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## ***Interactive comment on* “Characterization of road freight transportation and its impact on the national emission inventory in China” by X. F. Yang et al.**

**X. F. Yang et al.**

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Received and published: 29 July 2014

We would like to thank anonymous referee #1 for his/her comments on our manuscript. Our response to his/her questions and comments can be seen below.

Specific Comment 1: Clarify whether the classification of trucks into the four types was based on the 1060 questionnaire results or some other data source.

Response: In this study we tried to keep a unified classification for the trucks for different sources of data. As we mentioned in p. 15224, line 1, the classification followed how the National Bureau of Statistics reports the vehicle stock. Besides, in our 1060

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questionnaires, we also kept the same classification so that all the numbers we used in this research, from statistics or questionnaire answers, could be matched with each other. To clarify the classifications, the edited lines 26/Page 15223 – lines 2/Page 15224 now reads as:

“The classification of trucks in this research follows how the National Bureau of Statistics reports the vehicle stock (CATARC, 2012). According to weight, the trucks are classified into four types: Mini Trucks (MiniT) with weights less than 1.8 t, light duty trucks (LDT) with weights of 1.8–6 t, middle duty trucks (MDT) with weights of 6–14 t and heavy duty trucks (HDT) with weights greater than 14 ton. Besides, trucks that were investigated via questionnaires were classified following the same rules.”

Specific Comment 2: “Because the MiniT population only consists of a very small proportion. . .” How small is this proportion?

Response: In 2011, Mini trucks only consisted of 0.98% of the total freight truck stock. As the referee suggested, it is very important to present the proportion of MiniTs in the paper. To present that MiniT’s proportion in freight stock was not significant, the edited lines 2-3/Page 15224 now reads as:

“Because the MiniT population only consists of a very small proportion of the total truck fleet, for instance, 0.98% in 2011, and the differences between MiniT and LDT are not significant. . .”

Specific Comment 3: It would be useful to include in the supplementary information a table or figure showing the emission rates by operating mode bin.

Response: I agree with the referee that presenting emission rates by operating mode bin would be useful. Detailed information about it has been added to supplementary information, from . . . to . . .

Specific Comment 4: “. . .therefore meet the China 3 tailpipe emissions standard.” Provide a brief description of China’s tailpipe emissions standards.

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Response:

This comment reminded me that I should include a brief description of China's tailpipe emission standards for readers who are not familiar with it. Therefore, we added a few sentences in line 15/Page 15229, which are read as:

"Chinese government adopted vehicle emission standards following emission standards in Europe, which means China 3 emission standard is equivalent to Euro 3 standard. "

Specific Comment 5: ". . .long idling time without shutting down the engine. . ." The GPS data alone cannot reveal whether the engine is on or not. Does this claim stem from the questionnaires or some other observation?

Response:

It is true that the old style GPS receiver alone cannot reveal whether the engine is or not. The GPS receiver that we used is capable to capture this information. In this research, we used a multifunction Columbus GPS data logger V-990 produced by GPSWebShop (Canada) Incorporation. Its charger can be plugged in the jack that holds the cigarette-lighter. It is also capable to sense the voltage of jack to see whether the engine is on. When we were monitoring the trucks, we set the GPS receiver in a mode that made it only to record data when the engine is on. Therefore, whenever we have the GPS data shows that the speed equals to zero, it means the truck is idling. We explained this very briefly in the data collection section, lines 17-18/Page 15224. To clarify this, the edited lines 17-18/Page 15224 now reads as:

"The GPS data logger is set to automatically turn on/off when the engine of the investigated truck is turned on/off. Therefore, the data were collected every second when the engine is on."

Specific Comment 6: "The distribution of bins on each type of road is shown in Fig.4. . ." Fig. 4 shows the proportion of running time on different types of roads by truck type

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and not the distribution claimed.

Response:

I am sorry. The sentence should be corrected as:

“The distribution of bins on each type of roads is shown in Supplementary Information, Fig. S4.”

And the figure is added in Supplementary Information, Figure S4.

Specific Comment 7: “. . .urban or suburban roads where the driving conditions are relatively worse.” Are suburban roads lumped together with urban roads?

Response:

Suburban road here is not a road type here. There are only 5 types of roads: freeway, national road, provincial road, country/town road and urban road. Here I used the phrase ‘suburban road’ to show that these roads are located in suburban areas. Mostly, roads in suburban areas are also urban roads. I understand that it could be very confusing and misleading. To clarify, the edited lines 8-9/Page 15233 now read as:

“Generally, the emission factors are tested on urban roads where the driving conditions are relatively worse, leading to a higher emission factor.”

