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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A new vehicle emission inventory for China with high spatial and temporal resolution" *by* B. Zheng et al.

Anonymous Referee #2

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General comments

This manuscript develops a vehicle emission inventory by estimating vehicle stock and monthly emission factors at county-level, and technology distribution at provincial level. The emissions are then allocated to 0.05x0.05 grids based on China Digital Road-network Map. This manuscript presents improvements in bottom-up emission estimates by increasing the spatial resolution of input parameters, and emission gridding by applying more vehicle activity related surrogates. These improvements will benefit climate and air quality modeling. The paper is well written and clearly structured.

My major concern of this manuscript is that some assumptions are not clearly explained (see specific comments). Therefore, I would like to recommend major revisions.

Specific comments

1. Line 15 on page 32007, what is the reference for vehicle emission contributions in Beijing?

2. Lines 4-6 on page 32009, explain why use road map in 2010 to allocate emissions in 2008.

3. Line 11 on page 32009, be consistent in the whole manuscript, whether VOC, NMHC, or HC.

4. Equation (1) on page 32010, it includes emissions from buses and trucks. Authors should explain whether these buses are for commercial use only or not. It is not quite clear whether cars for private use and motorcycles are included. In the latter discussion, "passenger vehicles" and "passenger cars" are used sometimes. Authors should clarify the grouping of vehicle types. Besides, authors did not distinguish emission factors by road types. The symbol E was used twice in Equation (1) and (3) to represent emissions and per-capita GDP. It is better to use different ones.

5. Equation (2) on page 32011 and lines 19-21 on page 21013, authors first used Gompertz function to estimate the total vehicle ownership on county level and then broke it down to different vehicle types based on provincial shares of vehicle type. There are several gaps here: whether the shares of vehicle type is the same for county level and provincial level, whether passenger cars, buses, and trucks have the same relationship with GDP per cap, and whether all vehicle types share the same value of V*. Authors should provide more information about their assumptions.

6. Equation (3) on page 32012 and lines 1-2 on page 32013, α and β are derived from linearly relationship, and they should be independent on E. But the discussion about Fig. 1b finds inverse correlation between β and E. it seems conflict. Authors are suggested to have an explanation here.

7. Equation (4) on page 32013, it is not quite straightforward how authors use the

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discussion on page 32012 and 32013 to conclude the adjustment of β from city to county level in Equation (4). It is better that authors provide more explanation.

If I understand it correctly, Ei,min and Ei, max are min and max of 10 observations of E in city i, then what is the definition of Ej? Does it represent GDP per cap of county j in 10 years, on average, or in single model year (e.g., 2008)?

8. Equation (9) on page 32014, authors used T and b values determined in Huo and Wang (2012), which provides survival rate of light-duty vehicles in Beijing from Yang et al. (2003). Authors should clarify their assumptions about survival rates for different vehicle types in different provinces. It is better to show T and b values for each province if it is possible.

9. Lines 21-28 on page 32016, how many and which cities with measurements are used to determine φ values? How are φ values determined? For which vehicle types, φ is set as 1? Are φ values distinguished by county or city? Please clarify. 10. Lines 25-28 on page 32017, clarify whether all provinces use the same VKT levels, as shown in Table 2.

11. Lines 6-9 on page 32023, the statement that NOx running emissions are not dependent on temperature is not consistent with Fig. 7c and discussion in line 1 on page 32021. Authors should have a careful discussion about little latitude variations of NOx monthly emissions.

12. Line 22 on page 32026, define what is “significant bias”

Editorial Comments 13. Table 1, suggest to show the VKT allocation of other vehicles types, though they are based on assumptions

14. Table 2, suggest to show which year and which level (national, provincial or others) in the title

15. Fig. 1, suggest to give more details about the x label in Fig. 1b. Is it the average per-cap GDP or the one in 2008?

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16. Fig. 4b, define the growth rate. Is it the average growth rate between 2002 and 2010, or the growth rate for a specific year?

17. Fig. 8, is the spatial distribution by county or grid (0.05x0.05)?

18. Fig. 9, the second element of legend in (d) should be “PM2.5_Running” instead of “PM2.5_Emission”

19. Line 8 on page 32024, “constrain “ instead of “contain”

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 32005, 2013.