Xu et al. presents a method to estimate regional emissions of pollutants based on surface measurements and trajectory modeling. The authors developed a series of mathematic equations to establish the relationships between local concentrations measured for different trajectories at the receptor site (C_l) and emission rates of different grids in the surrounding areas (E_{mn}). They proposed that the residence time of a trajectory in the PBL (T_l) is a key parameter in the emission retrieval and introduced a method to estimate the T_l. They demonstrated their approach by estimating the source distributions of BC and CO in the North China Plain. As stated in the manuscript, emission inventory is crucial for air quality forecasting and air quality management, and both traditional bottom-up emission estimates (based on energy statistics and emission factors) and emission retrieving (based on satellite dataset and modeling) have large uncertainties and some shortcomings. Therefore, surface measurements combined with meteorological analyses as presented in this study should provide an alternative or additional method for regional emission estimates. The manuscript fits well with the scope of Atmospheric Chemistry and Physics, and certainly this kind of work should be encouraged. The English is fine in general. Below are my questions and comments.

General comments:

1) The emissions retrieved in this study are expressed by the amount of a pollutant in unit volume ($\mu g\ m^{-3}\ h^{-1}$ or $ppbv\ h^{-1}$). The dimension of such expression is different from the one used in normal inventories (the amount of a pollutant in unit area, e.g, $\mu g\ m^{-2}\ h^{-1}$ or molecules $m^{-2}\ h^{-1}$). Note that for some elevated sources (e.g., stacks or aircraft) in an inventory, the altitude range information is generally given when the emission rates have a unit of $\mu g\ m^{-3}\ h^{-1}$ or $ppbv\ h^{-1}$. Therefore, the emission rates derived in this study can neither be used directly into the model nor compared quantitatively with previous emission inventories. To convert their retrieved emission rates into the normal ones, the authors need to state clearly to what altitude range their emission rates apply.
2) It is confusing whether the method could be used for regional emission retrieval (independent of previous inventories) or it could be used only for regional emission update (dependent of previous inventories). Sometimes they stated this method of emission retrieval is straightforward, but finally they had to use INTEX-B inventory as the first guess fields. As can been in Fig. 4a2 and b2, the emission rates retrieved for most of land areas are comparable to the false values derived for the sea areas, indicating that there can be large errors in the retrieved source strength and distributions.
3) The retrieving procedure is not well demonstrated in the manuscript. Instead of presenting the

results directly (Fig. 4), the authors need to show their methods and results step by step. First, how could the positions of the important sources e.g., cities and large steel pants, be located, and then how could their emission rates be calculated? Are these estimating steps coupled together?

4) The uncertainties and limitations of their estimate method should be discussed in detail. For example, are there any biases in the estimated positions of the important sources (cities and large power, steel and coke plants), or these important source positions are pre-described? What are the uncertainties or confidence of their emission rate estimates? Considering both INTEX-B inventory and the method developed in this study may have large bias, the authors need to provide strong evidence to support that at least for some cities or some grids they could update the emission estimates for the year 2009.

Specific comments:

1) Page 31138, Line 14, what does 'reasonable emission' mean? Line 15-20, these results are meaningless for emission estimates.
2) Page 31140, does m or n refer to the same variable in the Eqs. (1) and (2)?
3) Page 31141, Line 15-21, what are the biases of CO and BC measurements?
4) Page 31142, Line 1-3 and Fig. 1, the two domains have nearly the same area.
5) Page 31143, Line 3-8 and Eq. (3), Could other processes, e.g., deposition and dilution, affect the C_l? Were there any cloudy and rainy days during the experiment period? It is difficult to understand the pollutant concentrations and emission rates ('factor') could be the same for all grids on the same trajectory, especially in the case when a city is in the middle way.
6) Page 31143, Line 9-13 and Eq. (4), do these multiple emission values represent the real situation, or they are just the uncertainties caused by the method itself?
7) Page 31143, Line 13-23 and Eqs. (5) and (6), it is unbelievable that the field of any variables could serve as a priori to the emission field analyses. If they think so, the authors should show that the retrieved results from different fields can be neglected.
8) Page 31144, Line 1-9, Eq. (7) and Fig. 2, how much could the variation in the PBL affect the emission estimates? The PBL height can be much less than 1000m in the morning and much higher than 1000m in the afternoon.
9) Table 1, how about the sample numbers and standard deviations? Are the values for Tianjin and Beijing comparable to the INTEX-B inventory?
10) Figs. 3 and 4, for which grids the emission rates can be updated according to the meteorological conditions during the experiment period and the uncertainties of the method?