Specific comment 8: Please explain briefly the inputs and methods used by the MEP to estimate emissions so that readers can better understand the differences between the two inventories.

Response:

The 2011 MEP emission estimations came from their annual report, China Vehicular Pollution Prevention Annual Report. The method that MEP used to estimate emissions was not introduced in the report. We contacted the technical staff in MEP to confirm their method of estimating emissions. Their method is briefly introduced as below. And

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the introduction is inserted into line 16/page 15233. And Table S2 mentioned in below text is added in supplemental information.

“Briefly, MEP estimated vehicle emission on the basis of local vehicle stock, activity level and emission factors. Vehicle fleet is divided into different groups according to their gross vehicle weight and the national emission standards. For each group, the emission equals the product of local registration number, kilometer travelled per vehicle and emission factor. Adding up emissions of each group is the total emission. The emission factor that MEP used is based on the national emission standard. Detail information of emission standards in China is shown in SI, Table S2. The vehicle registration number of trucks in 2011 was 17.88 million. However, no further input data related to vehicle kilometer travelled was provided in this inventory.”

Specific comment 9: “The NO<sub>x</sub> number is a little higher than the MEP’s estimation. . .” Calculate how much higher these NO<sub>x</sub> emissions are relative to the MEP’s inventory.

Response:

It should be clarified that how much higher our NO<sub>x</sub> result is than MEP’s inventory. Lines 15-16/Page 15233 now reads as:

“This NO<sub>x</sub> number is 28% higher than the MEP’s estimation of 3 900 000 t NO<sub>x</sub> emissions from trucks in 2011”

Specific comment 10: The finding that NO<sub>x</sub> reduction from diesel trucks was not as successful as expected seems worthy of being mentioned in the Conclusions section, for its policy-making implications.

Response:

Thanks for your suggestion. A few sentences talking about the reduction of NO<sub>x</sub> in freight truck sector was added in line 24/page 15238 in the conclusion sector. The newly added sentences read as:

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“The results revealed that NO<sub>x</sub> reduction from diesel trucks in China was not as successful as expected even though China 3 emission standard had already been adopted. The major cause to this failure is that even though emission standard has gotten tightened, NO<sub>x</sub> emission factor hasn’t been improved significantly. According to our research, the failure of reducing NO<sub>x</sub> emission made the China 3 diesel trucks a major contributor to the total NO<sub>x</sub> emission of the entire fleet since the sales of trucks went up promptly recent years. China 3 emission standards on diesel trucks didn’t manage to reduce the NO<sub>x</sub> emission from diesel freight trucks. And the challenge of NO<sub>x</sub> reduction will last for more years since recent test results showed that NO<sub>x</sub> emission factors of China 4 freight trucks were not significantly improved still.”

Specific comment 11: According to Figure 10, Henan ranks 3rd in NO<sub>x</sub> emissions and 3rd in PM<sub>2.5</sub>, not 3rd and 5th. Other claims in the following 10 lines are also not supported by the figure. A difference in ranking of one place does not seem like it would be significant.

Response:

Thanks for the correction. A major mistake was made here. We have deleted the whole paragraph of this conclusion from line 13/page 15236 to line 3/page 15237.

Specific comment 12: Much more explanation of the legend colors and pie charts is needed. Same comment for Figure 7.

Response:

Thanks for the suggestion. We have already rearranged Figure 3 and Figure 7 (See Fig.1 and Fig.2 here).

Please also note the supplement to this comment:

<http://www.atmos-chem-phys-discuss.net/14/C5399/2014/acpd-14-C5399-2014-supplement.pdf>

