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Atmospheric Chemistry and Physics
Discussions

Interactive comment on “Comparison of Polycyclic Aromatic Compounds in Air Measured by Conventional Passive and Passive Dry Deposition Samplers and Contributions from Petcoke and Oil Sands Ore” *by* Narumol Jariyasopit et al.

Anonymous Referee #3

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This manuscript provides extensive characterization of polycyclic aromatic compounds (PAC) in the Alberta Oil Sands region in the autumn of 2015. Two different types of passive air samplers are used, a traditional PAS, and a PAS-DD (passive dry deposition), which has a geometry that allows it to capture coarse mode particles, in addition to fine mode particles and gas phase molecules. The authors argue that because coarse mode particles deposit at higher rates, including a measurement of any PACs bound to these particles is crucial for estimating PAC dry deposition. It would be helpful if the authors could provide more insight as to how the PAS-DD measurements would

be converted into deposition measurements. In some sections, it appears that the argument is that the PAS-DD is designed to measure the deposition of the gas and particle-phase analytes, whereas in other sections, it appears that it is being used to measure their concentration. The authors should clarify which interpretation is correct, and if it’s the latter, how are the measurements made by the PAS-DD used to calculate deposition.

Are the distributions of compounds measured by the PAS and PAS-DD samplers similar because gas phase compounds dominate the loadings for each type of sampler or because there is not a compound-specificity to the gas-particle partitioning?

Section 3.2 discusses the enhancement ratios of concentrations measured on the dry deposition samplers relative to the traditional samplers. It makes sense that the less volatile compounds tend to have larger enhancement ratios, as explained by the authors. But don’t the enhancement ratios also depend on the relative loading of coarse mode particles near the site? For a given total amount of an individual semi-volatile PAC in the air, the higher the coarse mode particle loading, the higher the enhancement ratio. This could be discussed (and perhaps explored quantitatively) in the context of the site-to-site variability.

Specific comments Line 78 – ‘emissions’ should be ‘sources’

Lines 107-113 Can the authors be confident that the sampling volume derived for gas phase species can also be applied to particle-bound material, especially for coarse mode particles? Given that diffusion is unlikely to be the main mechanism of mass transport, this assumption seems questionable.

Line 114 – What is COSIA?

Line 120 – Chiron (Norway) appears twice

Figure 3 legend – some bars are labelled ‘ANS instead of ‘AMS’

Table 1 – are the mass loadings in air in units of pg/m3 or ng/m3? The caption and the

table are inconsistent

Lines 149-150 The particle extraction method involved ultrasonication in dichloromethane. Is it possible that any components of the particles would have been dissolved in the dichloromethane and how would that impact the interpretation of the results?

Lines 172-174 and Figure 2 – The text states that the 2-3 ring PACs account for 65-70% of the sum of the target compounds, but based on the figure, it looks more like 75 – 85%.

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