

Interactive comment on “Nitro-polycyclic aromatic hydrocarbons – gas-particle partitioning, mass size distribution, and formation along transport in marine and continental background air” by Gerhard Lammel et al.

Anonymous Referee #1

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This manuscript provides a study of nitro-PAHs in 2 background locations. The study includes results about their atmospheric concentrations, gas/particle partitioning measurements and modeling, particle size distribution and substance patterns together with an evaluation of the urban influence of the samples using a Lagrangian particle dispersion model. Overall, the manuscript results are scientifically relevant and well presented. The modeling approach used to track the air mass history and to understand the nitro-PAHs sources and processes is very interesting and innovative. Thus, I recommend the publication of this paper in ACP after some minor revisions listed below.

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1. Introduction. - Line 46: OK to cite review papers but you should also cite some key papers. - Line 47: mutagenicity yes. Toxicity, no: What about metals, PAHs, other POPs...? - Line 55: recent paper about that: (Keyte et al., 2016) - Line 59-60: OK for 2-NFlt. Instead of 3-NFlt, better to give as an example for primary source, 1-nitropyrene. - Line 68: 2007 instead of 2006 - Line 72: an altitude (remote) site in the French Alps has been also investigated in (Albinet et al., 2008).

2. Methodology 2.2. Chemical analysis. - Line 174: PM10 determined by gravimetry using dedicated filters? Using automatic measurement instrumentation? Precise method and references.

3. Results and discussion - Lines 261-266: These results refer to the particulate phase. What about the gaseous phase? You should discuss both phases or the total. Heterogeneous photolysis is true for PAHs too. You could also have an enhanced formation of nitro-PAHs during night-time. Is the pattern the same for all PAHs and all nitro-PAHs or did you notice some differences for specific compounds? The time trend of some compounds should be shown somewhere as an example. - Line 286, Table 3: what about the altitude (remote) site in the Alps? The concentrations seemed very low. - Line 289: α_s should be defined before. This refers to the particulate phase, right? - Lines 293-300: this paragraph should be moved in the “Mass size distributions” section. - Line 344, Figure 3: There is a problem with the x-axis, it should be the opposite or the size distribution shown is wrong. PAH and nitro-PAHs are mainly associated to the finest aerosol particles. You should also show the standard deviation of the particle size distribution for each size range. As it is shown on this figure, you should remove these data from the Table 1. - Lines 374-377: To evaluate the influence of primary or secondary sources of nitro-PAHs, it is better to focus on the 2-NFlt/1-NPyr ratio. - Lines 378-388: What about the day/night variations? Did you notice anything specific showing a predominance of day-time or night-time processes at the continental site? This is then useful to support the findings of the following paragraph (Lines 389-396).

References:

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Albinet, A., Leoz-Garziandia, E., Budzinski, H., Villenave, E., 2007. Polycyclic aromatic hydrocarbons (PAHs), nitrated PAHs and oxygenated PAHs in ambient air of the Marseilles area (South of France): Concentrations and sources. *Sci. Total Environ.* 384, 280-292.

Albinet, A., Leoz-Garziandia, E., Budzinski, H., Villenave, E., Jaffrezo, J.L., 2008. Nitrated and oxygenated derivatives of polycyclic aromatic hydrocarbons in the ambient air of two French alpine valleys. Part 1: Concentrations, sources and gas/particle partitioning. *Atmos. Environ.* 42, 43-54.

Keyte, I.J., Albinet, A., Harrison, R.M., 2016. On-road traffic emissions of polycyclic aromatic hydrocarbons and their oxy- and nitro- derivative compounds measured in road tunnel environments. *Sci. Total Environ.*

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