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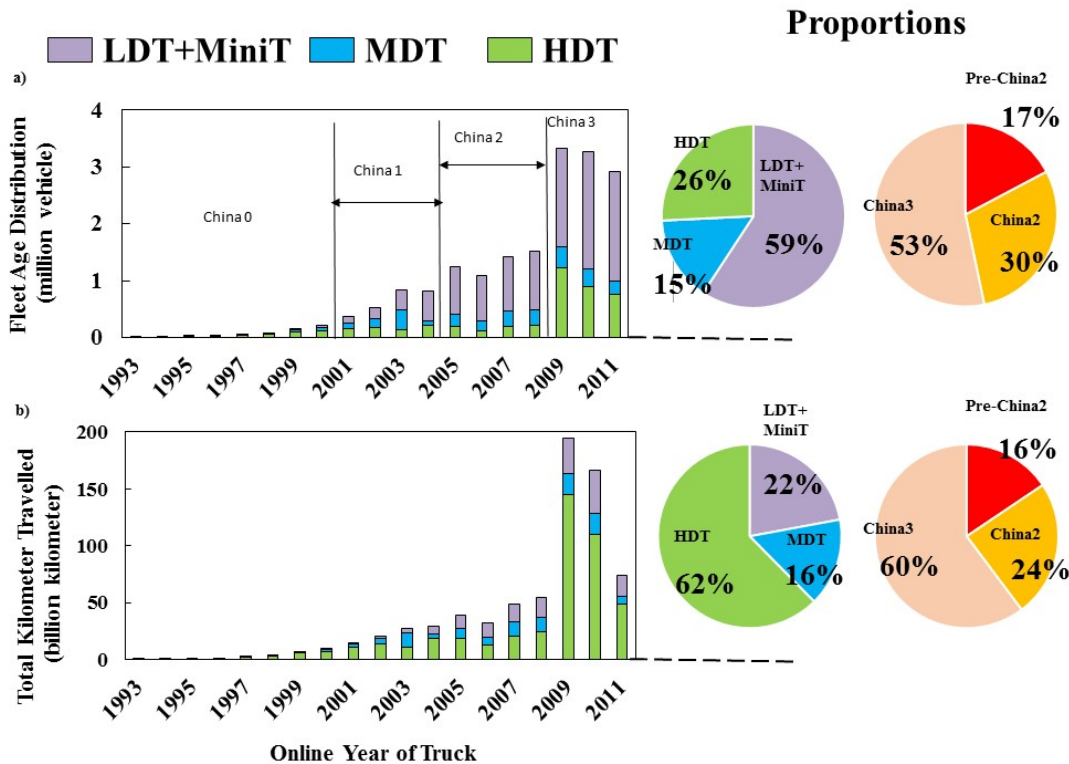


Fig. 1.

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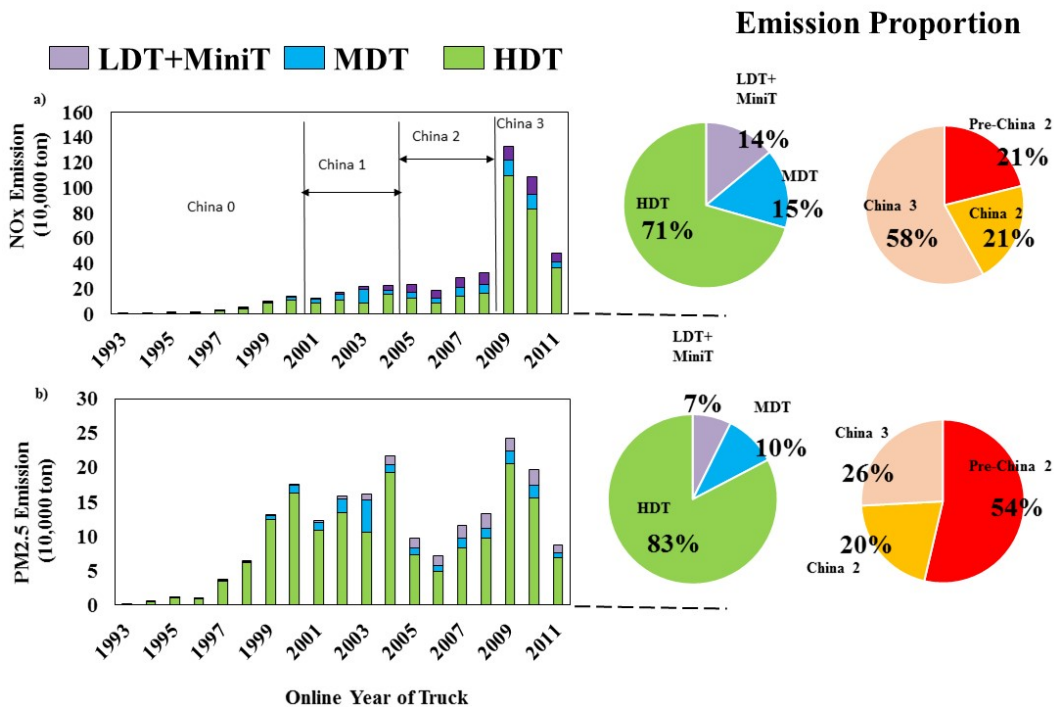


Fig. 2.

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