

Response to Reviewer's Comment (Minor Revision)

(Manuscript No. ACP-2014-359)

Editor Decision: Reconsider after minor revisions (Editor review)

Please address the two final comments by Referee #1:

1st comment:

Page 10, lines 4-13: In their discussion of the differing O/I mass concentration ratios for the three PM size fractions, the authors attribute the trend of decreasing O/I ratio with increasing particle size to transport dynamics caused by the "piston effect".

While this may be one factor contributing to different observed ratios, the authors should also mention that these differences could also be related to different emission rates within the tunnel for PM in different size fractions.

Author's response:

Thanks for the reviewer's comment. We agree that different emission rates for different sized PM within Hsuehshan Tunnel might be another reason for discrepancies of O/I ratios in observed PM₁, PM_{1-1.8} and PM₁₀ as written in [lines 13-16 on page 10](#).

2nd comment:

Page 15, paragraph beginning line 5: I find this paragraph on results of principal component analysis to be confusing and suggest revising to more clearly identify why specific sources were associated with specific factors. For example, I find the attribution of PC1 and PC2 in the coarse fraction to diesel and gasoline exhaust to be somewhat speculative. Given the primarily submicron particle mass distribution generally shown for motor vehicle emissions, how do the authors support attributing coarse fraction factors to vehicle exhaust?

Author's response:

Thanks for the reviewer's comment. We agree very well that diesel/gasoline-emitted PM is mainly found in smaller particles, particularly in submicron mode. On the other hand, previous studies showed that Fe, Ba, Sb, Zn, Cu and Pb, Mo, Ti and V in coarse mode were associated with wear debris ((Wählén et al., 2006; Lawrence et al., 2013; Pio et al., 2013, also see in Table S1). Accordingly, PC1 of PM_{1.8-10} might be only associated with wear abrasion origins. In PC2, high loadings of Na, Mg, K, Ca and Rb with a moderate loading of Al suggest crustal materials. However, high loading of Pb was also found in this factor. This might be associated with crustal elements since

little amounts of Pb are emitted from fugitive dust (Tanner et al., 2008; Zhang et al., 2014). In the revised manuscript, we have re-categorized the components of coarse PM into wear debris and dust. [\(lines 13-17 on page 15 and lines 11-14 on page 16\)](#)