

Interactive comment on “Characteristics of trace metals in traffic-derived particles in Hsuehshan Tunnel, Taiwan: size distribution, fingerprinting metal ratio, and emission factor” by Y.-C. Lin et al.

Anonymous Referee #2

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1. General comments

In this paper, MOUDI was used to get the size-fractionated aerosol samples at the inlet and outlet sites of Hsuehshan Tunnel in northern Taiwan. 36 metals in aerosols were analyzed by ICP-MS. The concentrations, size distributions, and major sources of those metals are presented based on the ErF, correlation matrix and PCA analysis. Moreover, the authors give the information about fingerprinting ratios of traffic-derived metals and EmF of PM₁₀, especially of PM₁ metals. The data set in this paper is valuable, and the results and most of the discussions are reasonable. The description is precise and the tables and most of the figures are good. Overall, the paper is deserved to be published

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in ACP after the authors revise the following concerns.

2. Special comments

2.1 P13968 Line 8-10: Many experiments related to the traffic emissions were conducted in Hsuehshan Tunnel (See Reference). Is there any difference between this experiment and before? It seems that the authors ignore the previous works in Hsuehshan Tunnel in introduction.

2.2 P13968 Line 16-23: According to the description in paper, both sites are near the exchange and/or interchange station. Did the ventilation system work during the sampling period and how long? Did the activities of the ventilation system affect the sampling result? Please provide the relative illustration. 2.3 P13971 Line 20-23 and P13972 Line 1-2: The authors mentioned that the abundance of PM₁ may be the result of the absorption of organic gases by Teflon filter. The blank filter was sampled according to the description in P13969 Line 24-25. Did the results of those blank weights support this possibility?

2.4 P13972 Line 11-21: The authors suggest that the ratio of 4.4 might be regarded as a reference ratio of difference in PM mass between two sites caused by traffic emissions. I can't agree with this suggestion. Except for the direct traffic emission, the secondary formation from trace gases is an important factor for the concentration of PM₁. However, the contribution of secondary formation is little in coarse particles. It's not reasonable to use the same ratio in different size particles. In my opinion, the O/I ratio of elements may be taken as a reference ratio. My suggestion is to provide the O/I ratios of elements in three size bins.

2.5 P13974 Line 4-6 and Fig1c: Most of the O/I ratio for traffic-derived elements is about 2-3. Why are the O/I ratios for Zn and Mn so high?

2.6 P13975 Line 25-26: The R Cu-Zn (0.63 in coarse mode) is less than 0.67.

2.7 P13976 Line 5-7: The authors point out that Pb only correlated moderately with Cu,

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Sb and Ba and Zn had a good correlation with Cu, Ba and Sb in PM_{>1} (P13975 Line 25-26). However, Zn and Pb show the similar correlation with Cu, Ba and Sb in Table 2 (See the following table). So that it's hard to get the conclusion "Pb was contributed preferentially by combustion process". Cu Ba Sb Zn 0.63 0.77 0.67 Pb 0.60 0.75 0.64

2.8 P13976 Line 22: "Ti" can't be found in PC2 of coarse particles in Table 3. It should be "Pb"

2.9 P13976 Line 20-25: Zn and Pb had similar loadings in PC1 of coarse and fine particles (See Table 3). Why isn't gasoline emission a possible source in coarse particles?

2.10 P13976 and P13977: What's the reason for the assignment of gasoline emissions or/and diesel emissions in PCA results? It seems that the assignment is based on the loading of Pb and Zn. If so, please provide relative references.

2.11 P13976 Line 26-27: There is a high loading of Na in PC3 of fine particles. Is it possible that some particles are from seasalt?

2.12 P13977 Line 10-13 and P13978 Line 15-24: In this paper, V catches my attention. The authors claim that V is mainly from combustion. However, O/I ratio and ErF of V are both low in this study. So, I'm doubt about the source of V and the use of V/Ni ratio as a fingerprinting ratio in Hsuehshan Tunne.

2.13 P13979 Line 14-19: The authors mention that "In contrast to the La/Ce ratio....soil and crustal materials". I can't get the same information from Table 5 because the values of La/Ce and La/Nd are both lower than that in soil and crustal materials. My suggestion is to delete Table 5 and relevant content.

2.14 the section of 3.5: for the same reason mentioned above, I suggest that it's better to delete the relevant content of EmF of PM and only present the EmF of elements.

2.15 P13982 Line 23-26: The description of elemental classification in summary is different from that in P13972 Line 24-29 and some elements, such as Mo and Pb, are difficult to be divided into different groups. My suggestion is to delete the classification

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in summary.

3. Technical corrections

3.1 Fig1.b: It's hard to get useful information from Fig1b. my suggestion is to redraw it.

3.2 P13973 line10: suggest modifying "at the entrance" to "at the inlet site"

3.3 Table 2 is not a complete Table for losing PM_{<1}. My suggestion is to remove Table2 to supplement.

3.4 Figure 5 is better to be removed to supplement.

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