# Response to Reviewer's Comment

# (Manuscript No. acp-2014-359)

**Anonymous Refree#3**

**General comment:**

This manuscript entitled "Characteristics of Trace metals in Traffic-Derived Particles in Hsuehshan Tunnel, Taiwan: Size Distribution, Fingerprinting Metal Ratio, and Emission Factor" by Lin et al. mainly describes the PM metals in the 2nd longest tunnel in Asia. It is well reported and discussed what the authors found. In general, the paper is well organized and easy to follow. It is suitable for inclusion in Atmospheric Chemistry and Physics. The manuscript is scientifically sound and should be accepted for publication after moderate revision and address. The comments are in the following:

**Author's response:**

We have followed the reviewer's comments and revised this manuscript. The revised portion will be explained in details of the following response.

**1st comment**

P. 13971 Line 21-24. The abundance of submicron PM at the outlet site was due to enhancing carbonaceous PM. Do the authors have experimental data to support this hypothesis? If no, it should be removed.

**Author's response:**

Thanks for the reviewer's comment. We do not have any support for this possibility. Thus, we have removed this sentence in the revised manuscript.

**2nd comment**

P. 13980 line 1: The emission factor of PM was significantly lower than other studies. Is the ventilation system triggered during the sampling period? If so, how about the influence of ventilation on the estimated emission factor?

**Author's response:**

Thanks for the reviewer's comment. The ventilation system was operated during the four experimental periods, resulting in underestimated EmF values for both PM mass and metals. As suggested by other reviewers, we have omitted the section of "3.5 Emission factors of trace elements" in the revised manuscript.

**3th comment**

P. 13996. Please correct “Petrolium refining” to “petroleum refining”

**Author’s response:**

Thanks for the reviewer’s comment. We have deleted Table 5 in the revised manuscript and “Petroleum refining” has been also removed.

**4th comment**

Sb/Cu is an important ratio to trace the traffic-produced PM. However, the Sb/Cu ratio in this study is lower especially when compared with those in US. The authors should clarify this reason.

**Author’s response:**

The reason for the lower Cu/Sb ratios in Hsuehshan Tunnel is written in the text (lines 9-17 on page 17). The previous study indicated that Japanese car had Sb/Cu ratios ranging from 0.05-0.11 which were lower than those of American vehicles. Nevertheless, we import lots of cars (almost half of the total vehicles in Taiwan) from Japan, and the abundance of Japanese car in Taiwan may result in the lower ratio of Sb/Cu.

**5th comment**

P 13998. The resolution of Figure 1(b) is very poor. Please replot this figure.

**Author’s response:**

Thanks for the reviewer’s comment. In the revised manuscript, we have re-plotted the new Figure 1(b) and improved its quality and resolution.

**6th comment**

6. Please describe the temperature and CO concentration during the sampling period. It is very important information, whether the ventilation system is triggered or not.

**Author’s response:**

According to the monitoring data provided by Taiwan Area National Freeway Bureau, the 1-hour average CO concentrations at these stations never exceeded 50 ppm, but temperature frequently exceeded 40°C, especially, in July and August. This suggests that the ventilation system was triggered due to high temperature, resulting in

underestimation of EmF. As suggested by other two reviewers, we have deleted all the descriptions of EmF in the revised manuscript.

**7th comment**

Is this the only one paper for estimated emission factor on Hsuehshan Tunnel? If not, please cite all the related paper in this manuscript.

**Author's response:**

In fact, this study is not only one work for estimating EmF of PM inside Hsuehshan, but is the first one for PM metals. Because underestimated EmF is due to the exchange between inside-air and outside-air, all the descriptions of EmF have been removed as suggested by other reviewers.