Response to referee #2 comments

Authors gratefully thank to referee #2 for his/her thorough reviews and valuable comments which would contribute to improve the manuscript. Authors have revised the manuscript to respond the referee's comments. Authors tried to substantially improve the manuscript by clarifying the ambiguous expressions, and adding 3 Figures (Figs. 5, 10, and 11) with scatter plots between ISABLE_ABLH and conventional ABLHs with respect to time zones and cloud covers. The revised manuscript was edited by a professional Editing company. Major changes are marked in **RED** in the revised manuscript. I hope that this manuscript will be accepted for the publication in AMT.

Specific points:

1, Line 26-27, 'Besides, when SBL exists at night, the lower atmosphere is stabilized and stagnant, and atmospheric diffusion does not occur in the lower layer', why? or weak diffusion?

- The sentence is rewritten as "In the presence of well-developed SBL at night, air pollutants near the surface tend to be trapped inside the SBL due to the low vertical diffusivity, and their concentrations could increase sharply (L30-32).

2, Line 28-29, 'the ABL can be used as a meteorological factor to determine the air pollutant concentration', ABL should be ABLH.

- The term 'ABL' is corrected to the term 'ABLH' (L33).

3, Line 31-32, 'Many previous studies have developed various methodologies for determining ABLH, such as the ML height (MLH) and SBL height (SBLH).' It is better to change 'such as' into 'including'.

- The term 'such as' is changed to the term 'including' (L35).

4, Line 35-36, it is better to using 'thermal turbulence and mechanical turbulence'.

- The sentence is changed to '~which includes the thermal turbulence term generated by surface heating as well as the mechanical turbulence term arising from the vertical wind shear.' (L39-40).

5, Line 82-84, Section2, 'atmospheric attenuation and brightness temperature…' should be' electromagnetic wave attenuation'.

- The expression is rewritten as 'atmospheric attenuation and brightness temperature from electromagnetic radiation' (L96-97).

6, Section3, Figure2, the noise is really less after pretreatment during the daytime, but the noise is more during the nighttime, why?

- The strong noise with random backscattering coefficient was seen at heights above 2,500 m throughout the day in Fig. 2a. After pre-processing, noise signals at higher altitudes have decreased with maintaining their main features in Fig. 2a. But, vertical broadening at heights with strong signals was shown as a result of moving averaging. The above sentences were added in L136-145.

7, Section 4.1, Line 162-164, 'When determining the nocturnal SBLH, it is possible to estimate the SBLH using the vertical profile of the thermal parameter only because the turbulence or aerosol layer characteristics can be used to detect the residual-layer at night', please confirm the logical relationship.

- The above sentence is clarified as 'Actually, it is not easy to detect a residual layer using radiosonde sounding. This is because the vertical variations of the moisture and the wind in the residual layer can be more substantial compared to those in the SBL (L179-181)

8, Section 5.1, Line 334-335, 'ABLH of more than 1 km altitude appeared as outliers at nighttime', if possible, please show the data of the 'heat island phenomenon.

- Main factors for nocturnal urban heat islands are heat release by the heated materials during the daytime in urban areas, mentioned in the previous studies. The following expressions are added in L366-370: The SBL over rural areas is well developed over rural surfaces via surface cooling from earth radiation at night, especially under clear skies. However, that over urban area is not always developed because the sensible heat flux in urban areas does not always show strong negative values even at a clear night due to heat release by the heated materials during the daytime. So formation and evolution of SBL were not active over compact urban surfaces such as Jungnang station.

9, Section 5.3, Line 398-399, it is almost no difference for ABLH at clear skies (1202m) and cloudy skies (1085m), but the cloud cover is more difference, why?

- The complementary explanation is added in L419-422: The period mean hourly maximum ABLH was 1,220 m at 1600 LST on clear skies, while it was 1,090 m at 1500 on cloudy skies. Diurnal pattern and mean of ABLH on clear skies seemed to be similar to those on cloudy skies. But, median of ABLH was 1,170 m at 1600 LST on clear skies, 210 m higher than that (960 m) at 1500 LST on cloudy skies. Variances of ABLH on cloudy skies were also larger than those on clear skies.

10, Section 5., Line 403-404, The maximum seasonal mean ABLH was 1,268m in the Spring season (March, April, May), Please try to explain that using the net radiation data.

- Some errors in cloud cover calculation were found in 2015 and 2016, so the ABLHs were re-evaluated. The diurnal variation of ABLH was compared with that of net radiation in Fig. 15. Theoretically, the surface is heated from the time when net radiation becomes positive, and an ML evolves to balance the energy provided from the surface during the positive net radiation with the energy consumed to heat the overlying air volume. In reality, the ABL started to evolve from 3 h after the positive net radiation. The peak of net radiation occurred at 1200 LST, while the peak of ABLH occurred at about 1600 LST. The ABLH declined rapidly at 1 to 2 h before the negative net radiation. The net radiation in MAM was similar to that in JJA, and larger than that in SON, while the ABLH in MAM was similar to that in JJA, and larger than that in SON. The above explanation is added in L450-455.