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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 #1

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The authors developed a high-resolution vehicle emission inventory of air pollutants in China for the year 2008. The emission inventory is essential and important data for atmospheric science community as well as policymaker and the topic certainly is suitable for ACP. The manuscript presents the sophisticated methodology based on activity data and emission factors at county-level. The author's inventory has some advantages in the spatial distribution and in the input data.

Reliability and accuracy of an emission inventory rely on data certainties of activities and emission factors. In this paper, the authors have established new database on the activity data, emission factors, and spatial allocation factors to reflect the regional situation. Especially, they have developed a new method for China to assess vehicle emissions based on regional information of county-level vehicle population estimated

by city-level functions and province-level technology distribution calculated by provincial vehicle stock and survival functions. In terms of emission factors, they determined monthly county-level emission factors simulated by the vehicle emission model using China's on-road vehicle emission corrections and county-level meteorological corrections. Also, the authors developed the gridded inventory with high-resolution of 0.05 degree based on allocation weights for the vehicle kilometers traveled and the finer road-network map. Such efforts have made this new emission inventory study more reliable and complete compared to others previously reported.

Consequently, the contents of this manuscript are suitable for the publication of ACP. However, there are some questions and problems in methodology and data. I am recommending the acceptance of this paper after major revisions.

(Major comments)

(1)Page 32010, Eq. (1): Eq. (1), which is a vehicle population-based approach, doesn't take account of inter-county traffic. On the other hand, the inter-country traffic has an important role of vehicle emissions as described in lines 10-11 of page 32017 ("Heavy duty trucks run more frequently on inter-county than on county roads"). The authors should analysis and discuss the influences on spatial allocation of emissions. Additionally, the assumption in lines 20-21 of page 32017 ("all use of passenger vehicles occurred within the city boundary and the use of trucks within the province boundary") is unclear in the relation to Eq. (1).

(2)Page 32012, Eq. (3): The left hand is proportional to the city-level per-capita GDP with slope of [beta]. Fig.1b shows that the slope [beta] is in inverse proportional to the GDP. Consequently, the left hand of Eq. (3) is independent on GDP. This is very curious. The authors should analyze and discuss about this point more carefully.

(3)Page 32016, lines 10-11: It is considered that the driving pattern strongly depends on traffic characteristics of each county. The assumption of "same driving pattern for all counties" is too rough. At least, the authors should analysis and discuss about the

uncertainty caused by this assumption.

(4)Page 32016, lines 24-28: The authors need to explain in detail how to set the correction factor and demonstrate their values.

(5)Page 32017, lines 2-4: The author's method of VKT allocation weights on different types of roads to split vehicle activity is an interesting method for spatial allocation. However, the driving pattern (and emission factors) varied largely between road types. The variation of emission factors due to road types should be reflected in estimation of county-level emissions.

(Minor comments)

(1)Title: The new method of this work has great advantages in the spatial distribution characteristics. On the other hand, the author's effort in high temporal resolution is relatively small and only is development of monthly emission factors corrected by monthly variation of meteorological parameters. For higher temporal resolution of vehicle emissions, not only monthly variation (including VKT) but also daily and weekly variations should be considered. As a result, the title "A new vehicle emission inventory for China with high spatial resolution" may be more suitable for author's work.

(2)Page 32008, line 3: REAS inventory uses road density as a surrogate for grid allocation. (Ref.) Page 4422 of Ohara et al. (2007)

(3)Page 32008, line 20: It is better that "Therefore" is replaced by "Consequently" or other term.

(4)Page 32010, lines 3-5: Why is motor cycle excluded in this work?

(5)Page 32026, lines 19-25: The reviewer can't find from Fig. 14b and c that M1 and M2 methods causes "significant bias". Fig.14b and c or Fig.14d and e seem to demonstrate that M1 is closer to "this work" than M2. It is suggested that the authors add some discussions about this reason.

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