ indicates the density of dry $PM_{2.5}$, while $f_0(\mathrm{RH})$presents the particle hydroscopic growth function, which is $f_0(\mathrm{RH}) = (1 - \mathrm{RH}/100)^{-1}$. PBLH can be derived from remote sensing and radiosonde measurement.

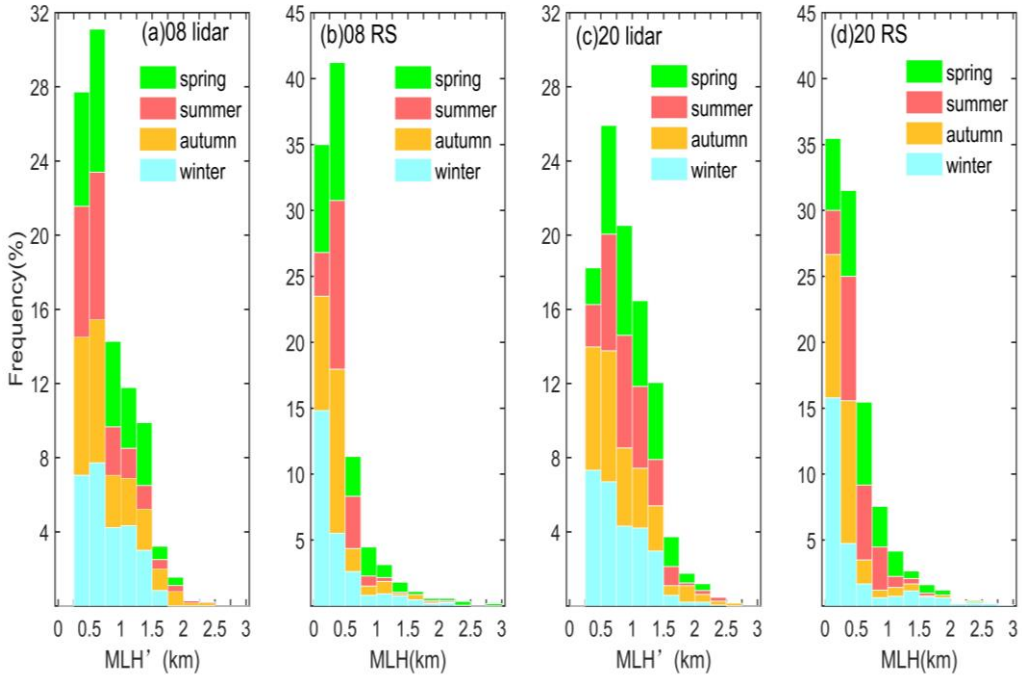

Fig. S3. Comparison of MLH' retrieved from lidar and radiosonde of different seasons. MLH' from (a) lidar and (b) radiosonde at time of 08 (LST), (c) lidar and (d) radiosonde at time of 20 (LST).

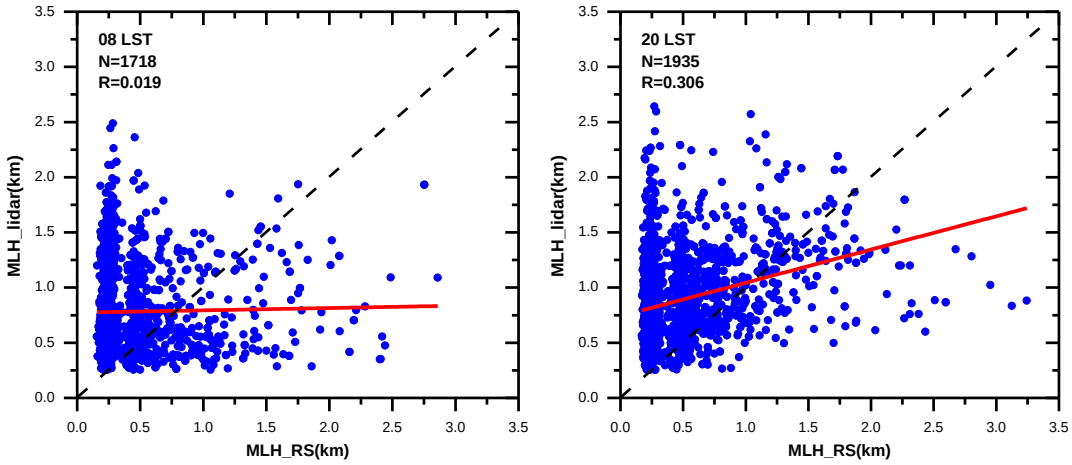

Fig.S4. Comparisons between MLH derived from lidar and from radiosonde at time of 08 and 20 (LST). Red line indicates the linear fitting, while the black dash line represents the 1:1 line.