This article provides a complete analysis on the interactions between the air pollutant processes and the structure evolution of urban boundary layer over Beijing during 1-4 December 2016. The synoptic/local meteorological condition, vertical distribution of wind/temperature/humidity, radiative exchange, energy budget, intensity variation of vertical mixing and urban boundary layer depth were investigated by using the data collected from a 325-m meteorology tower and by two lidars. The dataset is unique in a sense that it provides detailed vertical structure of the urban boundary layer during pollution episodes. Besides, one of the nice features of this paper is that it includes analyses of the intensity variation of vertical mixing in a relative superior spatial and temporal resolution. The paper is interesting and generally well-written. However, there are several questions need to be answered before its acceptance.

Major concerns:

1. The boundary layer height calculation with the turbulence method is not applicable for nocturnal condition, as can be seen in figure 10 that most of the BLHs are zeroes at night time. However, nighttime BLHs are specifically important for understanding the PM accumulation. Therefore, correctly retrieval of nighttime BLM is important for the analysis.

2. Temperature inversion is also a key factor to the formation of air pollution. For the case analyzed in the paper, the authors showed that the temperature profiles also had inversions, but how these inversions interact with PM concentration were not analyzed.

3. The maximum heat storage occurred on Dec 2, the BLH reduced significantly from Dec 1 to Dec 2, while the PMs increased only a little, what are their relationships?

Minor questions:

Line 33, 'It clearly showed that weak vertical mixing caused the concentrating of pollutants ...', I don't see how this conclusion can be derived, since the concentrating of pollutants is affected by various factors.

Line 57, located on -> located in

Line 83 and 84, delete 'the'

Line 94, 'dormant'? Please reorganized the sentence, it is confusing.

Line 118, 'of the evolution of the vertical UBL structure' -> 'of the vertical UBL structure evolution'

Line 155 - 0n -> on

Line 154 'Aoti surface station' should be defined here.

Line 178, was -> were

Line 190, Acronym 'SEB' should be defined before usage.

Line 202, add 'one of' before 'the most'

Line 248, 'partly led to the' -> 'contributed to the formation of'

Line 257 - Fig.4-> Fig. 4

Line 294 - PM2.5 /PM1-> PM2.5/PM1

Line 327, 'Radiation from the sun' -> 'Solar radiation'

Line 384 - Fig.4-> Fig. 4

Line 393, The LE shows a maximum at 24:00 of Dec 4, why?

Line 441, 'caused a fatal influence on' -> 'suppressed'

Line 451-5, reorganize the sentence.

Line 487, 'is' -> 'was'

Line 500 - Fig.2-> Fig. 2

Line 563 - 1– -> 1

Line 579, 'reducing' -> 'the reduction'

Line 623, 'cleaned' -> 'driven away'